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VOLUME 2
NATIONAL EXHIBITORS

Editor: Andrei Victor SANDU

NATIONAL EXHIBITORS

VOLUME 2

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SYSTEM AND METHOD FOR DETECTING ACTIVE AIRCRAFT (DRONE) VEHICLES BY DEEP LEARNING ANALYSIS OF SOUND AND CAPTURE IMAGES (Patent appl. RO 00331/2020)

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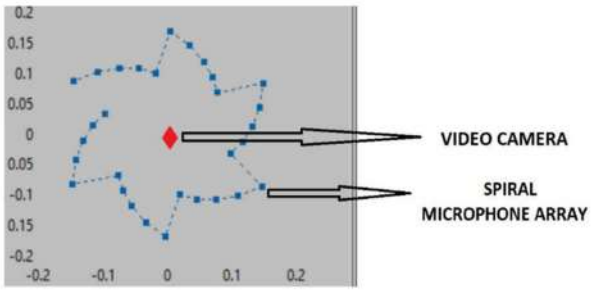
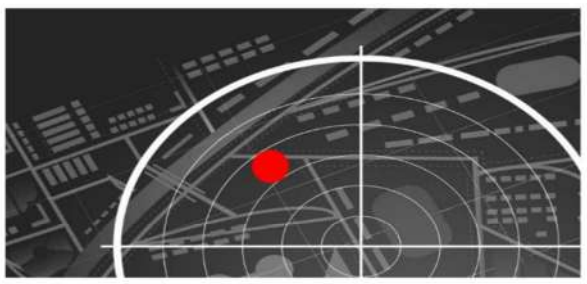
PRESENTATION





The invention relates to a system and a method for detecting, identifying and classifying drones (UAV), based on the concept of competition at the level of a collection of artificial neural networks with performance in identifying acoustic signals, by means of a computing unit for processing, analysis and classification of drones based on associated acoustic fingerprints.
Application domain: Critical Infrastructure Protection

ADVANTAGES

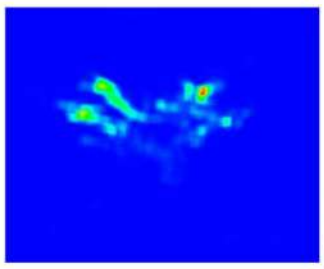
➢Achieving a state-of-the-art drone recognition method that works on as large a model as possible, can be applied independently of the drone model, is robust to noise and at the same time provides the most accurate response possible. as short a time as possible.

➢Use of a microphone area with a built-in video camera.

➢The solution performs a complex spectrum analysis using Cohen class spectrograms.

➢The solution allows the integration of the acoustic drone recognition system with the video images detected by the camera built into the microphone area.

➢The solution introduces a new concept of competing neural networks for the detection of drone-specific acoustic signals.



PROBLEM SOLVED

❖ The solution delivers economy in infrastructure complexity; does not interfere with any of the existing equipment and is safe and secure,

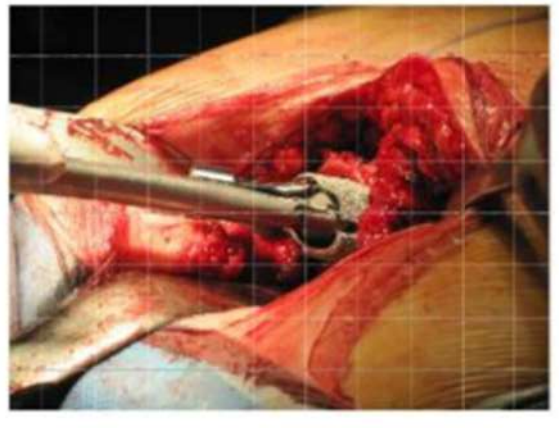
❖ It is adaptable according to the companies in the field of Critical Infrastructures (transport, energy, defense);

❖ The solution is scalable and can be integrated with other detection modules - radar, RF detection (Data Fusion);

❖ The solution can be adapted for detection, recognition, classification for other acoustic signals (shooters detection, birds, determination of engine vibrations, etc.)

❖ Ensures the correct visualization of recorded information and improves accuracy over time, informs can be integrated into a Command and Control Center.

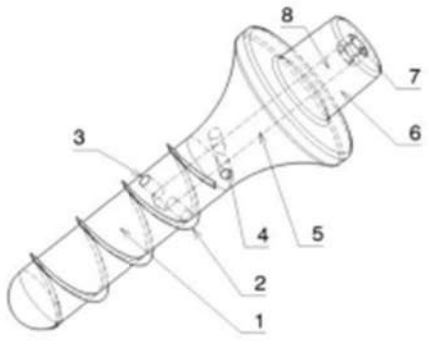
SHORT FEMORAL STEM CERVICAL ENDOPROSTHESIS

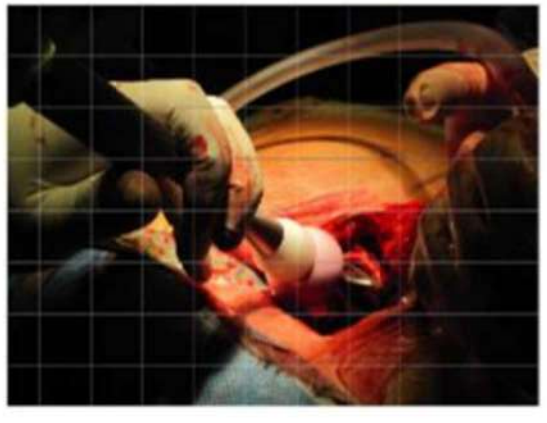


A/00551/29.07.2015
Clasa A61F 2/36, A61F 2310/00
IPC8 Class: AA61F236FI
USPC Class: 623 2335

Abstract

The patent relates to a SHORT FEMORAL STEM CERVICAL ENDOPROSTHESIS, conceived with a threaded fixation system, working through the process of screwing, improves the process of osteo-integration by increasing the application forces of the bone-prosthesis interface and by increasing the primary and final stability, through the injection via an axial or excentric opening of low viscosity orthopaedic cement.





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DENTAL ALLOY OF COBALT-CHROMIUM-MOLYBDENUM TYPE USED FOR MAKING METAL-CERAMIC DENTAL PROSTHESES, COMPRISES COBALT, CHROMIUM, MOLYBDENUM, SILICON, NIOBIUM, RUTHENIUM, ZIRCONIUM AND SILVER (patent no: RO134131)

ANTONIAC Vasilea Iulian,RAU Dzulietta, SEMENESCU Augustin, DAWOD Nazem, GEANTA Victoras, VOICULESCU Ionelia, MATES Ileana Mariana, SOLEA Marina Roxana

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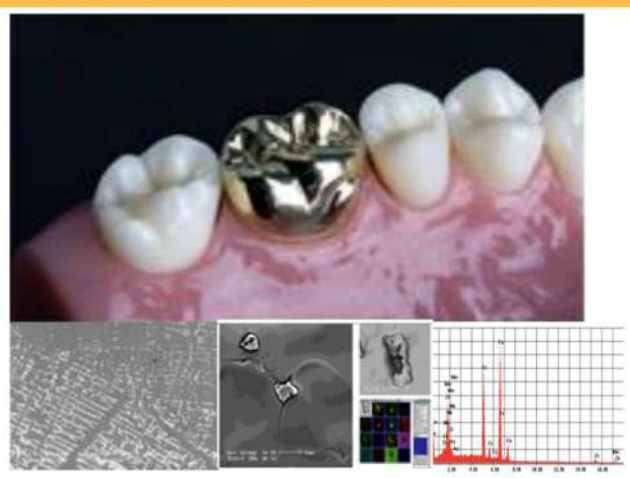
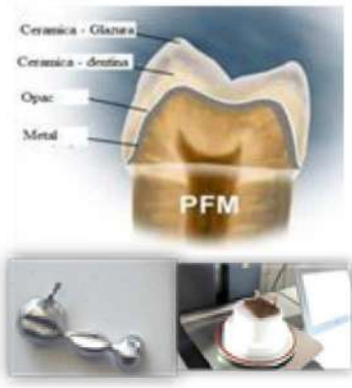
PRESENTATION



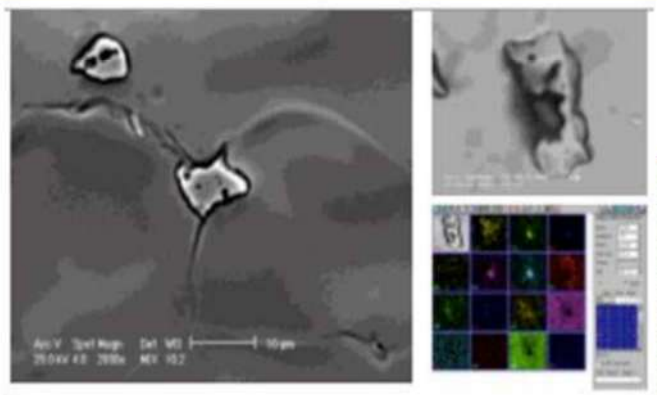
Dental alloy of cobalt-chromium-molybdenum type comprises 47-53 wt.% cobalt, 22-26 wt.% chromium, 4-7 wt.% molybdenum, 0.9-1.2 wt.% silicon, 3-5 wt.% niobium, 0.8-1.1 wt.% ruthenium, 10-14 wt.% zirconium and 2-4 wt.% silver, where the alloy has biocompatible metals comprising molybdenum, zirconium, niobium, silver and ruthenium, and is prepared by elaboration in electric arc furnace in neutral atmosphere.

ADVANTAGES

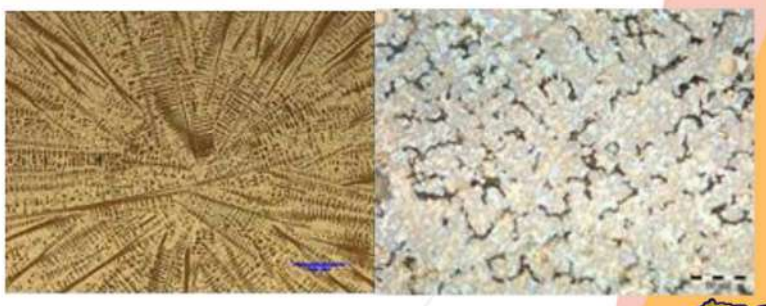
❖ The alloy exhibits excellent biocompatibility and corrosion resistance.



PROBLEM SOLVED



❖ The alloy is used for making metal-ceramic dental prostheses.

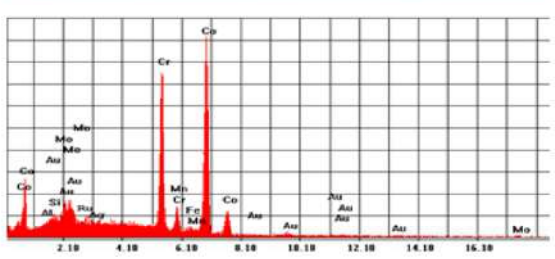


COBALT, CHROMIUM AND NOBLE METAL CONTAINING ALLOY USED FOR MANUFACTURING METAL-CERAMIC DENTAL PROSTHESES, COMPRISES COBALT, CHROMIUM, SILICON, RUTHENIUM, ZIRCONIUM AND SILVER (patent no: RO134132 A0)

ANTONIAC Vasilea Iulian,RAU Dzulietta, SEMENESCU Augustin, DAWOD Nazem, GEANTA Victoras, VOICULESCU Ionelia, MATES Ileana Mariana, SOLEA Marina Roxana

Contact persons: augustin.semenescu@upb.ro

PRESENTATION

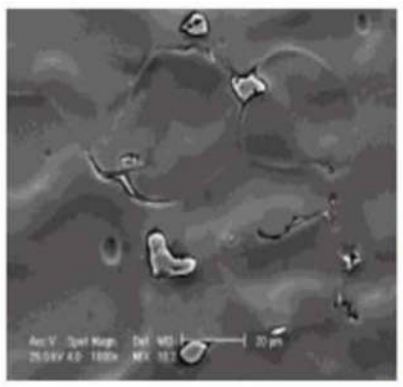


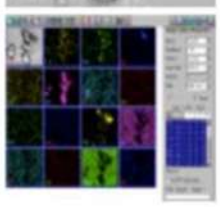
Cobalt, chromium and noble metal containing alloy comprising 58-61 %mass cobalt, 28-30 %mass chromium, 3.4-4.4 %mass silicon, 2-4 %mass ruthenium, 0.7-1.4 %mass zirconium and 0.8-1.2 %mass silver and obtained by elaboration in an electric arc furnace in a neutral atmosphere, with or without magnetic levitation.

ADVANTAGES

- **The alloy has high biocompatibility. DETAILED DESCRIPTION - Cobalt, chromium and noble metal containing alloy of formula: CoCrMn comprises 58-61 %mass cobalt, 28-30 %mass chromium, 3.4-4.4 %mass silicon, 2-4 %mass ruthenium, 0.7-1.4 %mass zirconium and 0.8-1.2 %mass silver and obtained by elaboration in an electric arc furnace in a neutral atmosphere, with or without magnetic levitation. Cobalt, chromium and noble metal containing alloy of formula: CoCrMn comprises 58-61 %mass cobalt, 28-30 %mass chromium, 3.4-4.4 %mass silicon, 2-4 %mass ruthenium, 0.7-1.4 %mass zirconium and 0.8-1.2 %mass silver and obtained by elaboration in an electric arc furnace in a neutral atmosphere, with or without magnetic levitation**

PROBLEM SOLVED





- The alloy is useful for manufacturing metal-ceramic dental prostheses.

Patent application A/00818/ 2020

COMPOSITION FOR RESTORING PAPER FROM DOCUMENTS AFFECTED BY MICROORGANISMS

Ovidiu OPREA[1], Anton FICAI[1], Denisa FICAI[1], Ludmila MOTELICA[1], Roxana TRUȘCĂ[1], Ecaterina ANDRONESCU[1]
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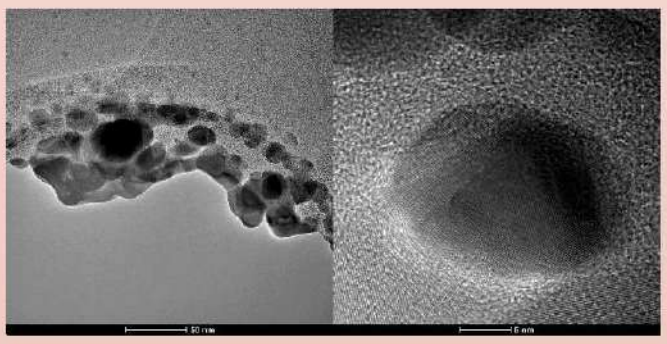
Introduction

The present invention relates to the production of innovative compositions consisting of cellulose gel with Ag nanoparticles, for the treatment of degraded paper support of documents affected by pathogens (fungi, molds or bacteria). One of the current problems faced by libraries, archives, but also private collectors or occasional customers of antique shops, is the degradation of books or documents, especially those stored in less stringent conditions. Normally the temperature should not fall below 21°C, the humidity should not exceed 50% and the storage place should benefit from good air ventilation. Most of the time, private collectors, but also smaller libraries or institutions, do not have the necessary financial strength to hire a professional restorer and / or to purchase the necessary equipment, which is extremely expensive. Also, this problem of mold and specific odor can be faced by anyone when buying a book from an antique shop or borrowing it. Moreover, in the case of schools that reuse books in several successive years, an advanced sterilization of books can be ensured, either in a regime organized by the educational units or by the direct beneficiaries (parents of the students). If the removal of visible inflorescences is relatively easy, there is always the problem of the subsequent appearance of molds as the spores remain trapped in the cellulosic, fibrillar texture, which acts as a net. The cellulosic gel loaded with silver nanoparticles can be used to repair the degraded support, the missing bits, it can be placed under the printed letters, or it can be used as a surface treatment of whole sheet. The nanoparticles will remain trapped into the cellulosic net and will confer a long-lasting antimicrobial activity. This will ensure an increased resistance of the support to subsequent attacks.

Obtaining method

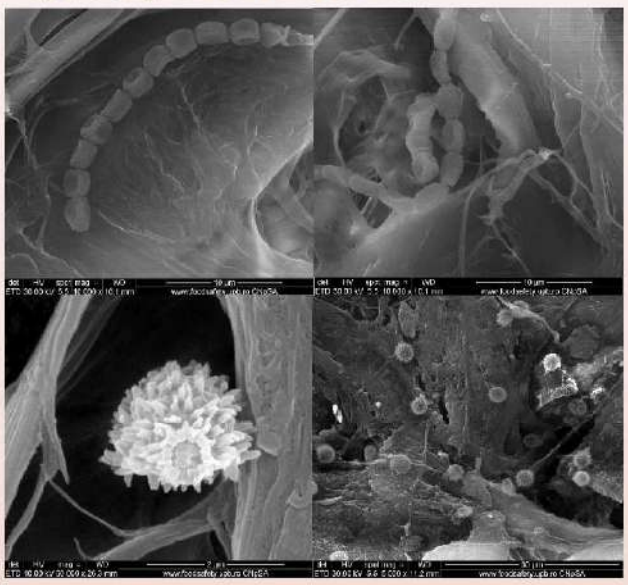
Silver nanoparticles are a well-known antimicrobial agent with multiple uses in day-by-day life. Its intrinsic bacteriostatic property promote the silver nanoparticles as a topical wound dressing in combinations with other drugs. There are antimicrobial paints or house-holds appliances with silver nanoparticles or even cloths. The round shaped silver nanoparticles were obtained by Turkevich method. Briefly, 0.6 g $AgNO_3$ were solved in 100mL H_2O and 0.6 g sodium citrate was added to the boiling solution. The yellow colloidal silver solution was used further in the obtaining process of cellulose gel. Cellulose hydrogel was obtained by mixing with certain amounts of chitosan and colloidal silver solution. The

The gel with cellulose derivatives, with silver nanoparticles, by rapid drying, forms a cellulose film that will repair the damaged areas (ruptures, holes with missing material, etc.). The gel can also be inserted under the letters that came off the initial support following the degradation of the cellulosic material. By rapid drying it will act as a real glue, but having the same composition, based on cellulose. Because the composition contains silver nanoparticles, the cellulose film remaining after drying has antimicrobial activity and no longer allows the development of microorganisms on the treated area.



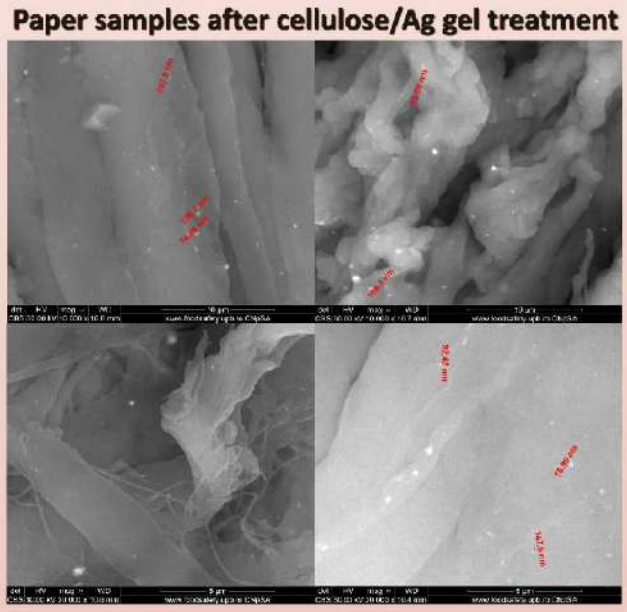
TEM and HRTEM for Ag NPs

Paper samples before treatment



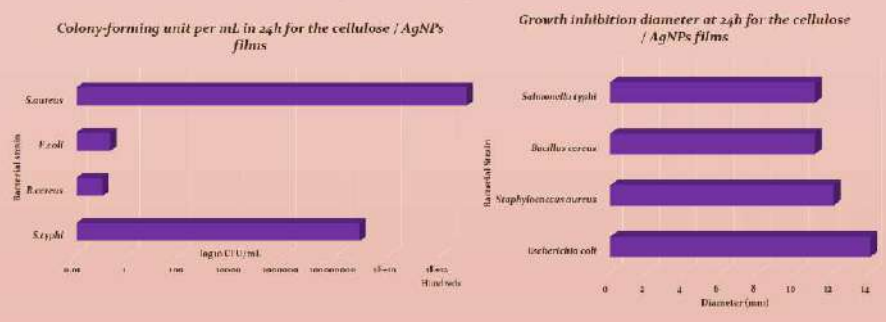
Infested paper from XVI-XVIII

Paper samples after cellulose/Ag gel treatment



Treated paper with cellulose and Ag NPs trapped among fibers

Quantitative assay of the Ag antimicrobial activity



Advantages of the novel solution types

The present invention relates to the production of gel-type compositions based on cellulose derivatives, with silver nanoparticles protected with biocompatible polymers, such as PVP, PEG for the restoration of paper documents, which will provide long-lasting antimicrobial protection. The advantages of the proposed treatment solutions consist in the synergistic, complex activity of the antimicrobial agents, as well as in the fact that a lasting antibacterial and antifungal activity can be ensured after application. Moreover, it is important to mention that the nanoparticles exhibit a good adhesion to the cellulosic surface of the paper. The antibacterial and antifungal activity of silver nanoparticles manifests itself at a slow rate but is sufficient to prevent the reappearance of molds. The gel with cellulose derivatives, with silver nanoparticles, by rapid drying, forms a cellulose film that will repair the damaged areas (ruptures, holes with missing material, etc.). Because the composition contains silver nanoparticles, the cellulose film remaining after drying has antimicrobial activity and no longer allows the development of microorganisms on the treated area.

Acknowledgement: This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI - UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0689 /P1. „Lib2Life - Revitalizarea bibliotecilor si a patrimoniului cultural prin tehnologii avansate" within PNCDI III

UNIVERSITY POLITEHNICA OF BUCHAREST

NANOM MEMS SRL

522PED / 2020

EXPLOITATION OF THE MAGNETIC NANOPARTICLES IN DEVELOPING MAGNETIC MICRO-DEVICES

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[2] NANOM MEMS SRL; Râșnov, Romania

Abstract

The aim of the present project is to develop magnetic inks/pastes used for a modern and cost-effective deposition technique, namely screen-printing. The project aims to integrate the two separate components in a demonstration model to prove the enhanced functionality of microelectromechanical systems devices (MEMS) used in biological applications by magnetic actuated micropumps. Starting from this, two major objectives are defined. First of all, the development of the magnetic inks/pastes is essential to be further used in development of a demonstrator for magnetic actuated microdevices. By using the developed magnetic inks/pastes the consortium, especially by the involvement of the innovative SME, novel experimental models of magnetic actuated micropumps will be developed. So, two experimental models (one product and one device) will be developed by two (nano)technological approaches. According to the proposed work-plan, the consortium is assuring the validation at laboratory level. Moreover, the presence of an innovative SME creates the premises to further develop these researches and to produce magnetic inks and even magnetic actuated microdevices.

Project description:

The objective of the present project is to development:

- of an innovative electromagnetically actuated micropump. Figure 2 shows the cross-section sketch of a theoretical model of the micropump that is intended to be developed in the present project. The model of the pump will comprise two functional layers: a composite film/membrane embedded with magnetic nanoparticles and a functional layer incorporating flow control elements (flow channels with integrated valves if necessary and pump chamber). These two functional layers are going to be sandwiched between other layers of the same material in order to offer protection of the functional layers. For example, PDMS is a versatile material with remarkable properties for layers of MEMS/BioMEMS applications [1]. PDMS layer will be obtained using by spin coating and/or dr. Blade, ferromagnetic layer will be deposited by screen printing and different layers of PDMS will be bonded by activation with UV radiation or plasma treatment. The liquid will be pumped by applying appropriate voltages (not exceeding a few volts) to the electromagnets.
- an experimental model of a microsystem for DNA amplification is presented (figure 3). NANOM MEMS SRL have experience regarding similar devices, as seen in the figure. The experience and knowledge gained in previous experiments [35, 36] related to the field it will allow them an easy integration of the separate components used in EM actuated microdevices and a clear transition from TRL2 to TRL4. This microsystem uses PDMS microchambers for DNA amplification (single use). Apart from the pumping actuation, integration of different sensors and electrodes will be embedded into the demonstrator: temperature sensor; pH sensor; Ag/AgCl reference electrode; work and counter-electrodes; impedimetric sensor (for liquid presence into capillaries). For the temperature sensor, Pt microwire covered with glass (5 μm diameter) will be connected between two Ag pads deposited by screen printing. For pH sensor one solution is based on screen printing of a paste based on conducting polymer and the other is based on a Sb paste as sensing layer. Ag/AgCl reference electrode will be obtained by screen printing of the DuPont 5874 paste. Work and counter-electrode and impedimetric sensor will be obtained by screen printing of carbon paste.

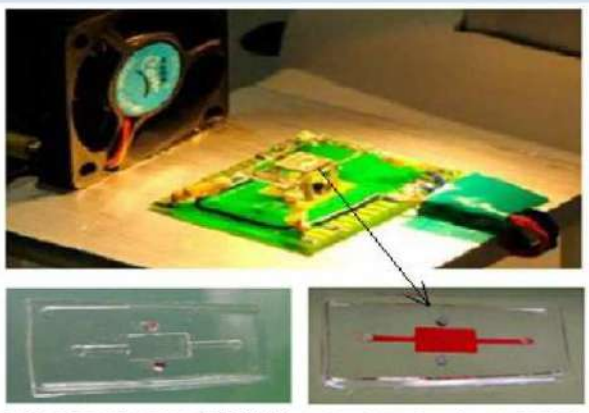

Figure 2. Microsystem and disposable chamber manufactured in PDMS [2]

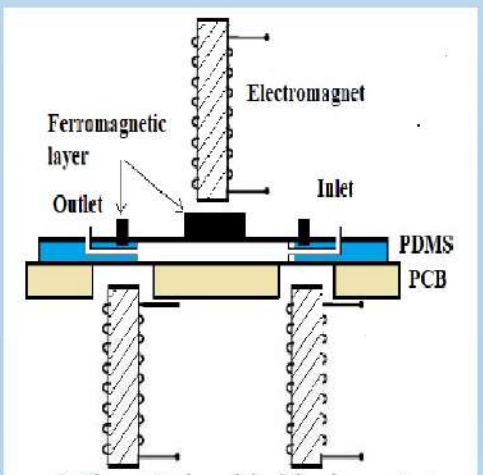

Figure 3. Theoretical model of the demonstrator

Conclusions

The project objectives will be reached by applying a strategy based on a multi- and interdisciplinary work combining the expertise on synthesis and characterization of magnetic nanopowders and additive manufacturing with the expertise related to microelectronics technology and engineering.

Bibliography

[1] M. Gheorghe, S. Blionas, J. Ragoussis, P. Galvin, Evaluation of Silicon and Polymer substrates for fabrication of integrated microfluidic microsystems for DNA extraction and amplification, Proceedings of IEEE 2006 International Conference of the Engineering in Medicine and Biology Society, New York, USA, 2006, 2485 - 8.

A/000752021

TREATMENT PROCEDURE FOR VARIOUS NATURAL OR SYNTHETIC SURFACES WITH THE SCOPE O INDUCING ANTIMICROBIAL, ANTIBIOFILM, ANTIFUNGAL, ANTIALGIC OR ANTIVIRAL ACTIVITIES BASED ON NANOTECHNOLOGY

Liliana Marinescu[1], Laura-Florentina Boanta[2], Anton Ficai[1], Denisa Ficai[1], Ecaterina Andronescu[1]

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1. Introduction

The invention consists of developing treatment solutions based on functionalization agents/coupling agents of silanes/siloxanes with functional groups with the role of performing a silanization action onto the treated surfaces. It also consists in functional groups that can ensure both the system's detergency, the non-adhering activity, biological activity, as well as pore closure and „crack healing". It is also possible to control the hydrophil/ hydrophobe ratio. The mixture of agents of functionalization can develop, through functional groups and / or adsorbed nanoparticles as gold, copper, silver (AuNPs, CuNPs AgNPs), complex surfaces with antimicrobial, antiviral, antifungal, analgesic protection for various substrates.

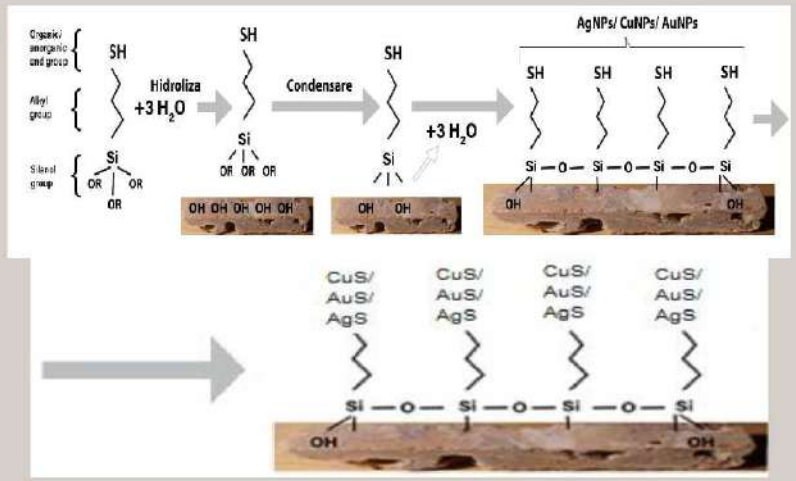

Fig 1. Treatment scheme applied onto surfaces

2. Experimental

The treatment of substrates consists of applying a certain concentration of siloxanes/silanes as coupling agents and silver, gold or copper nanoparticles solutions (Fig 1). Thus, surfaces are prepared to be treated with silver, gold or copper nanoparticles. Nanoparticles solutions were applied onto the impregnated surface by brushing, spray-ere, or surfaces were immersed in nanoparticles solutions with various concentration between 10 -1000ppm.

3. Results and discussions

In this section are presented tests are conducted on the antimicrobial impregnated surfaces.

IR maps (Fig 2) confirm the efficiency of impregnation of stone substrate with siloxanes coupling agent. Thus, relatively similar images obtained at different wavelengths specific presence of carbonate, siloxanes, or thiol groups confirm that the substrate were impregnated and ready to be treated with nanoparticles solutions. The antimicrobial test was done on the treated surface with AgNPs and confirm the efficiency (Fig 3). The test results obtained for the same type of impregnated stone with different concentration of AgNPs solution shown a high efficiency.

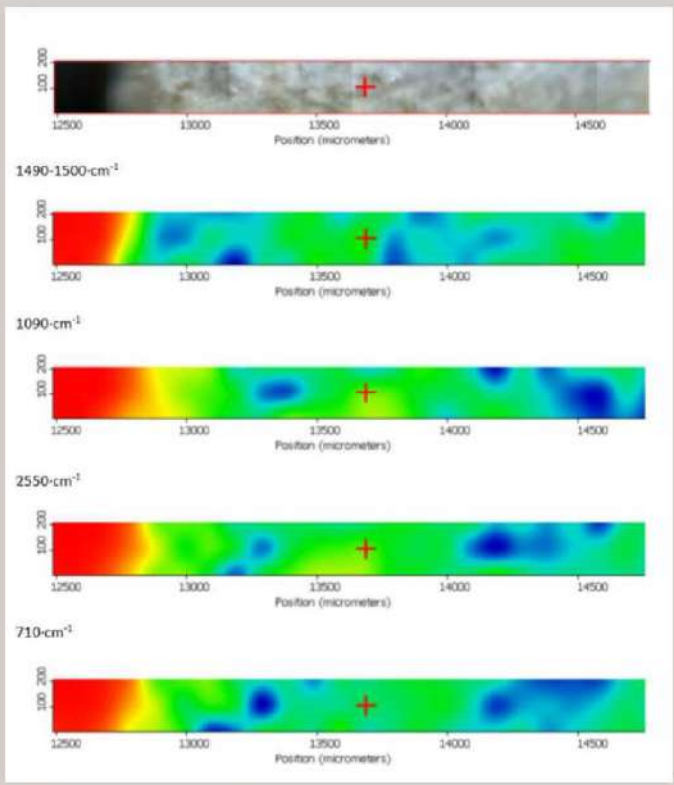

Fig 2. IR maps at specific wavelengths and treated stone substrate

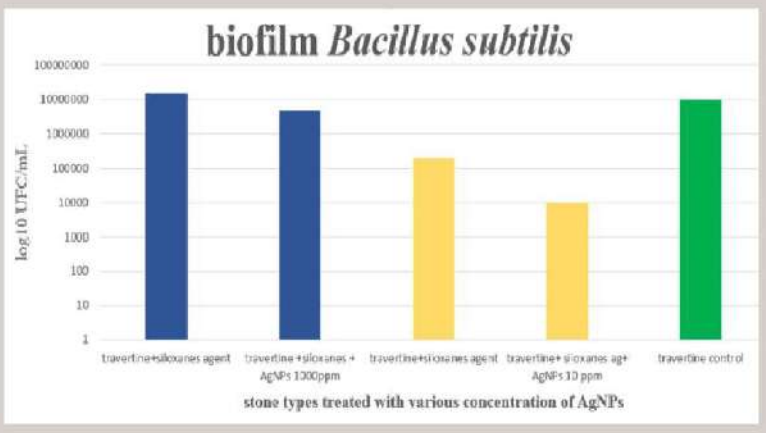

Fig 3. *Bacilus substilis* antibiofilm results

4. Conclusions

Treatment of various substrates using coupling agents with long chains and inorganic head as thiol groups or ethylene glycol are able to give together with silver, gold, copper nanoparticles antimicrobial, antialgic, antifungal, or antiviral surfaces.

5. Bibliography

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Equipment for microhole finishing by ultrasonically aided electrical discharge machining

Granted Patent : RO-126381/ 2015-07-30

Prof. Niculae Ion MARINESCU, Ph.D., Eng.
Prof. Daniel GHICULESCU, Ph.D., Eng.
Sergiu Alexandru NANU, Ph.D., Eng.

Novelty

- Finishing technology of microholes, previously machined by pulsed laser, by electrical discharge machining aided by ultrasonic longitudinal vibrations of electrode-tool (fig. 1).
- Adjusting device of electrode-tool guide: rotation around horizontal axis on spherical surfaces, and rough and fine translation on vertical axis (fig. 2);
- Multiple guiding of electrode-tool, by superior and inferior bushing (fig. 2), prismatic surfaces and elastic elements (fig. 3).
- Electrode-tool clamping in antinode point by triple jaws and screwed nut (fig. 4);
- Dielectric lateral flushing through inferior bushing (fig. 2) and interior flushing in case of tubular tools by a nozzle that enters the horn in nodal point (fig. 4).

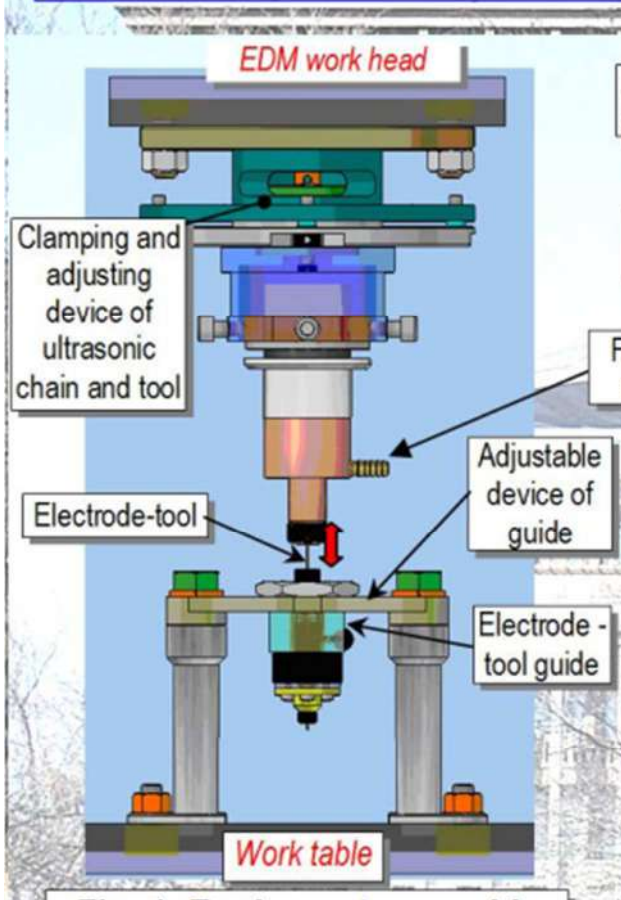

Fig. 1. Equipment assembly

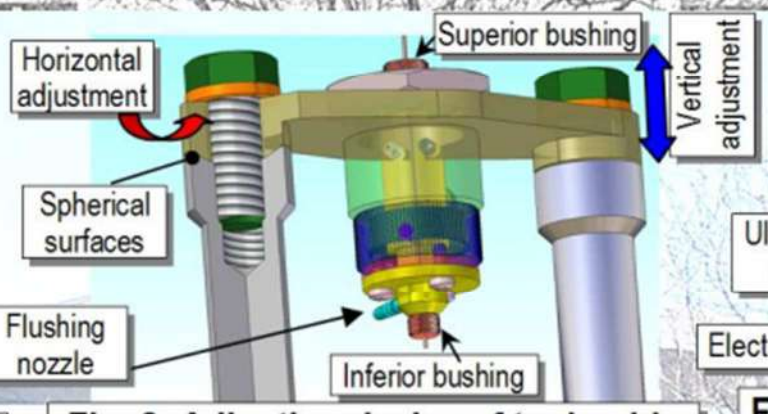

Fig. 2. Adjusting device of tool guide

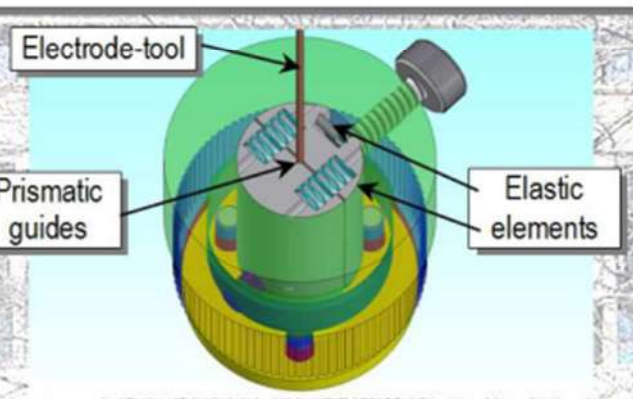

Fig. 3. Prismatic tool guide

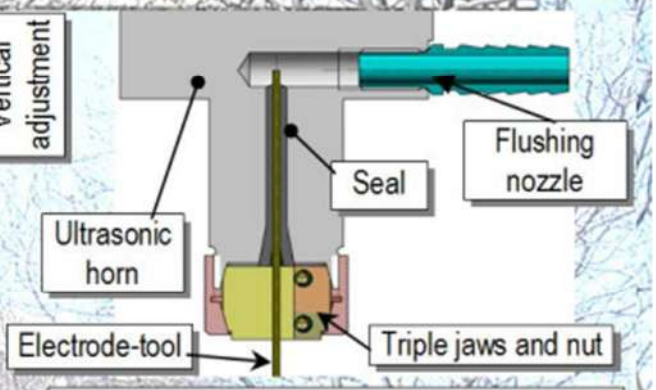

Fig. 4. Tool clamping and interior flushing

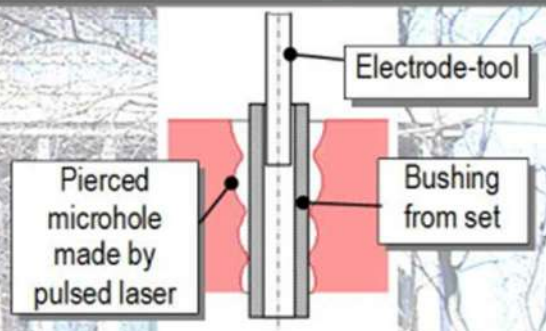

Fig. 5. Tool guiding by bushings set

Advantages

- High machining rate and surface quality due to ultrasonically induced cavitation within working gap and tool guiding through bushings set (fig. 5);
- High quality of electrode-tool guiding in terms of position and shape precision;
- Efficient clamping and flushing of electrode-tool.

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Equipment for ultrasonically aided electrical discharge machining (EDM+US) of microslots
Granted Patent : RO-126381/ 2012-05-30

Prof. Daniel GHICULESCU, Ph.D., Eng.
Prof. Niculae Ion MARINESCU, Ph.D., Eng.
Sergiu Alexandru NANU, Ph.D., Eng.

Novelty

- High pressure supplying of dielectric liquid within working zone through cavitational effect produced by an ultrasonic chain that vibrates within a hopper - fig. 1;
- Cumulating the effects produced by vibrations of ultrasonic chain including the electrode-tool and of ultrasonic chain acting at workpiece level - fig. 1;
- Simultaneous inclination and rotation both of blade electrode-tool - fig.2 and workpiece - fig.3.

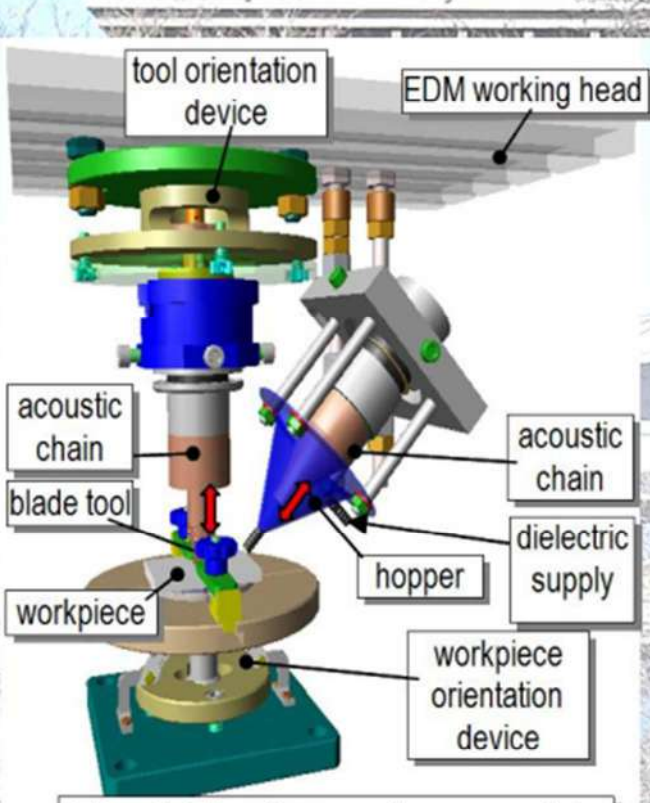

Fig. 1 Equipment assembly

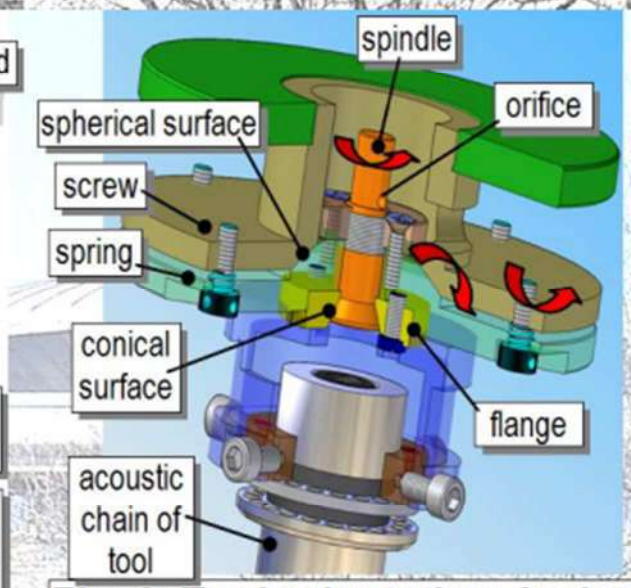

Fig. 2. Tool orientation device

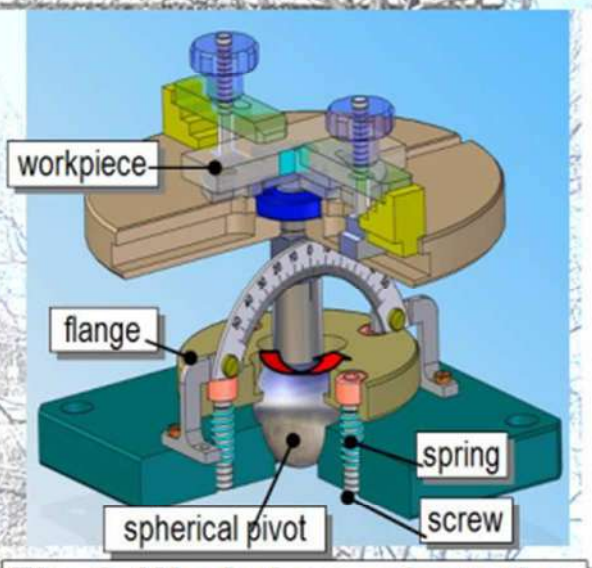

Fig. 3. Workpiece orientation device

Advantages

- EDM+US deep micro-slots with more than 100% machining rate increase against EDM, without holes for flushing inside workpiece or electrode-tool;
- Decrease with up to 50% of volumetric relative wear and surface roughness;
- Achieving great inclination of pierced and unpierced micro-slots;
- Adjusting perpendicularity and angular position of electrode-tool relative to workpiece.

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Mobile equipment for ultrasonically aided electrochemical machining of workpieces of big dimensions

Granted Patent : RO - 128982/30.04.2019

Prof. Niculae Ion MARINESCU, Ph.D., Eng.
Prof. Daniel GHICULESCU, Ph.D., Eng.
Prof. Alexandra BANU, Ph.D., Eng.
Sergiu Alexandru NANU, Ph.D., Eng.

Novelty

- Ultrasonic aiding of electrochemical machining using an electrode-tool positioned at the end of an ultrasonic chain and electrolyte liquid supplying through a nozzle located in nodal point (fig. 1);
- Ultrasonic aiding of electrochemical polishing using a rotary electrode-tool and a hopper supplied with electrolyte liquid on which an ultrasonic transducer is assembled (fig. 2);
- Ultrasonic removal of passivated layer works when polishing by tool rotation stops (fig. 2).

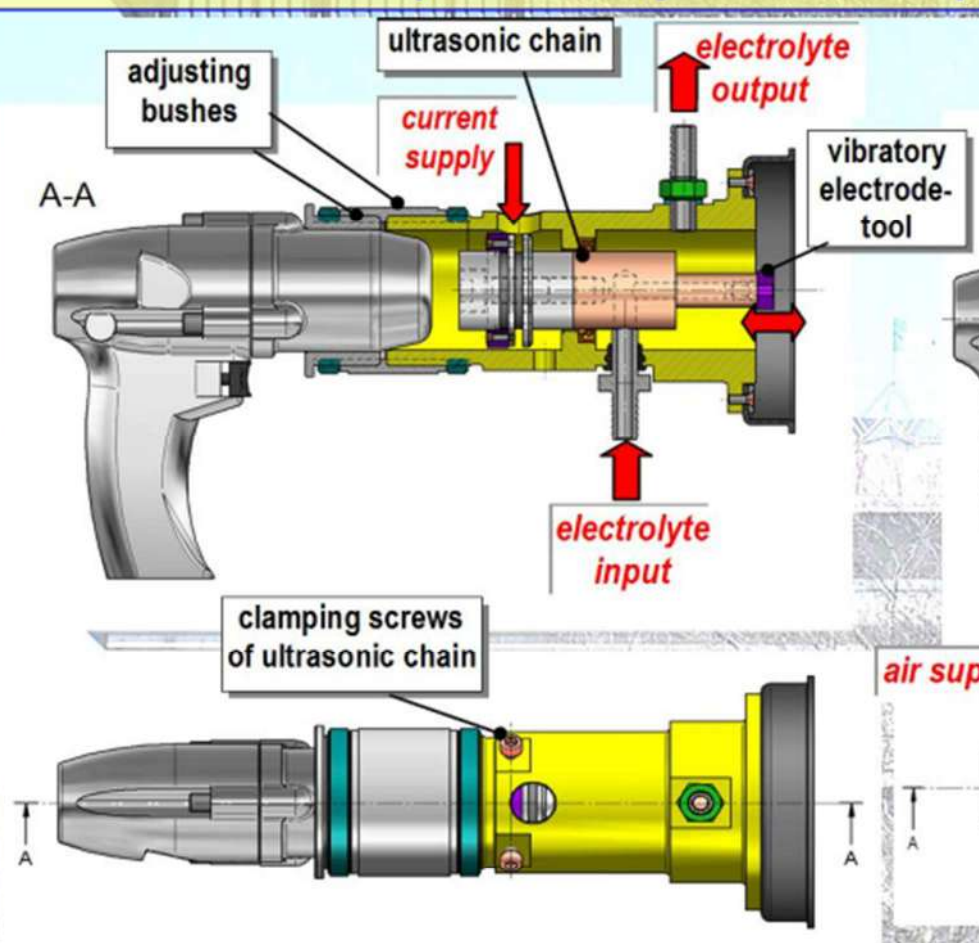

Fig. 1. Mobile equipment for ECM aided by ultrasonics

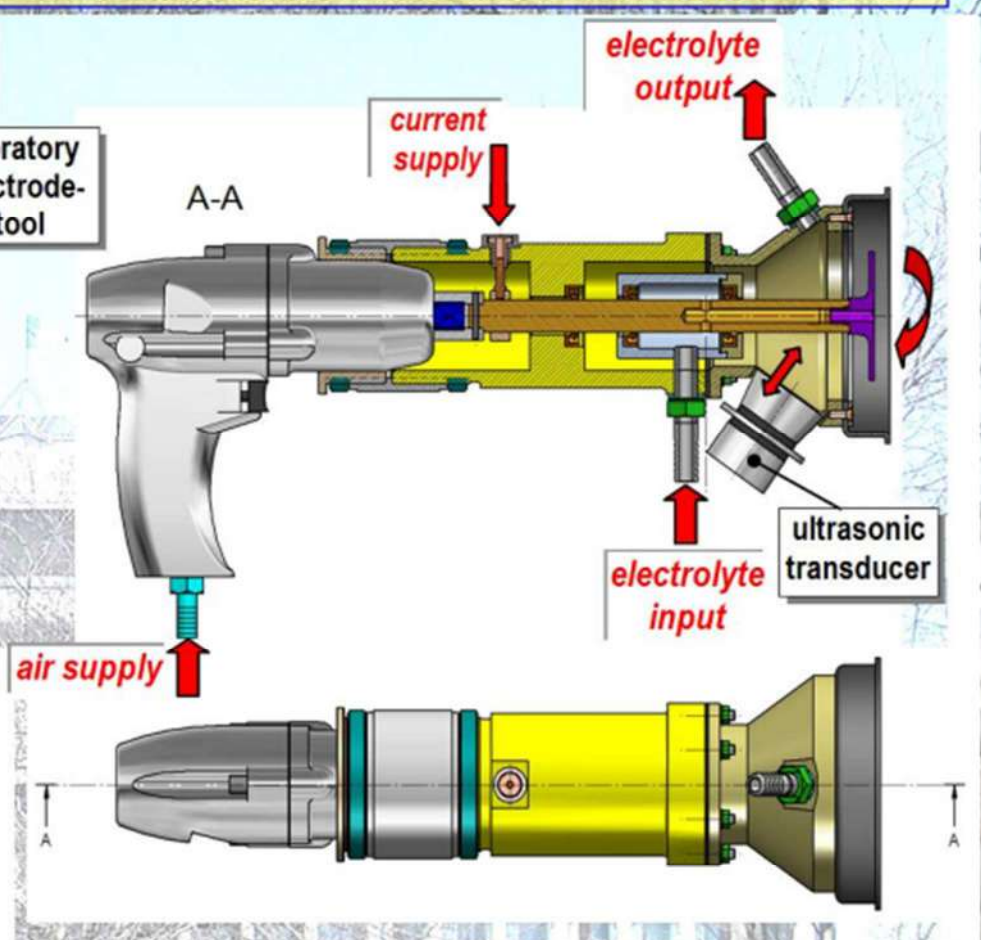

Fig. 2. Mobile equipment for EC polishing aided by ultrasonics

Advantages

- Electrochemical machining complex surfaces of workpieces with overall great dimensions located indoor and outdoor;
- Efficient removal of passivated layer by ultrasonic aiding, increasing process stability and machining rate without supplying with high pressure of electrolyte liquid;
- Uniform circulation of electrolyte liquid on machined surface using rotary electrode-tool, decreasing surface roughness.

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Machining of Advanced Materials Based on Ti and Co Alloys through Ultrasonically Aided Electrical Discharge Micro-drilling (AM_ED_US)

Research project: PN-III-P2-2.1-PED-2019-0367; 31.08.2020-31.01.2022

Project team

Prof. Daniel GHICULESCU, Ph.D., Eng.
Prof. Alexandra BANU, Ph.D., Eng.
Gheorghe Jitianu, Eng.
Assoc. Prof. Andrei DRUMEA, Ph.D., Eng.
Prof. Nicolae Ionescu, Ph.D., Eng.
Assoc. Prof. Ovidiu Alupei, Ph.D., Eng.
Assist. Prof. Gabriela Pârvu (Ene) Ph.D.st., Eng.

PhD Theses

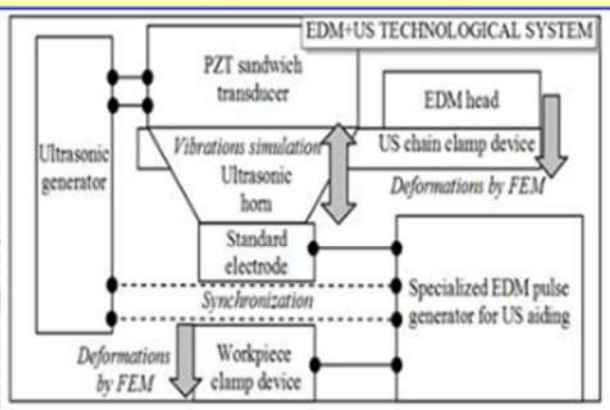
Bogdan Cristea: Feed system for microEDM+US
Cornel Engiu: *Hybrid technologies with ultrasonic assistance*
Andrei Nedelcu: Advanced materials machined by microEDM+US

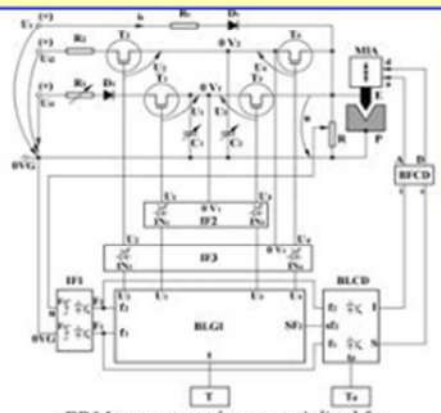
Project goals

- EDM+US microdrilling technology applied on advanced materials validated at laboratory level (TRL4).

Advanced materials

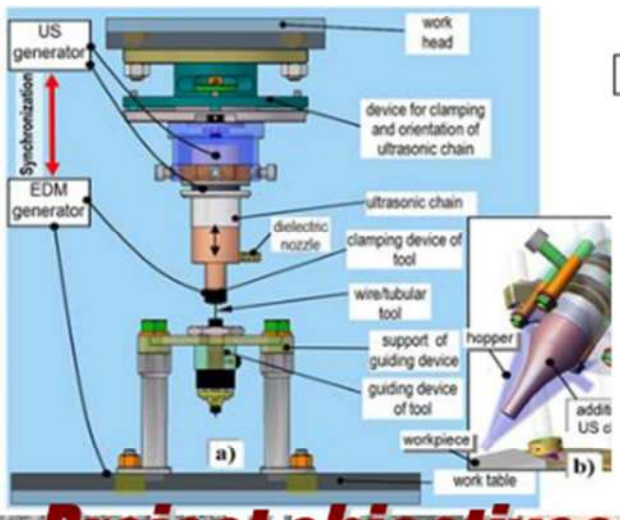
- *Applications:* medicine, automotive, aerospace, military, nuclear, food industry etc.
- nanotubes of TiO_2 thin layers on Ti or Ti alloy support, Titanium aluminides with different proportions between Ti_3Al (α2) and TiAl (γ) phases, and *CoCr alloys*

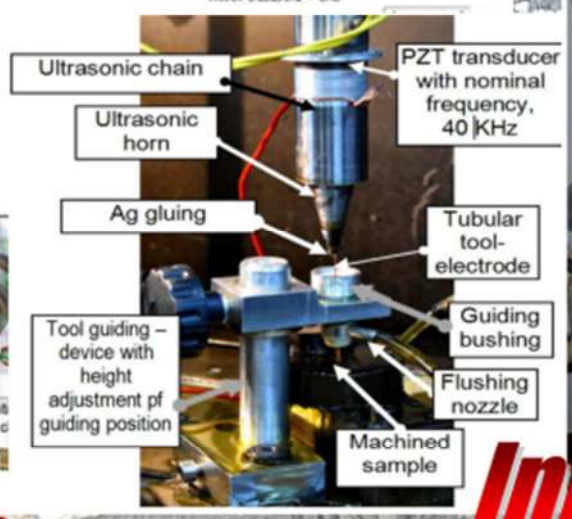




EDM generator scheme specialized for microEDM+US

Jitianu, Gh., Method and equipment for growing machining rate of finishing process of surfaces through electrical discharge machining. *Granted patent, RO-129537, 30.05.2016.*





Infrastructure

Project objectives

- increase of *machining rate* with at least 100%, decrease of *volumetric relative wear* and surface roughness *Ra* with at least 50% in comparison with classic EDM, for microholes range diameters of 0.2-0.8 mm, *validating the technology* of EDM+US microdrilling at laboratory level;

New patent applications

- Equipment for machining micro pins and micro holes by electrical discharge with torsional and longitudinal ultrasonic vibration of tool-electrode A / 00698 / 31.10.2019; *Method and flushing device of the working gap at ultrasonically aided micro-electrical discharge machining A / 00779 / 25.11.2020.*

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20-22 MAY 2021
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EURO INVENT

MILL KNIFE FOR ASPHALT CUTTING/STRIPPING THAT HAS WEAR SELF PROTECTION AND AUTO BLOCK WHEN SPINNING

BINCHICIU Emilia, GEANTĂ Victor, VOICULESCU Ionelia,
ŞTEFĂNOIU Radu, IOVĂNAŞ Răzvan Florin, BINCHICIU Horia,
BINCHICIU Aurelia


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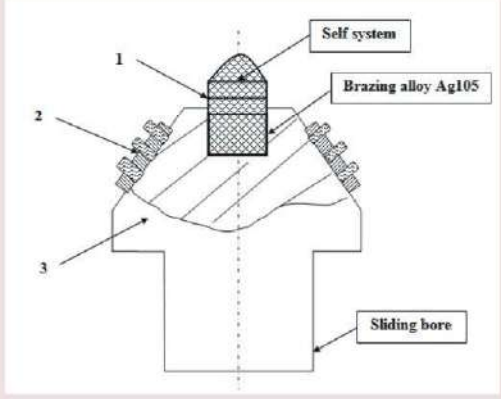
BREVET DE INVENTIE
Nr. 129863



Mill asphalt cutting knife.
1-reinforcement-cutting body with self-protection at wear, 2-knife support made from low allowed steel with chromium, 3-self-locking when spinning system.

Teeth for asphalt milling with brazed tungsten carbide tips.

MILL KNIFE FOR ASPHALT CUTTING/STRIPPING THAT HAS WEAR SELF PROTECTION AND AUTO BLOCK WHEN SPINNING comprises a support made of steel low alloyed with chromium, which is consolidated, at the conical surface level, with an system that avoid blocking during rotation around its axis, produced by welding process, WIG or flame welding, in the form of layers realized by a matrix of steel low alloyed with chromium, in which are embedded melted tungsten carbide particles. In the working area, a conical body made from tungsten carbide is brazed using soldering alloy.

MIG welding process for obtaining the hard deposit on mill asphalt cutting knife.

Filler material used for reinforcement of the mill asphalt cutting knife was flux cored wire with composition: ST Fe-25%W-4%Cr used for welding with MIG process deposits thin layers of alloy type Fe-25%W-4%Cr-Ti, rich in complex carbides, needle like. The deposited layers have a harsh aspect and a high resistance to abrasion combined with corrosion and thermo-mechanical wear.

THE MANUFACTURING PROCESS is performed in several stages: obtaining the knife holder, made by a low alloy steel, from a bars product; hardening the holder to around 55 HRC by heat treatment and quenching in oil; machining the knife holder to the final dimension; attainment by sintering of the reinforcing mill body, using tungsten carbide; brazing in the knife holder of the reinforcing mill body; obtaining of the reinforcing layers, that have the role of self-protection system; slow cooling of the assembly.

APPLICABILITY DOMAIN: earthmoving machines.

20-22 MAY 2021
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WEAR-RESISTANT REMOVABLE COMPOSITE REINFORCEMENT AND PROCESS FOR OBTAINING IT

ȘTEFĂNOIU Radu, BINCHICIU Emilia, BINCHICIU Horia, VOICULESCU Ionelia,
GEANTĂ Victor, BINCHICIU Aurelia

ROMÂNIA

DUPLICAT

ELIBERAT INVENTATORULUI
în baza Art.34 alin.(2),
din Legea nr.64/1991 republicată

OFICIUL DE STAT PENTRU INVENȚII ȘI MĂRCI

BREVET DE INVENȚIE

Nr. 129865

Acordat în temeiul Legii nr.64/1991 privind brevetele de invenție, republicată în Monitorul Oficial al României, Partea I, nr.613, din 19 august 2014.

Titular: SUDOTIM AS S.R.L., TIMIȘOARA, TM, RO

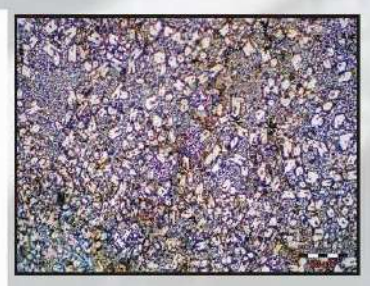
Titlul invenției: ARMĂTURĂ AMOVIBILĂ REZISTENTĂ LA UZURĂ DIN MATERIAL COMPOZIT ȘI PROCEDEU DE OBȚINERE A ACESTEIA

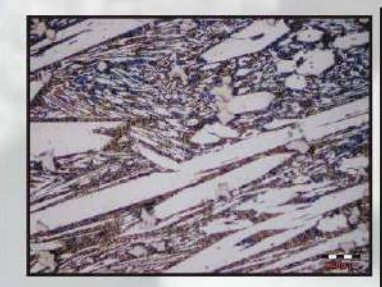
Inventatori: ȘTEFĂNOIU RADU, BUCUREȘTI, B, RO; BINCHICIU EMILIA, TIMIȘOARA, TM, RO; BINCHICIU HORIA, TIMIȘOARA, TM, RO; VOICULESCU IONELIA, BUCUREȘTI, B, RO; GEANTĂ VICTOR, BUCUREȘTI, B, RO; BINCHICIU AURELIA, TIMIȘOARA, TM, RO

Descrierea invenției, revendicările și desenele la care se face referință în acestea, fac parte integrantă din prezentul brevet de invenție.
Durata brevetului de invenție este de 20 ani, cu începere de la data de 23/07/2012, cu condiția plății taxelor anuale de menținere în vigoare a brevetului.

Director General

București, Data eliberării 30/05/2019





Hard deposit

Heat affected zone.

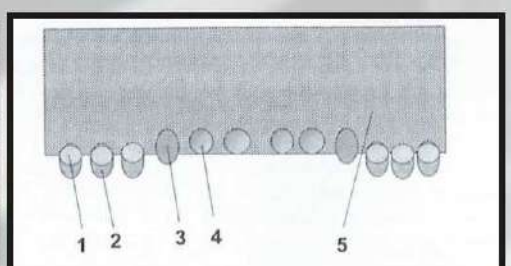


Fig. 1

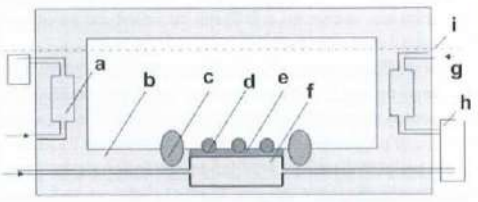


Fig. 2

WEAR-RESISTANT REMOVABLE COMPOSITE REINFORCEMENT AND PROCESS FOR OBTAINING IT relates to a removable reinforcement of solid rigid composite type, of equal wear resistance, used to reinforce the active elements of the crushing-grinding equipment of the stone quarry aggregates, in order to increase their reliability and ensure efficient operation conditions from economically point of view and a process for obtaining this reinforcement. The reinforcements consist of a matrix made of austenitic-manganese steel alloyed with max. 12% Cr and max. 3% Ni, reinforced in the area of maximum wear, in a ratio of up to 30%, with spheroidal particles having the granulation of 3...10 mm and reinforced, in the areas of medium wear, with layers of NiFe-CW-Ti, NiFe-Cr-CW, FeNi-Cr, Fe-Cr-Ti, Fe-Cr, Fe-CW alloys compatible, upon welding, with the matrix, and deposited as anti-wear intelligent systems of grid, embossed and/or grooved type.

The electrode consists of a case of 55%Ni-45%Fe alloy, which contributes by 55% by mass to forming the deposition and a composite core consisting of 80% carburized Cr, 12% FeTi60, 5% FeSi70 and 3% FeMn45 with a contribution of 45% to the deposition mass. The process consists in carrying out the reinforcement matrix as a rectangular plate with the dimensions of 1000 x 250 x 100 mm, anti-gravitationally cast into a mold made of quartz sand, of steel of the Fe-14%Mn-3%Ni-2%Cr type, onto the reinforcements of 6 mm, uniformly pre-positioned in the central area in a ceramic mass.

20-22 MAY 2021
13th Edition of

TUBULAR ROD WITH COMPOSITE CORE AND IT'S MANUFACTURING PROCESS

BINCHICIU Emilia, VOICULESCU Ionelia, BINCHICIU Horia, GEANTĂ Victor,
ŞTEFĂNOIU Radu, BINCHICIU Aurelia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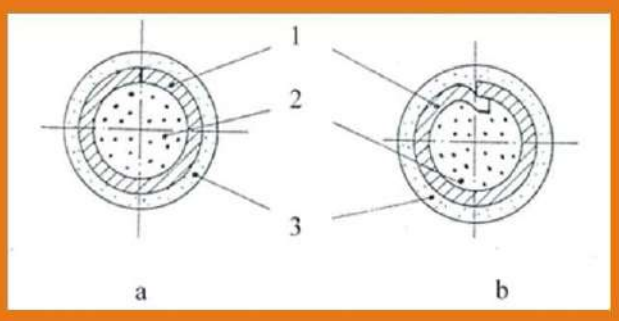
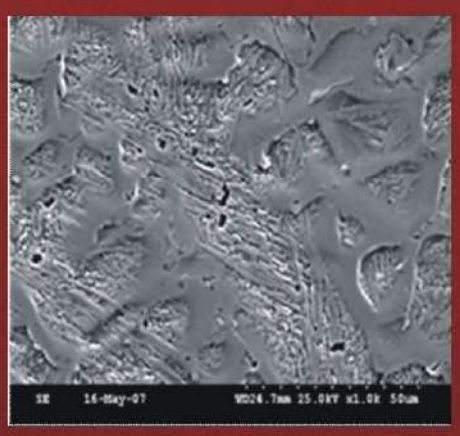
BREVET DE INVENŢIE

Nr. 129867



Cross section of two types of tubular rod for hardfacing.
1 – metallic tubular rod; 2 – composite core (contains metallic alloying elements, tungsten carbides, other minerals that ensure the desulfurization or dephosphating of the molten metal bath); 3 – optional mineral covering



Tubular Rods with Composite Core

TUBULAR ROD WITH COMPOSITE CORE allows coating by welding process, WIG or flame welding, of rough composites layers. The rod consists in a soft steel sheath that has a composite core realized from two distinct layers, made of wolfram carbide and an alloying-compensation system.

THE MANUFACTURING PROCESS consists in: shaping of sheath in U-shape, using a band of steel low alloyed with chromium (1), uniform dosage of the first layer of reinforcing material, as wolfram carbide granules (2), dosage and homogenization of the alloying-compensation system (3), dosing and deposition of the second layer of alloying-compensation system over the first layer (4), shaping and closing of the sheath, compacting of the composite core and cutting of the tubular rods at the specified length.

APPLICABILITY DOMAIN: Deposition of homogeneous rough layers with high hardness.

20-22 MAY 2021
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AIR-ARC GOUGING ROD AND MANUFACTURING PROCESS

VOICULESCU Ionelia, BINCHICIU, Emilia GEANTĂ Victor, BINCHICIU Horia,
ŞTEFĂNOIU Radu, BINCHICIU Aurelia


ROMÂNIA
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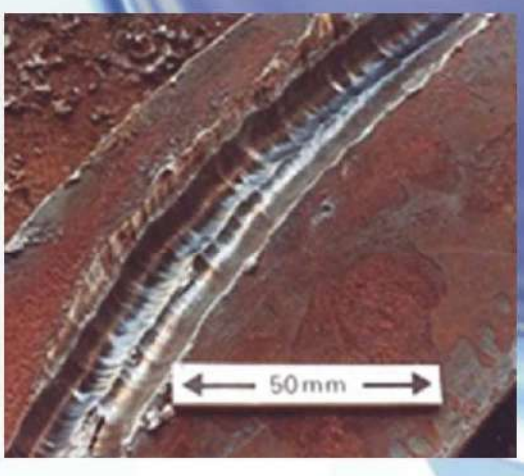
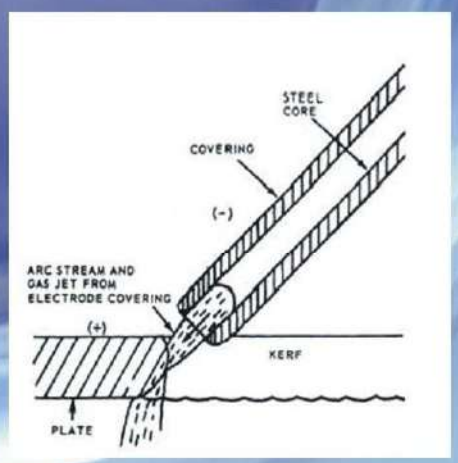
în baza Art.31 alin.(2),
din Legea nr.64/1991 republicată
OFICIUL DE STAT PENTRU INVENTII SI MĂRCI
BREVET DE INVENȚIE
Nr. 129992
Titlul invenției: ELECTROD PENTRU CRĂTUIRE ARC-AER ȘI PROCEDEU DE OBTINERE A LUI
Inventatori: VOICULESCU IONELIA, BUCUREȘTI, B, RO; BINCHICIU EMILIA, TIMIȘOARA, TM, RO; GEANTĂ VICTOR, BUCUREȘTI, B, RO; BINCHICIU HORIA, TIMIȘOARA, TM, RO; ȘTEFĂNOIU RADU, BUCUREȘTI, B, RO; BINCHICIU AURELIA, TIMIȘOARA, TM, RO
Brevetul de invenție este valabil pentru o durată de 20 ani, cu începere de la data de 22/07/2013, cu condiția plății taxelor anuale de menținere în vigoare a brevetului.
București, Data eliberării 20/03/2015

Air supply pressure will be up to 5 bar from the air line but restricted to about 2 bar from a bottled supply. This presure values are sufficient to providing there is sufficient air flow to remove molten metal.
Air gouging process. MMA gouging is used for localised gouging operations, removal of defects for example, and where it is more convenient to switch from a welding electrode to a gouging electrode rather than use specialised equipment. Compared with alternative gouging processes, metal removal rates are low and the quality of the gouged surface is inferior.



Arc-air gouging traces.



Schematic of Arc-air gouging process.

Air gouging process.

AIR-ARC GOUGING ELECTRODES are covered rods, made from carbon steel pipes with thin laminated walls, and then coated with special extruded layer.

THE MANUFACTURING PROCESS of the gouging electrodes consists in the following steps: cutting of the pipes at the specified length; filling with stearin of the pipe ends; cleaning the stearin excess; preparing the covering mixture, the dosing and homogenization of the constituents; deposition by extruding of the covering on the rod; heat drying and packaging of the electrodes.

APPLICABILITY DOMAIN: metallurgical processing, welding reparations.

20-22 MAY 2021
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EURO INVENT

COMPOSITE STRIP USED TO REINFORCE THE ACTIVE SURFACES OF SOIL-WORKING EQUIPMENTS AND PROCESS FOR OBTAINING IT

BINCHICIU Emilia, BINCHICIU Aurelia, BINCHICIU Horia, VOICULESCU Ionelia,
GEANTĂ Victor, ȘTEFĂNOIU Radu


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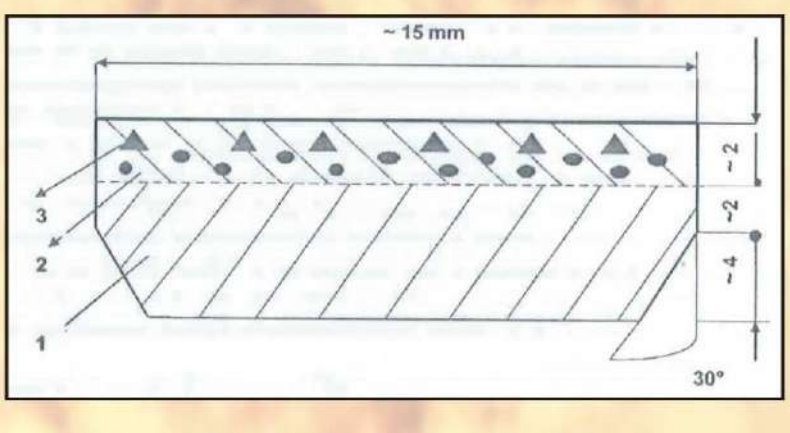
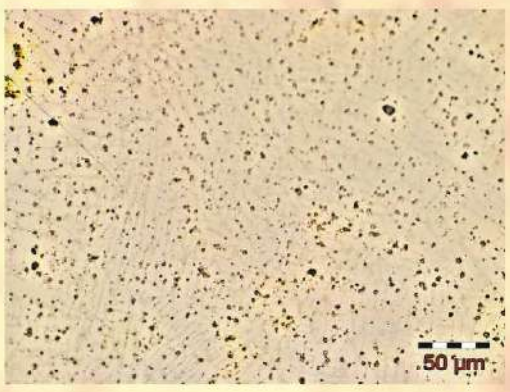
OFICIUL DE STAT PENTRU INVENTII SI MĂRCI
BREVET DE INVENȚIE
Nr. 129877

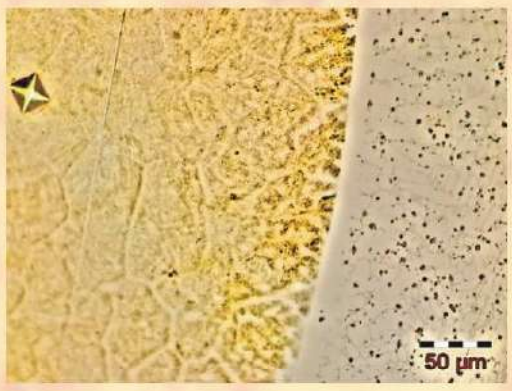


Schematic of composite strip containing two different plates.

Multifunctional plate made by welding of two hard alloy strips



Microstructure of the weld deposit containing various types of carbides



Heat affected zone

COMPOSITE STRIP USED TO REINFORCE THE ACTIVE SURFACES OF SOIL-WORKING EQUIPMENTS AND PROCESS FOR OBTAINING IT relates to a composite strip, used for reinforcing the active surfaces of soil working equipment, which has a saw teeth-like cutting edges with self-sharpening properties in operation, which favors easy soil-working, with low fuel consumption.

The strip comprises a support made of steel low-alloyed with Mn, rolled at sizes of 15 x 6 mm, whereon there is deposited, by welding, an anti-wear layer with a thickness of 2 mm, consisting of a steel matrix of the Fe - 30%Cr; Fe - 12%Cr - 14%Mn; Fe - 25%Cr - 1%V type, wherein particles of melted W carbide with grinding texture, in the granulometry class of 1.5 mm are embedded, in ratios of 15%. The process is a sequential technological process comprising operations of cutting, chamfering, build-up welding with one of the above mentioned alloys, followed by heat treatment of the assembly.

Applications: soil-working equipments, construction and metallurgical industry.

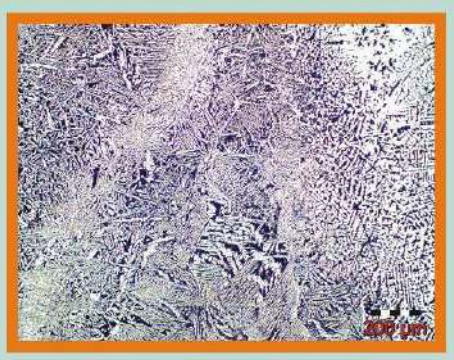
20-22 MAY 2021
13th Edition of

METALLIC MATERIAL TYPE Ni-Cr-Fe-Mn-Al FOR WELDING LOADING AND PRODUCTION PROCESS

GEANTĂ Victor, VOICULESCU, Ionelia., ȘTEFĂNOIU Radu., BINCHICIU Horia,
VASILE, Ion Mihai, BÂRLĂDEANU, Mihai, IONESCU, Maria,
CÂRCIUMĂREASA, Daniel, IRIMIA, Mihailena.

Casting molds

Casting



HEA Microstructure

HEA Plate and electrodes

HEA Electrodes Φ8 mm

Electrodes made by high entropy alloy

Teeth hardfaced by TIG welding process

Excavator teeth hardfaced, after a working period

The patent refers to a new filler material used for cladding by welding, characterized by a good behavior during mechanical processing and high mechanical strength under severe conditions of erosive-abrasive wear with impact, combined with mechanical fatigue, that are used for surfaces which work in conditions of crushing-grinding process in contact with natural aggregates (gravel, sand, ballast) and crushed stone. The metallic material shows high hardness and toughness, consisting of five high purity metallic elements having the chemical composition within the range of values: Al = 4.60 - 6.80 %, Cr = 20 - 22.50 %, Fe = 23 - 24.50 %, Mn = 23 - 24.50 % and Ni = 24 - 26.50 %. The density of filler material varies in the range of 7.4-7.6 kg/dm3, as function of chemical composition, and the liquidus temperature is placed in the domain of 1350 – 1400 0C. Before heat treatment, in as cast state, the material shows average values of hardness of 400 - 535 HV0.1 but after applying of specific heat treatment, shows an increase of hardness until 700 - 950 HV0.1 associated with toughness expressed by the values of fracture energy of 55 - 70 J at 200C, during Charpy impact test.
The procedure for obtaining of the filler material for hard cladding is characterized in that the metallic materials used for its obtainment (Al, Cr, Fe, Mn, Ni) have high purity (more than 99%), are mechanically prepared before to be charged in the vacuum induction furnace or in the induction furnace under argon controlled atmosphere.

APPLICABILITY DOMAIN: Cladding, Mechanical Engineering – Metallurgy, Buildings and Materials.

20-22 MAY 2021
13th Edition of
EURO INVENT

EQUIPMENT FOR COMPLEX METALLURGICAL PROCESSING BY HEATING INDUCTION - BIOLEV

GEANTĂ Victor, VOICULESCU Ionelia, KELEMEN, Gyorgy, MOLNAR, Gabor,
KELEMEN, Hajnal, HORVATH, Laszlo, OPREA, Simion


ROMÂNIA

DUPLICAT
ELIBERAT COTITULARULUI
BREVETULUI DE INVENȚIE
NR. 133993

OFICIUL DE STAT PENTRU INVENȚII ȘI MĂRCI

BREVET DE INVENȚIE

Nr. 133993

Acordat în temeiul Legii nr.64/1991 privind brevetele de invenție, republicată în Monitorul Oficial al României, Partea I, nr.613, din 19 august 2014.

Titular: GEANTĂ VICTOR, BUCUREȘTI, B, RO; VOICULESCU IONELIA, BUCUREȘTI, B, RO; KELEMEN GYORGY, TÂRGU MUREȘ, MS, RO; MOLNAR GABOR, TÂRGU MUREȘ, MS, RO; KELEMEN HAJNAL, TÂRGU MUREȘ, MS, RO; HORVÁTH LÁSZLÓ, TÂRGU MUREȘ, MS, RO; OPREA SIMION, TÂRGU MUREȘ, MS, RO

Titlul invenției: INSTALAȚIE PENTRU PROCESĂRI METALURGICE COMPLEXE PRIN ÎNCĂLZIRE CU CURENȚI DE INDUCȚIE

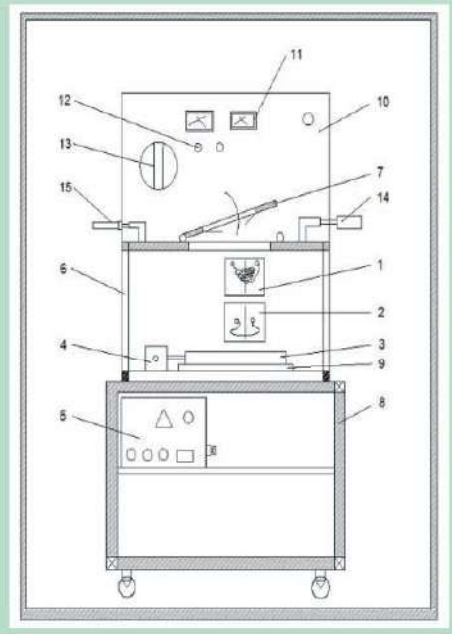
Inventatori: GEANTĂ VICTOR, BUCUREȘTI, B, RO; VOICULESCU IONELIA, BUCUREȘTI, B, RO; KELEMEN GYORGY, TÂRGU MUREȘ, MS, RO; MOLNAR GABOR, TÂRGU MUREȘ, MS, RO; KELEMEN HAJNAL, TÂRGU MUREȘ, MS, RO; HORVÁTH LÁSZLÓ, TÂRGU MUREȘ, MS, RO; OPREA SIMION, TÂRGU MUREȘ, MS, RO

Descrierea invenției, revendicările și desenele la care se face referință în acestea, fac parte integrantă din prezentul brevet de invenție.
Durata brevetului de invenție este de 20 ani, cu începere de la data de 14/09/2016, cu condiția plății taxelor anuale de menținere în vigoare a brevetului.

Director General

București, Data eliberării 27/11/2020


Melting equipment in levitation.




Melting process in levitation.


Mg-Ca alloys in the copper mould.


Mini-ingot ofMg-Ca alloys.

EQUIPMENT FOR COMPLEX METALLURGICAL PROCESSING BY HEATING INDUCTION - BIOLEV relates to a multifunctional equipment for complex sequential metallurgical processing with a single compact converter and working atmosphere, equipped with two different inductors (flat inductor and helical inductor) Depending on the type of inductor used, it allows the sequential development of several complex metallurgical processing operations such as: surface melting, deposits of metallic and non-metallic powders, obtaining compact layers (with flat inductor), elaboration of ferrous alloys and non-ferrous, brazing of cylindrical or flat products, elaboration of metallic and non-metallic alloys in levitation (with the helical inductor). The two inductors placed vertically at different distances are fed sequentially by a single medium frequency converter that performs the conversion of 50 Hz alternating current energy into medium frequency energy, necessary for heating and induction melting of metals and alloys.

Mg-based alloys are extremely difficult to obtain due to the strong oxidation phenomenon in ordinary atmosphere, continued with the burning of magnesium and its alloys. Therefore, it is necessary to produce magnesium alloys in controlled environments, using special installations designed for this purpose, i.e. in an inert atmosphere of argon. Thus, in the research, a number of magnesium alloys were obtained using an equipment for melting in argon environment by electro-magnetic levitation.

Applications: metallurgy

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Title

VARIABLE RELUCTANCE MOTOR WITH OUTER ROTOR AND MODULAR CONSTRUCTION FOR E-BIKE

Inventor/s - Contact

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Răzvan Alexandru Inţe, contact: Razvan.Inte@mae.utcluj.ro

Patent/ Application number

Patent OSIM: RO131721 -B1/30.03.2020

Short presentation

The patent refers to a variable reluctance synchronous motor with outer rotor and modular construction. The rotor is made up of six modules, between modules is an element of non-magnetic separation. Each module is made up of three separate magnetic elements fixed to each other by a dovetail joint. The connecting elements are made of non-magnetic material. Each pole rotor is provided with holes that allow attachment of 3 different lengths of spokes on the same module. Each spoke is fixed by means of safety spring pin. Using this motor with outer rotor and modular construction, facilities maintenance operations for a such systems making them more reliable and simple. Depending on the type of defect can be removed the entire motor or only components (rotor poles, spokes).

Applicability

This type of machine is designed to propel small electric vehicle as an electric bike. The electric machine will be mounting in the wheel to obtain a high efficiency of the mechanical transmission. The advantage of the machine is the simple maintenance which can be achieved by anyone thus is perfect suitable for an electric bike.

Images

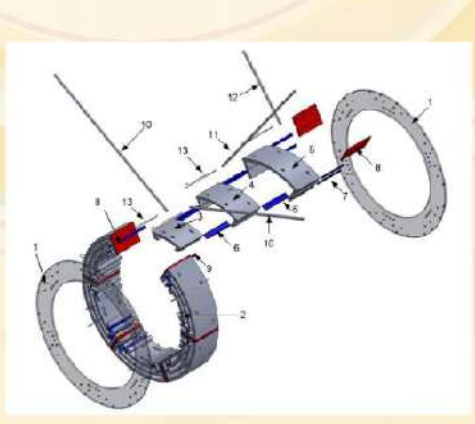

Figure 1. Spatial view of the motor with all the elements in details.

Figure 2. Spatial view of a bike wheel with the electric machine incoporated

Figure 3. Prototype machine

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Title

WIPING DEVICE OF SURFACE OF THE STEEL WIRE AFTER GALVANIZING

Inventor/s - Contact

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Marius.tintelecan@ipm.utcuj.ro

Patent/ Application number

Patent OSIM: RO130512 -B1/30.01.2020

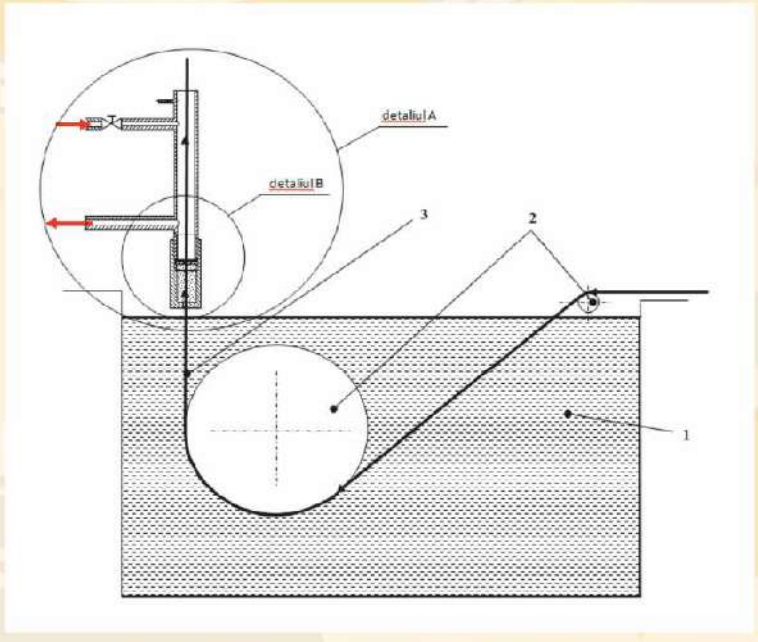
Short presentation

The patent relates to a device for wiping the surface of steel wire after galvanizing
This device, which will finally create a thin but strong zinc layer shiny appearance.
It is known that by immersing a steel wire in a molten Zn bath,
on its surface are formed seven concentric layers of Fe-Zn alloy having a matte appearance; the phases formed differing by micro- hardness, by mode of crystallization and (of course) by their chemical composition.
The basic, incipient ideas for achieving of this device refer to:
1. Proper wiping of the wire on which the zinc is deposited
2. Sudden cooling of the whole assembly: deposited steel-zinc wire
In these moments is used to wipe the surface of the steel wire after galvanizing, a different technique variant, in a horizontal version where some pills of asbestos are pressed on the outer surface of the wire, the wire following an ascending path (given by the its pulling system of accumulation) after its exit from the molten zinc bath.

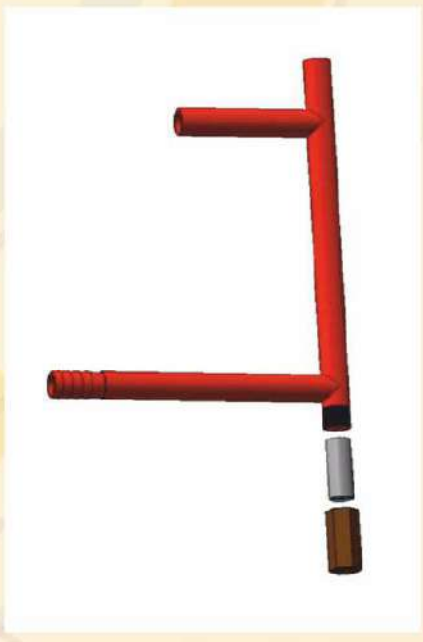
Applicability

In the metallurgical industry, when obtaining galvanized steel wire

Images



Vedere de ansamblu a dispozitivului de ștergere a suprafeței sârmei de oțel, după zincare, a vanei și a sârmei de oțel supusă ștergerii



Vedere de ansamblu (în manieră explodată) a detaliului A

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Title

MULTILAYERED COMPOSITE PANEL AND THE METHOD USED FOR OBTAINING IT

Inventor/s - Contact

TĂMAȘ-GAVREA Daniela-Roxana, IȘTOAN Raluca, TIUC Ancuţa Elena

Patent/ Application number

Patent OSIM: RO133261 -B1/30.04.2020

Short presentation

The invention relates to a multilayered composite panel and the method of obtaining it. The panel has two rigid perlite-based boards, reinforced with natural flax fiber nets, with a compact layer of flax fiber between them, using white cement as a binder. The purpose of the panel is to improve the quality of life and human health in buildings' environment by providing optimum acoustic comfort based on users' requirements.

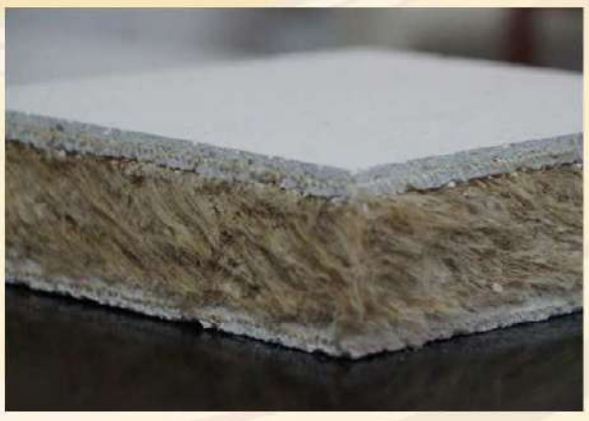
The acoustic absorption coefficient of the non-perforated composite panel is high at medium frequencies. The peak of sound absorption coefficient of 0.98 is reached at the frequency of 500 Hz.

In order to optimize the sound absorbing properties of the multilayered composite panel, perforations were made on one of the rigid boards of the panel. Thus, perforated panels have acoustic absorption coefficients above 0.70 for a wider frequency range, of 500-3000 Hz. The maximum absorption coefficient is 0.98 at the frequency of 900 Hz.

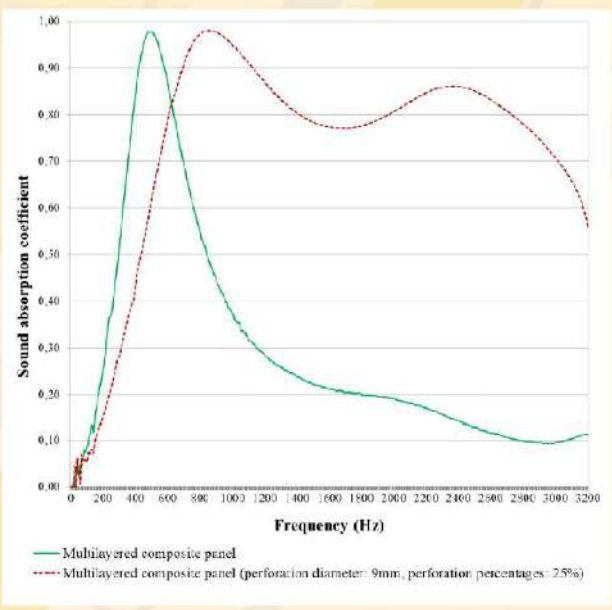
Applicability

The invention consists in obtaining of a multilayered composite panel for vertical partition walls in buildings, with acoustic properties comparable to the existing sound absorbing composites by using flax, which is a viable natural alternative to synthetic fibers.

Images



Multilayered composite panel



Sound absorption coefficient variation

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Title

PROGRAMABLE METHOD FOR CURRENT SENSOR FAULT DETECTION OF 3-PHASE ELECTRONIC INVERTERS

Inventor/s - Contact

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Patent/ Application number

Patent OSIM: RO132781 -B1/30.12.2020

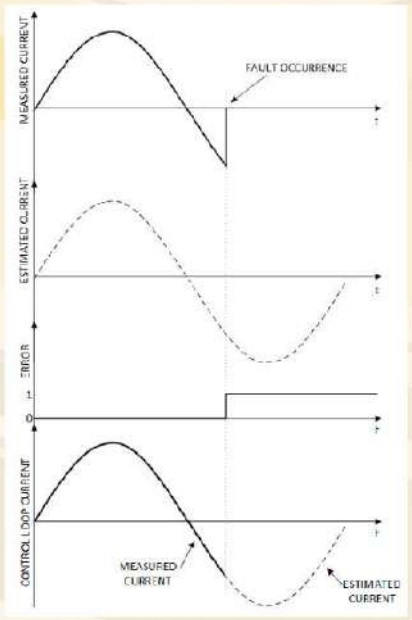
Short presentation

The invention refers to a method of detecting the current sensors faults of 3-phase inverters that is running at a rate of 250 time higher that the rate of the actual control loop. It permanently monitors readings from the sensors and computes the difference between the reference values and the actual measured ones. The difference than is compared with an adaptive threshold. The comparison yells is fault occurred on a certain sensor and decides the replacement of the faulted measurement with an estimated one and also modifies the gains of the control loop's PI regulators, adapting them to the new operational regime. In the same time, it stops the fault detection procedure for a certain period of time till the eventual occurred transient doe to the current replacement passes. By this, the detection, isolation and compensation of the fault occurred is handled by the strategy in-between two consecutive iterations of the actual inverter control loop. The fault detection procedure executes 250 calculations (detection) between two consecutive calculations of the control loop.

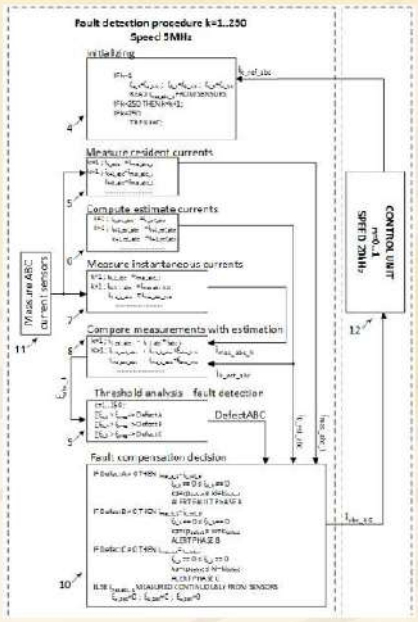
Applicability

The invention is dedicated for the most used type of electronic inverters used in industry, green energy as well as in automotive industry. It refers to 3-phase inverters that are always equipped with current sensors on at least 2 or even all the 3 phases. The method can very easily be used to detect and compensate line current faults as the exact same approach is applied in order to monitor the currents passing via the sensors.

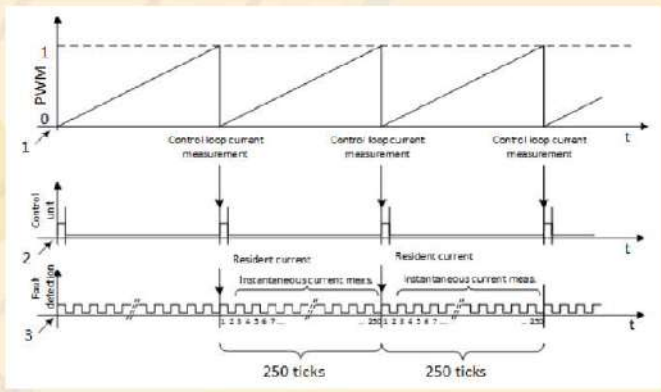
Images



The detection, isolation and replacement of the faulted measured current with the estimated on



The fault detection/isolation/compensation algorithm with block diagrams



The speed difference computation frequency between the fault detection and inverter control loop

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Title

STAND FOR STUDY OF TRIBOCOROSION

Inventor/s - Contact

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Patent/ Application number

Patent OSIM: RO130936 -B1/30.12.2020

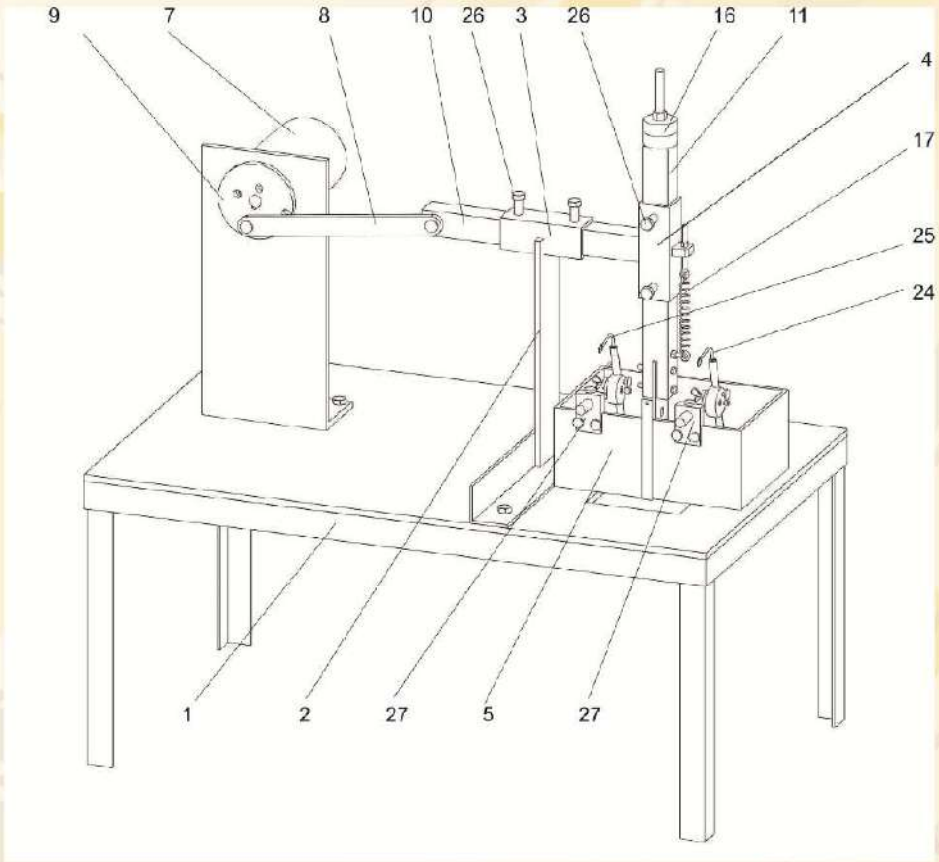
Short presentation

The invention consists of an experimental stand for the determination of surfaces tribocorrosion. The experimental stand for the study of tribocorrosion offers technological and building simplicity. It allows precise measurement of frictional force and other tribocorrosion parameters. It allows adjustment of working parameters, positioning and fixing of electrodes for the corrosion study. The synergistic action of tribocorrosion factors leads to surface degradation and hence loss of material, the result being superior to that obtained by simply summing up the individual degradation processes. The patent will be useful in determinations of tribocorrosion resistance of various machine parts which are working in both corrosive and wear environment.

Applicability

The invention is applicable in the automotive industries; mechanical installations, electrical engineering, aeronautics, car manufacturers, civil engineering.

Images



1. table;
2. Support;
3. horizontal translation mode;
4. vertical translation mode;
5. tribocorrosion cell;
6. study sample;
7. gear motor;
8, 9 connecting rod-crank mechanism;
10, 11 mobile assembly;
12. polygonal guidance;
13. lamellar arc;
14. insulating support;
15. glass ball;
16. weights;
17. stretching spring;
18, 19. eye screw;
20 nut;
21. gasket;
22. working electrode;
23. tensometric translators;
24. reference electrode;
25. auxiliary electrode;
26. Screws;
27. Support

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Title

SYSTEM FOR FIXING PLASTIC BOTTLES IN ROTARY TIGHTNESS TESTING APPARATUSES

Inventor/s - Contact

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Patent/ Application number

Patent OSIM: RO133200 -B1/28.08.2020

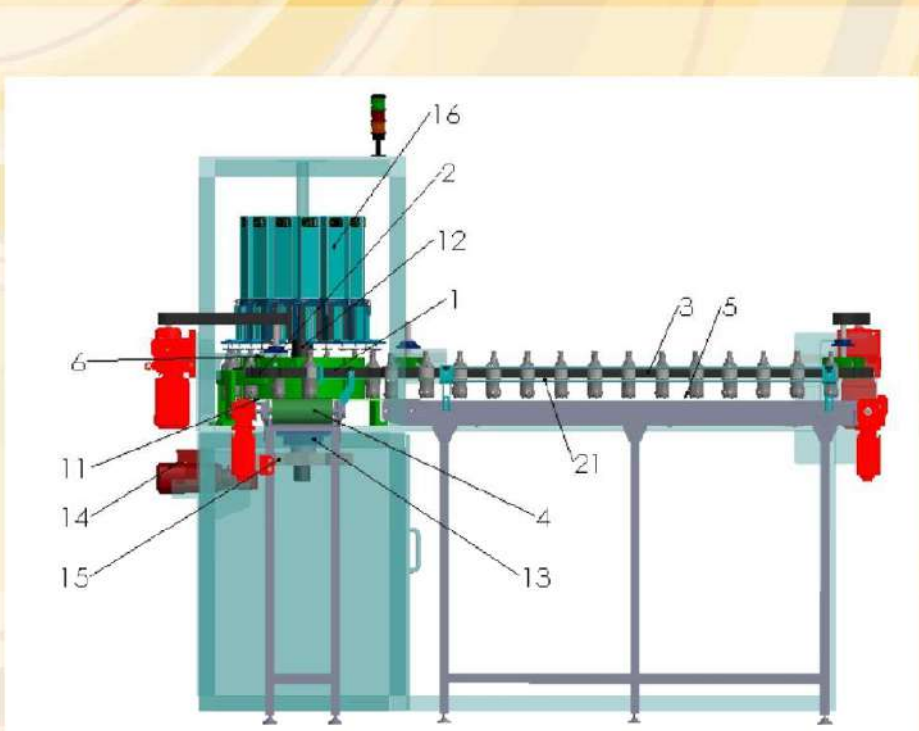
Short presentation

The invention relates to a system for fixing plastic bottles in rotary tightness testing apparatuses while maintaining the bottles in vertical position in transport means and ensuring their transfer from one transport means to the other. According to the invention, the system comprises three devices: the rotary bottle fixing device consisting of a metal drum on which a profiled rubber bush and two identical bottle fixing linear devices consisting of two vertical drums on which a profiled rubber belt.

Applicability

The invention proposes a flexible system for fixing the bottles on the means of transport of the rotary apparatus of high speed testing of plastic bottles for the detection of possible leaks. A problem of these devices is the transport of the bottles without being deformed and their maintenance in a vertical position.

Images



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Title

ADAPTIVE SYSTEM DESIGNED TO ENSURE ELECTRIC POWER QUALITY IN LOW VOLTAGE NETWORKS

Inventor/s - Contact

Sacerdoțianu Dumitru, Nicola Marcel, Ivanov Sergiu, Ciontu Marian, Chindriș Mircea Dorin,
Cziker Andrei Cristinel, Radu Alexandru, Dumitrescu Camil-Sorin.
Contact: dumitru_sacerdotianu@yahoo.com

Patent/ Application number

Patent OSIM: RO132402 -B1/28.08.2020

Short presentation

The invention relates to an adaptive system that compensates for most of the supply voltage disturbances (mainly harmonics, unbalance, dips and swells, slow and fast fluctuations of short or long duration), respectively of the electric current (mainly harmonics and unbalance), in low voltage electrical networks. The system consists of two active filters: one is connected in parallel with the electrical network and the load; the other one is connected in series with the electrical network. Each asset is made up of two voltage source inverters, interconnected through a joint DC voltage circuit.
The installation of this equipment ensures a satisfactory quality of the electricity supplied to the consumers as follows:

- Supply voltage in the imposed range
- Voltage unbalance less than 2%
- Voltage THD less than 8%
- Current THD less than 5%
- All voltage and current harmonics in the limits imposed by the present norms
- Compensation of single-phase voltage dips with depth up to 70% and duration up to 180 ms
- Compensation of three-phase voltage dips with depth up to 50% and duration up to 90 ms.

The proposed system ensures increased response speed to compensate for disturbances by constantly monitoring the electrical quantities in the network and adapting the control in real-time to optimize operation. In addition, the equipment provides a power factor of the unit at the connection point.

Applicability

The adaptive system for electric power quality improvement is used in low voltage networks to ensure their correct operation in accordance with existing regulations. It is extremely useful especially in weak networks or in alternating voltage microgrids that contain numerous electronic equipment. In both cases, significant violations of normal operating conditions may occur. Other fields of use are ensuring the quality of electricity in the connection points of generation assets based on renewable resources, respectively of sensitive or disruptive consumers.
Supplementary, the equipment provides the required reactive power in the connection point.

Images

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Title

INDUCTION MACHINE WITH ROTOR IN MODULAR CONSTRUCTION

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Răzvan Alexandru Inţe, contact: Razvan.Inte@mae.utcluj.ro
Dan-Cristian Popa, contact: Dan.Cristian.Popa@emd.utcluj.ro

Patent/ Application number

Patent application OSIM: A/00341/18.06.2020

Short presentation

The conception of the induction machine with rotor in modular construction is based on building the short-circuit rotor of the most used electric machine at industrial level from modules in which aluminum bars are placed. Modules are fixed to the rotor yoke, common to all modules, by dovetail clamps. The shape of the modules is of such a nature as to allow their fixation on the yoke. The short circuit ring will be fixed to the bars using the two holes with which each bar is provided at the ends.

The proposed induction machine, with the rotor in modular construction, retains all the operating characteristics specific to this type of electric machine. The advantage of this rotor construction is the reduction of the time and maintenance cost of such a structure.

Applicability

Industrial areas in which induction machines are used in classical construction, but especially those in which the loads are constantly of high values and the risk of failure of the rotor bars is higher.

Images

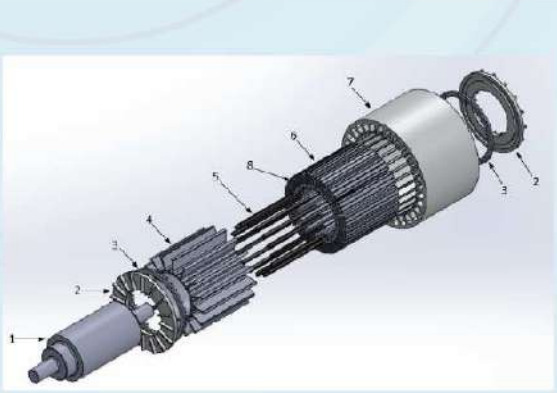

Fig.1

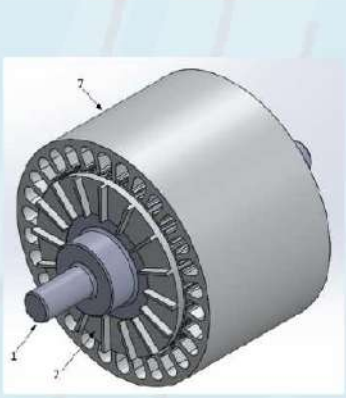

Fig. 2

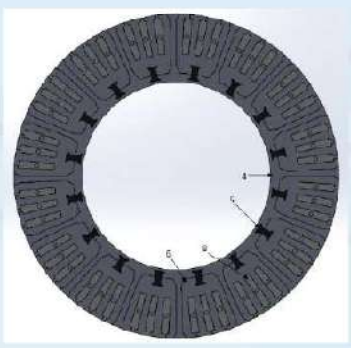

Fig.3

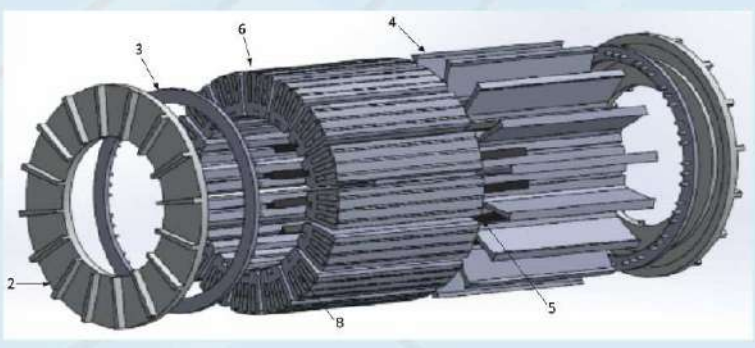

Fig. 4

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Title

REAR LOCATED AERODYNAMIC DEVICE FOR RIGID TRANSPORT SEMI-TRAILERS

Inventor/s - Contact

Mariasiu Florin, Scurtu Liviu Iacob, Varga Bogdan Ovidiu

Patent/ Application number

Patent application OSIM: A/00714/09.11.2020

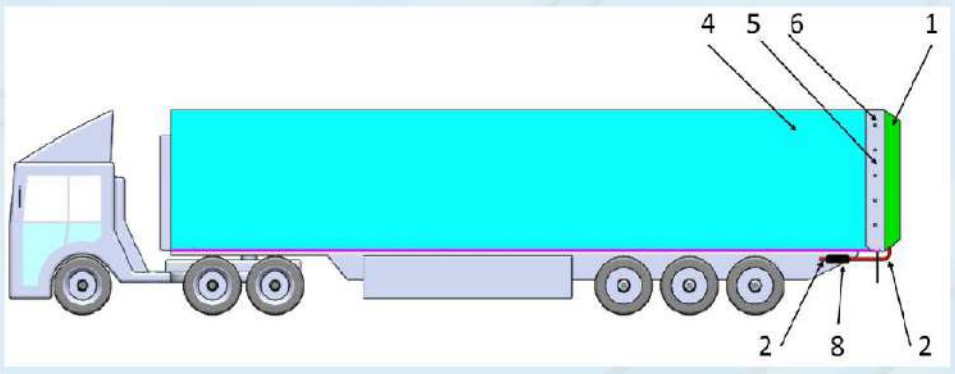
Short presentation

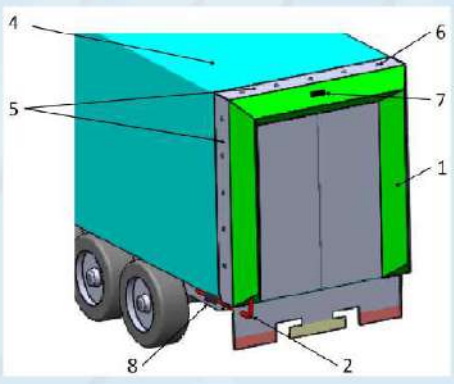
The invention relates to a rear aerodynamic device for rigid semi-trailers (with rigid walls) in the composition of a road freight train, which reduces the value of its aerodynamic coefficient. The rear aerodynamic device for rigid transport semi-trailers is characterized by the fact that the active operating principle is based on the use of variable geometric shapes (aerodynamic cushions) located at the rear of a rigid semi-trailer, made of a waterproof elastic material (rubber), which allows it to swell with compressed air until the desired shape is obtained.

Applicability

The applicability of the device in the road transport industry derives from the need to carry out the transport process in the best conditions of economic efficiency (achieved by reducing fuel consumption) and indirectly by reducing the pollutant emissions caused by road transport.

Images





Legend:

1- aerodynamic cushion
2- pipes
4- rear of the semi-trailer
5- side folds
6- mounting holes,
7- safety valve,
8- command and control system

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Title

SUPERIOR LOCATED AERODYNAMIC DEVICE FOR RIGID TRANSPORT SEMI-TRAILERS

Inventor/s - Contact

Mariasiu Florin, Scurtu Liviu Iacob, Varga Bogdan Ovidiu

Patent/ Application number

Patent application OSIM: A/00716/09.11.2020

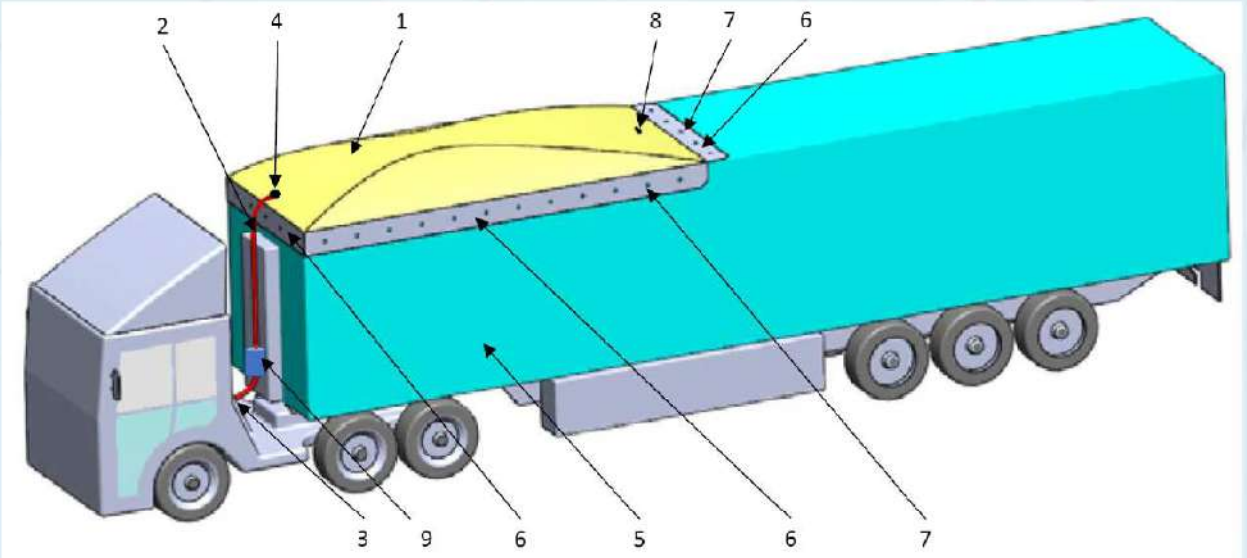
Short presentation

The invention relates to a superior located aerodynamic device for rigid semi-trailers in the composition of a road freight train, which reduces the value of its aerodynamic coefficient. The superior located aerodynamic device for rigid transport semi-trailers is characterized by the fact that the active operating principle is based on the use of variable geometric shapes (aerodynamic cushions) located at the superior part of a rigid semi-trailer, made of a waterproof elastic material, swell with compressed air until the desired shape is obtained.

Applicability

The applicability of the device in the road transport industry derives from the need to carry out the transport process in the best conditions of economic efficiency (achieved by reducing fuel consumption) and indirectly by reducing the pollutant emissions caused by road transport.

Images



Legend:
1- aerodynamic cushion
2- pipes
3- compressed air system of the road train
4- pneumatic coupling system
5- front part of the semi-trailer
6- side folds
7- mounting holes
8- safety valve
9- automatic command and control system

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Title

ELECTRONIC EXTREMAL REGULATOR

Inventor/s - Contact

Radu Adrian MUNTEANU, Eva Henrietta DULF, Clement FEȘTILĂ, Radu MUNTEANU
radu.a.munteanu@ethm.utcluj.ro

Patent/ Application number

Patent application OSIM: A/00287/26.05.2020

Short presentation

The invention relates to an extreme electronic regulator intended for the control of a conventional electronic power converter by which the operation at the maximum power point of an afferent photovoltaic panel is ensured. The regulator contains a generator that produces a triangular disturbance signal that is applied to the control of the electronic power converter, simultaneously with two short pulses, synchronized with the triangular signal. The effects of the disturbance are detected by a power transducer whose output signal is stored in two sample-and-hold circuits (S&H) in alternating successive moments, controlled by the generator pulses. The signal resulting from the decrease of the signals stored in the sample-and-hold circuits is applied to a usual integrating regulator to produce the intermediate control signal which will be added to the triangular signal, thus obtaining the control signal for the electronic converter which will ensure the operation of the photovoltaic panel at the point of maximum power (PPM).

Applicability

The application of the invention shows the following advantages:

- simplifying the construction and reducing the price of the extreme regulator that ensures the operation of photovoltaic panels in the Point of Maximum Power (PPM), by avoiding the signal multiplier and by using the usual low-cost electronic circuits;
- increasing the efficiency of medium and low power photovoltaic panels (of the order of tens of watts) by up to 30% (depending on the operating conditions), thus justifying the attachment of the extreme regulator to the electronic power converter;
- increasing the efficiency of photovoltaic panels of any power, due to the robust stability of the algorithm implemented in the extreme regulator, according to the invention.

Images

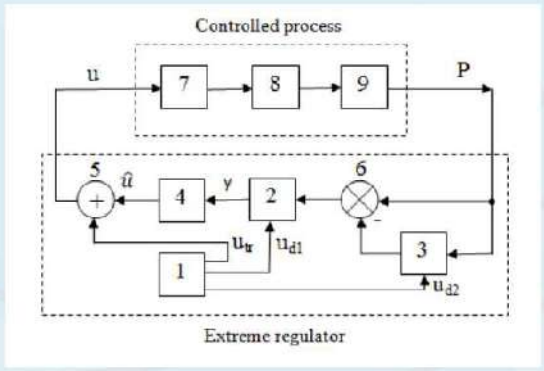

Figure 1. The structure of the extreme regulator and the controlled process

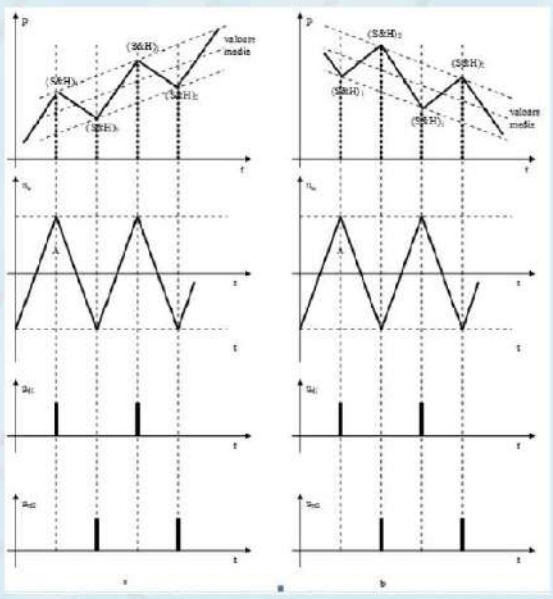

Figure 2. Operation of the extreme controller, according to the invention:
a) operation to the left of the maximum power point (PPM);
b) operation to the right of the maximum power point (PPM)

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Title

COMPLIANT MINI-GRIPPER WITH HIGH FLEXIBILITY

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Noveanu Dan Cristian, Dan.Noveanu@ipm.utcluj.ro

Patent/ Application number

Patent application OSIM: A/00103/26.02.2020

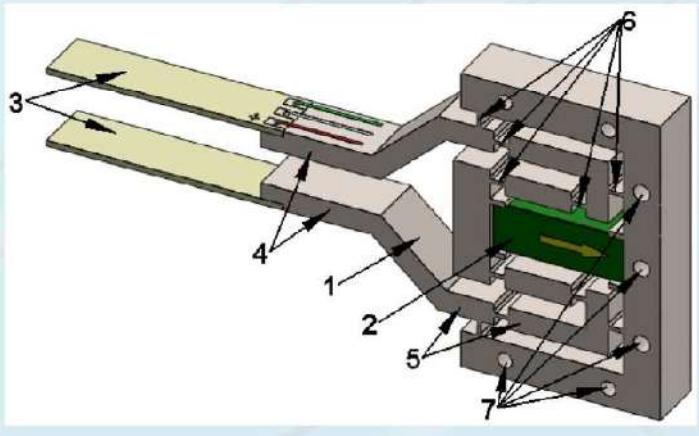
Short presentation

The compliant minigripper (1) with piezoelectric actuator type stack (2), is made with ten flexible couplings (4), identical, with rectangular profile with fillets, arranged symmetrically on the single-block structure, having attached piezoelectric actuators of type band (3) to the clamping kinematic elements (6). The flexible couplings (4) are made by thinning the section of kinematic elements (5), so as to ensure the movement by elastic deformation of the material from which they are made. The body of the compliant mini-gripper (1) is operated by the piezoelectric actuator (2), positioned on the symmetry axis of the structure, which by means of flexible couplings (4) and kinematic elements (5), transmit movement to the clamping kinematic elements (6), which perform the manipulation of objects. The piezoelectric actuators type band (3) fixed to the clamping kinematic elements (6) allow the extension of the workspace. The attachment of the assembly is carried out by the fastening holes (7), which are positioned in such a way that both the piezoelectric actuator and the mini-gripper frame ensure optimal operation.

Applicability

The compliant minigripper with high flexibility is used for precise handling of small objects in mini and microsystem-specific applications, micromanipulation of various shapes objects in different environments. By modifying the geometric shape of the flexible couplings (elliptical, rectangular, parabolic, circular or rectangular with different fillet radii), the choice of the material from which the compliant minigriper is made (steel, brass, polymethylmethacrylate, polytetrafluorethylene, etc.), as well as by the variation of the supply voltage of piezoelectric actuators ensures a wider range of manipulated objects and its use in different environments.

Images



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Title

LINEAR TUBULAR MOTOR WITH MODULAR CONSTRUCTION FOR DIRECT DRIVING VEHICLE ELECTRICAL POWER STEERING

Inventor/s - Contact

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Technical University of Cluj-Napoca, 400114 Cluj-Napoca, str. Memorandumului nr. 28, Romania

Patent/ Application number

Patent application OSIM: A/00260/14.05.2020

Short presentation

The linear tubular motor with modular construction for direct driving vehicle electrical power steering has simple parts. The stator modules are built up of ring type iron core pieces alternated by non-magnetic space holders. Round their yokes concentrated coils are wound, which are connected in series and form a phase of the motor. The mover is passive, and it is constructed by alternating ferromagnetic and non-magnetic rings.

The motor works upon the variable reluctance principle. By sequentially supplying its phases a bidirectional linear movement can be achieved.

Applicability

Due to its very simple but robust construction, this linear tubular motor with modular construction is an excellent solution for direct driving the electrical power steering system of any type of vehicle.

Images

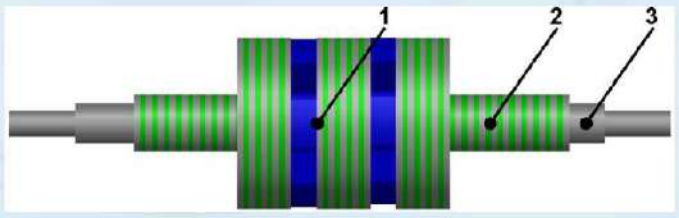

Fig.1

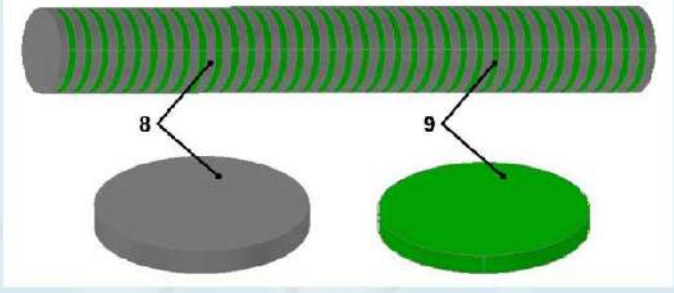

Fig.3

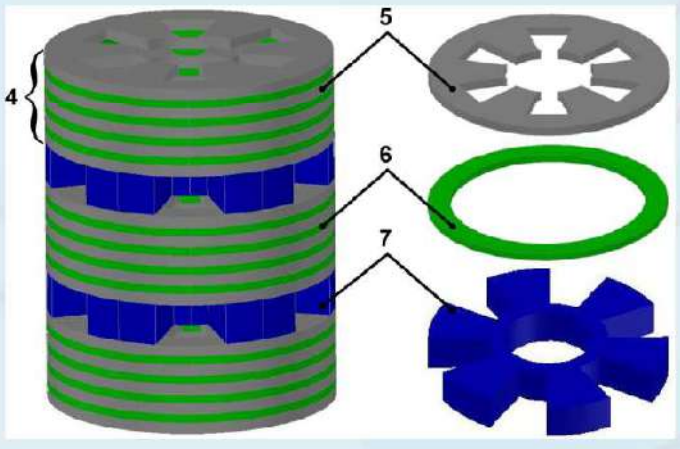

Fig. 2

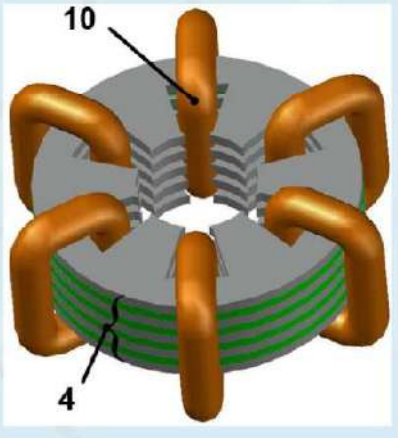

Fig. 4

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Title

DESULFATIZATION, OPTIMIZATION AND APPLICATION TECHNIQUE OF THE SPENT PLATES PROVIDED FROM CAR BATTERY

Inventor/s - Contact

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(simona.rada@phys.utcluj.ro; eugen.culea@phys.utcluj.ro)
[2]National Institute for Research and Development of Isotopic and Molecular Technologies, Cluj-Napoca, Romania

Patent/ Application number

Patent application OSIM: A/00531/24.08.2020

Short presentation

This patent relates to an efficient desulfatization technique of the spent plates from a lead acid battery by the doping with a suitable content of nickel (II) oxide or double cobalt (II and III) oxide in order to obtain optimized materials which can be used to make new electrodes for batteries. The process according to the invention uses as raw materials: the anodic electrode as source of Pb, the cathodic electrode as source of PbO_2 from a spent car battery with high wear and powder of nickel (II) oxide or double cobalt (II and III) oxide. The mixture of substances in the xNiO (100-x)[4PbO_2 Pb] or xCo_3O_4 (100-x)[4PbO_2 Pb] with x = 8 mol % NiO or 20 mol% Co_3O_4 chemical formulas is introduced into alumina crucibles, melted in an electric oven and then overturned on a stainless steel plate directly at room temperature. The analysis of the XRD data (see Figure b) indicates: i) the recycling temperature of the spent plates must be achieved at 1050oC because at this temperature takes place the decomposition of the 4PbO $PbSO_4$ crystallized phase; ii) the disappearance of the sulfated crystalline phases, respectively Pb2SO5 (with the peak of 100 % intensity centered at 26.66 o) and 4PbO PbSO4 phases below the detection limit of the diffractometer for the doped samples. The cyclic voltammograms (see Figure c) show that the undoped electrode does not give an electrochemical signal while for the materials doped with NiO or Co_3O_4 voltammograms have a high degree of irreversibility, especially for the doping with NiO.

Applicability

This invention proposes two types of recycled and metal-doped materials for the applications as new electrodes at batteries.

Images

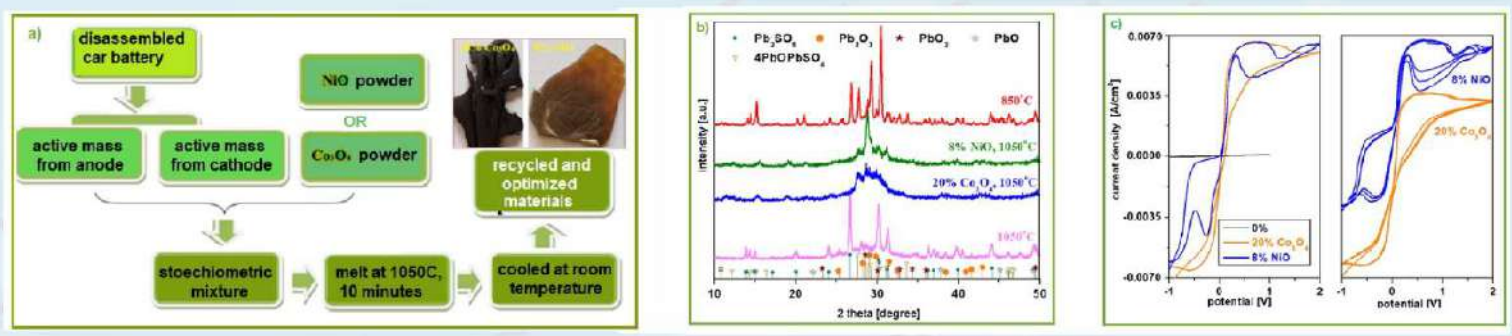

Figure: a) The preparation scheme of recycled and metal-doped materials;
b) X-ray difractograms of the recycled materials obtained at varried temperature and with different dopant contents;
c) Cyclic voltammograms scanned for first cycle and after three cycles of the electrode materials in electrolit solution of 5 M H2SO4.

Acknowledgements: The financial support of this work was provided by the Romania - JINR Dubna project.

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Title

BEAMFORMING COMPACT RADIANT SYSTEM

Inventor/s - Contact

Palade Tudor-Petru, Pastrav Andra-Elena-Iulia, Pușchiță Emanuel-Dumitru, Dolea Paul, Cristea Octavian, Dascăl Paul Vlăduț, Rațiu Ovidiu
Contact: Prof. Tudor Palade, e-mail: Tudor.Palade@com.utcluj.ro

Patent/ Application number

Patent application OSIM: A/00082/18.02.2020

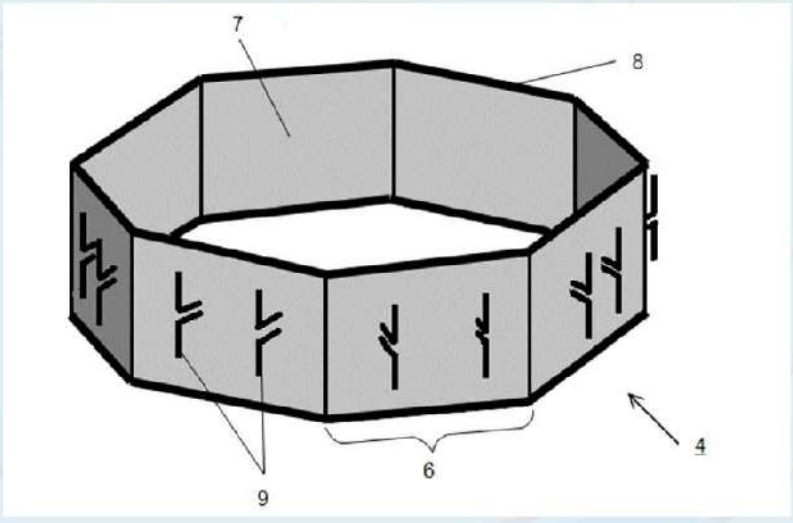
Short presentation

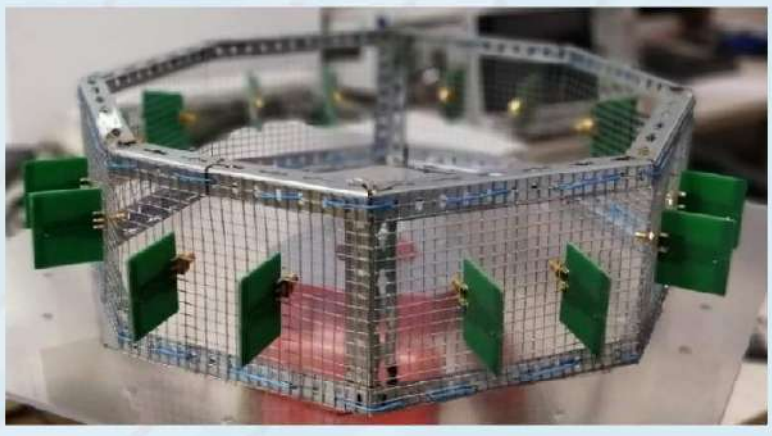
The invention describes a compact radiant system with beamforming capabilities. The radiant system, according to the invention, comprises a 1:16 combiner / splitter, a switching / phase shifting block and a radiant element block. The radiant element block comprises eight identical panel antennas, whose reflecting panels form a regular octagonal prism structure, each panel antenna including two open dipoles. The radiation pattern of the radiant system can be modified horizontally to obtain a radiation pattern with a circular symmetry or one that favors a certain direction. The system is controlled digitally, without the need for mechanical modifications of the system.

Applicability

Radio transmissions, cellular communications, terrestrial wireless communications, radio spectrum surveillance, radio detection, direction finding, target location (RADAR)

Images





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Title

SYSTEM AND METHOD FOR WIFI TERMINAL POSITIONING USING ANCHORS EQUIPPED WITH RETRO-DIRECTIVE ANTENNAS

Inventor/s - Contact

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Contact: Prof. Tudor Palade, e-mail: Tudor.Palade@com.utcluj.ro

Patent/ Application number

Patent application OSIM: A/00081/18.02.2020

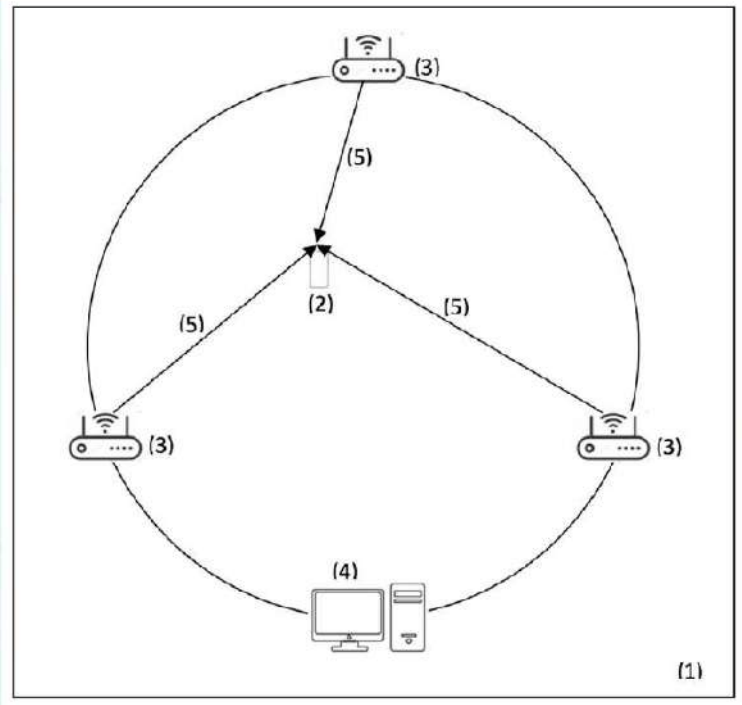
Short presentation

The invention describes a system and a method of locating a WiFi terminal using the directions found by two or more WiFi anchors. The WiFi anchors are equipped with retro-directive antennas and are connected to a computing system to which they transmit the information regarding the determined WiFi terminal direction. The computing system, knowing in advance the positions and orientations of the anchors, determines the location of the WiFi terminal.

Applicability

Wireless positioning and location, cellular communications, terrestrial wireless communications

Images



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Title

SOIL STABILIZATION WITH PLASTIC WASTE MATERIALS (PET)

Inventor/s - Contact

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Ana.Trimbitas@dst.utcluj.ro

Patent/ Application number

Patent pending

Short presentation

In this study, an approach for the recycling of plastic waste from water and soda bottles as stabilizing material in geotechnical and civil engineering practice is purposed. The aim of this research is to observe the variation of the shear parameters for clay mixed with polyethylene terephthalate waste. To investigate the effects of polyethylene waste on the strength of the soil, a series of test have been performed on the mixture.

By performing a compaction Proctor test, we determined the optimum water content (19%). First samples consisting of clay in the initial state were subjected to direct shear test. Thereafter, tests were performed on a mixture of clay and polyethylene terephthalate at a rate of 2%, 4%, 6% (by weight of the clay).Polyethylene was coming from shredded bottles (PET) and was provided by a local recycle deposit. The clay – PET mixture was prepared at optimal water content of 19% and subjected to the direct shear test.

The initial experimental results show that there is a significant improvement on the shear parameters. This increase is depending on the amount of waste plastic added to the clay.

Applicability

Reusing plastic waste is vital for the development of a clean environment. One of the most recent ways to reuse plastic wastes is mixing them with soils, in order to improve their geotechnical properties. By using this method, a part of plastic waste is reused and the consumption of natural materials is reduced.

Images

Figure 1.
Shredded plastic waste

Figure 2.
Shredded plastic waste and clay

Figure 3.
Mixture of clay + 6% PET at optimum water content

Figure 4.
Clay-PET mixture

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Title

INNOVATIVE USE OF SHEEP WOOL FOR OBTAINING NEW MATERIALS WITH SOUND-ABSORBING PROPERTIES

Inventor/s - Contact

SIMONA IOANA BORLEA (MUREŞAN), ANCUȚA-ELENA TIUC, OVIDIU NEMEŞ

Ioana.Muresan@staff.utcluj.ro

Patent/ Application number

Patent Pending

Short presentation

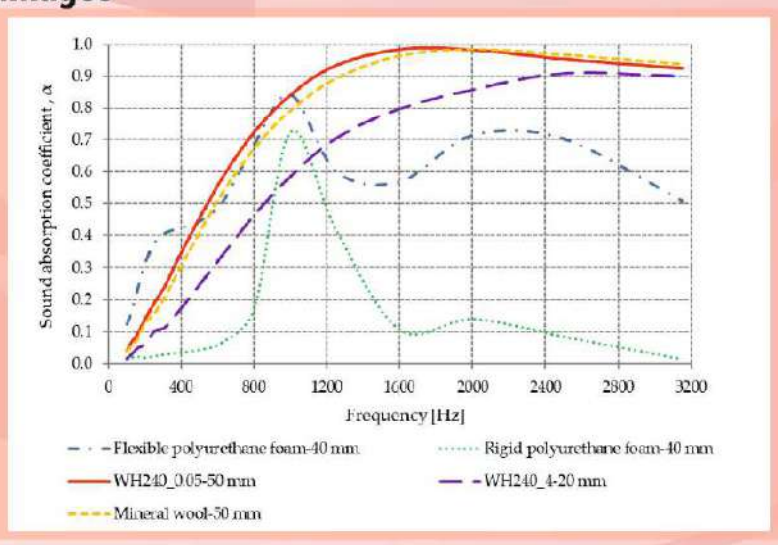
The aim of this study is to obtain new materials with sound absorbing properties using the sheep's wool as raw material. Seven new materials were obtained by hot pressing (60 ÷ 80 °C and 0.05 ÷ 6 MPa) of wool fibers and one by cold pressing. Results shown that by the simply hot pressing of the wool, a new product is obtained which can be processed and easily manipulated. The obtained materials have very good sound absorption properties with acoustic absorption coefficient values over 0.7 for the frequency range 800 ÷ 3150 Hz; the results prove that the sheep wool has a comparable sound absorption performance to that of mineral wool or recycled polyurethane foam. Hot pressed materials have a much higher density than cold pressed materials. The density of materials made from hot pressed sheep's wool increases with increasing pressure.

The hot pressed material (WH240_0.05) at 80 °C and 0.05 MPa, of 240 mm layer of wool, with 50 mm in thickness has the highest sound absorption coefficient values over the entire analyzed frequency range in comparison with WH120_0.05 material, obtained in the same conditions, but with a smaller thickness for it started from a 120 mm layer of wool. The WH240_0.05 material obtained in this study has the best sound-absorbing properties at frequencies below 2000 Hz, while in the frequency range 2000 ÷ 3200 Hz it has values almost identical to mineral wool. Thus, hot pressed sheep's wool has better sound absorbing properties or at least equal to mineral wool, which is one of the most widely used sound absorbing fibrous material. Obtaining the environmentally friendly materials with very good acoustic properties from natural and renewable raw materials, such as sheep wool, without using any binder is an important step in solving environmental problems and in the same time in finding new methods of using the wool.

Applicability

The study explores alternative usage of sheep wool as a construction material with improved sound absorbing properties beyond its traditional application as a sound absorber in textile industry or using of waste wool in the textile industry as a raw material. Sound absorbing materials can be used to reduce noise and to obtain an adequate acoustic for enclosed spaces. They can have many uses, both outdoors and indoors: in industry, commercial areas, relaxation and leisure areas, in areas used for education, in constructions, on building sites, highways, roads and streets, airports, ports, railways, etc. Materials studied in this research can be used to reduce noise impact, as decorative panels with sound absorbing role, to improve acoustic conditions, and to reduce or stop reverberations.

Images



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Title

SPHERICAL ROBOT FOR THE MEDICAL REHABILITATION OF THE PROXIMAL AREA OF THE UPPER LIMB

Inventor/s - Contact

Vaida Calin, Plitea Nicolae, Pisla Doina, Carbone Giuseppe, Gherman Bogdan, Ulinici Ionut, Pisla Adrian
CESTER, Technical University of Cluj-Napoca, Romania
Prof. dr. Ing. Doina Pisla, doina.pisla@mep.utcluj.ro, Prof. Dr. Ing. Calin Vaida, calin.vaida@mep.utcluj.ro

Patent/ Application number

Patent OSIM: RO132233 -B1/30.03.2020

Short presentation

The invention relates to a spherical robotic system for the rehabilitation of the proximal zone of the upper limb, containing three active couplers for the purpose of reproducing the abduction/adduction and flexion/extension of the shoulder in the horizontal and vertical plane and reproducing the forearm pronation/supination in the vertical plane. The invention is directed towards post-stroke patients suffering from paralysis at the level of the upper limb following stroke, but its use may be extended to other afflictions that result in the partial or total loss of upper limb mobilization capacity. The robot has three degrees of freedom, achieved through three active rotation joints that have the axis intersection in a single point, more specifically the centre of a sphere, which relative to the patient will be transposed over the centre of rotation of the shoulder joint, for the first two rotations, and the third being done around the midline of the upper limb.

Applicability

Medical rehabilitation for patients with upper limb brachial monoparesis caused by a neurological disease. In the figures below the roadmap towards a successful product is shown, starting from a patient centred design to the development of the experimental model and its validation in an 5 months long clinical study.

Images

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Title

PARALLEL ROBOTIC SYSTEM FOR THE MEDICAL REHABILITATION OF THE UPPER LIMB

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Patent/ Application number

Patent OSIM: RO132234 -B1/30.03.2020

Short presentation

The invention relates to a robotic system for the medical rehabilitation of the upper limb, having a modular structure, each module having a parallel architecture, with two degrees of freedom. The first module (fig. 1) has been designed for the mobilization of the forearm (achieving the elbow flexion) and for performing training exercises for the rehabilitation of the pronation/supination motion. It uses a universal joint and a spur gear mechanism for motion transmission to the end-effector, a custom designed ergonomic handle. The second module (fig. 2) has been designed for the rehabilitation of the patient's wrist, namely flexion/extension and abduction/adduction motions, using a spherical motion of the patient's hand around his/hers wrist.

Applicability

The specific application of this invention consists in the treatment of the stroke related impairments of the upper limb and brachial monoparesis. The advantages of the robotic system presented in this invention consist in a great range of motions, modularity, while the parallel architecture increases the stiffness and payload capacity. A complex human-robot interaction has been developed to achieve a great variety of rehabilitation exercises using different control types like: passive, active, assistive, active-assisted, corrective, path-guidance and resistive. The system has been validated in a hospital, with patients, for a period of 5 months.

Images

Fig. 1

Fig. 2

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IASI, ROMANIA, 20-22 MAY 2021

"Smart table to accomodate management and consumer needs to low interraction economy in the hospitality sector "

Andrei UNGUREANU[1], Florin Alexandru LUCA[2]

[1] *Phd student Alexandru Ioan Cuza University, Iasi, ROMANIA*
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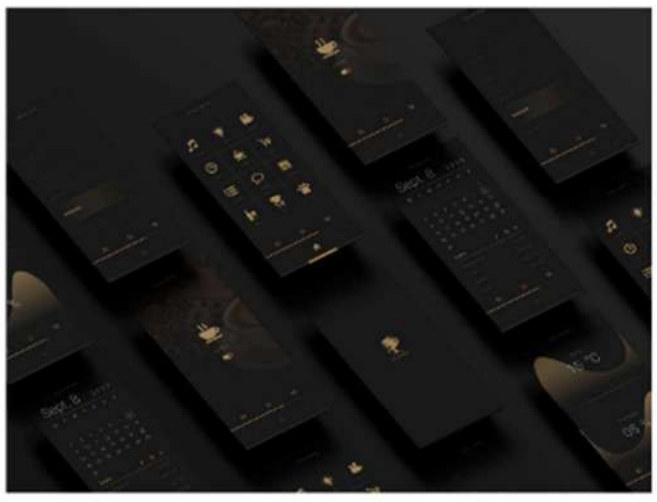
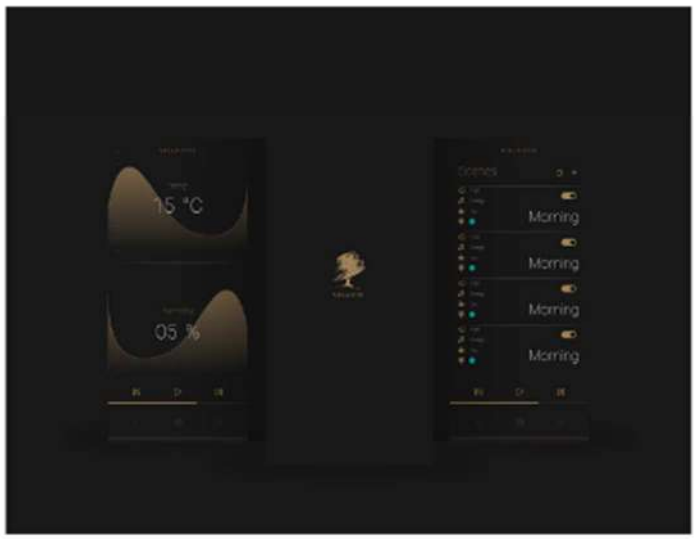


The following research has the scope of developing a prototype of a mobile application in the hospitality sector. The minimum viable product consists of the interface between a fully functional innovative table and a smartphone. Due to the implications of COVID-19, the low interaction economy has set different call to action measures for most of the hospitality sector and has direct positive economic outcomes.

The app prototype is an Android version, fully functional which integrates functionalities such as user login, check-in /check-out, room service order, room lightning and intelligent connection to the A/C or sound and TV system. The low interaction capability of customer to check-in or check-out, plus the integration with payment systems, can allow the hospitality management to handle the procedures remotely efficiently. Such possibilities are enhanced due to economic reasons such as less staff working during the pandemic period, but can as well be improved in the future for an easier customer management. Future integrations are to be considered as IoT, and intelligent systems are a fast-growing economic sector. Various implications such as user management and low interaction capabilities are a critical success to any hospitality development.

Its potential has also been brought sharply into focus as society grapples with the impact of the COVID-19 pandemic. As the world adapts to a new social and economic normality, the need for an intelligent application creating fluent bridge interaction strategies in the hospitality sector is more relevant than ever. The intelligent table has the role of keeping consumer and management connected, with as little physical interaction as possible. Such implications have necessary technical and economic integration capabilities.

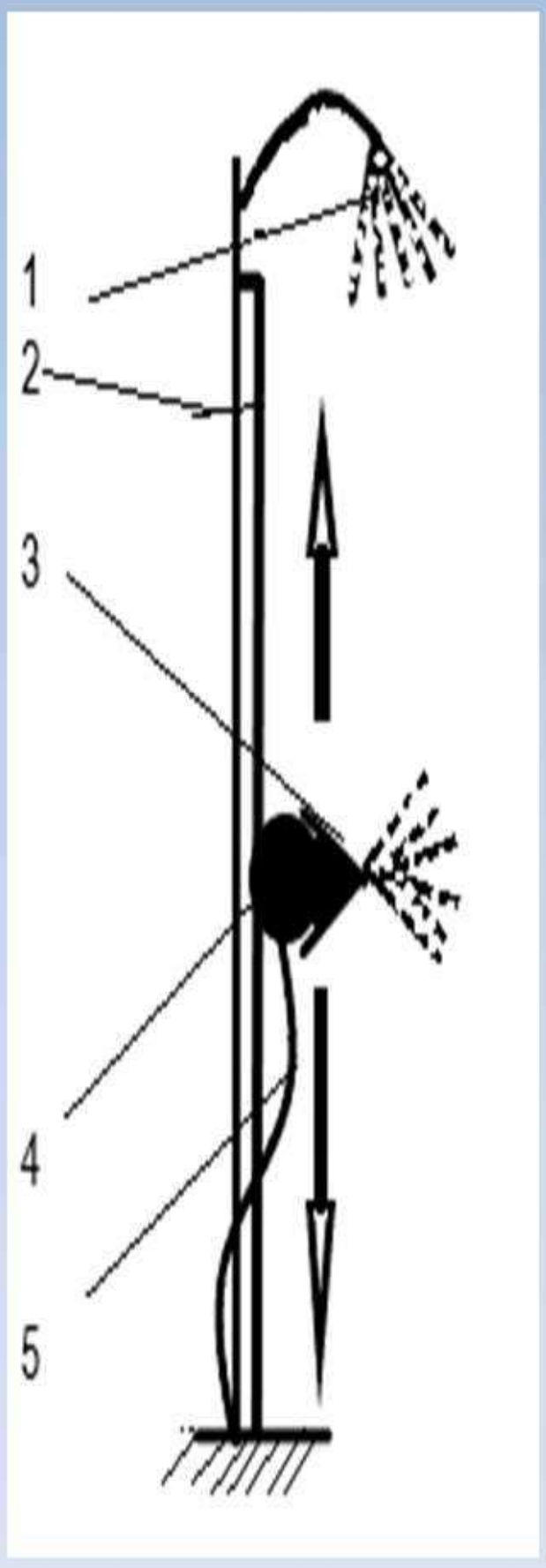


Hydromassage device

*Chirazi Marin, **University"Alexandru Ioan Cuza" from Iași***

Patent application No. 2354/2020

The hydromassage device consists of a hydraulic motor (4), driven by the pressure of the mains water, which slides controlled on a support (2), on the whole height of the body or only on a certain area. The engaged hydraulic motor has a nozzle (3) of various shapes attached, which scatters water and can generate either a pressure effect or a pungent effect on the targeted skin. The mains water, which engages the engine, is directed towards the sliding nozzle, and the user has the possibility to adjust the temperature. The bar on which the hydraulic motor slides is fixed next to a regular shower (1), so that the user will benefit from two sources of water at the same time, one ordinary from above and one from the sliding nozzle (5).



Benefits: This will allow the user to use two therapeutic procedures simultaneously: hydromassage and thermotherapy. Hydromassage by changing the sliding nozzle and obtaining the desired effect and thermotherapy by differentiating the temperature from the two sources. The device can have both a home use, in SPA centers or recovery centers. The other existing equipment is based on electric drive sources of the hydraulic motor and represents potential sources of electric shock.

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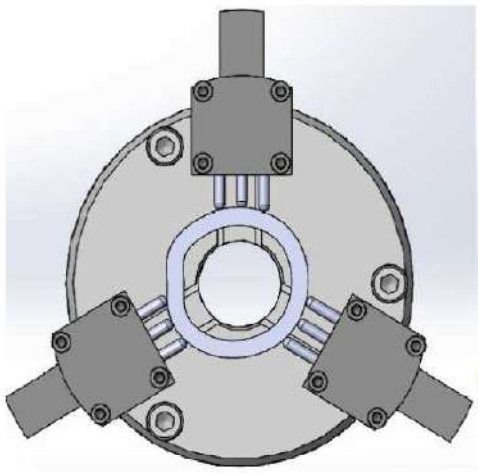
NATIONAL INSTITUTE OF INVENTICS, IASI, ROMANIA

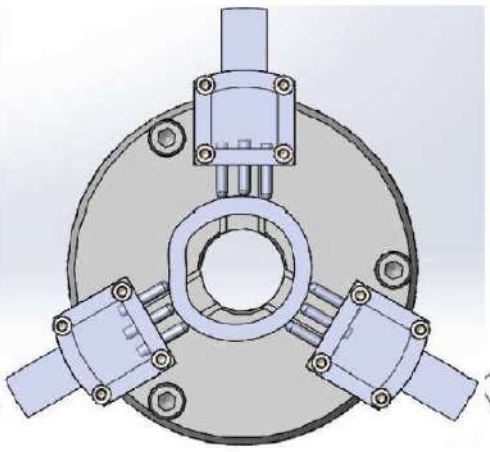
„Gheorghe Asachi" Technical University of Iași
Faculty of Machines Manufacturing and Industrial Management

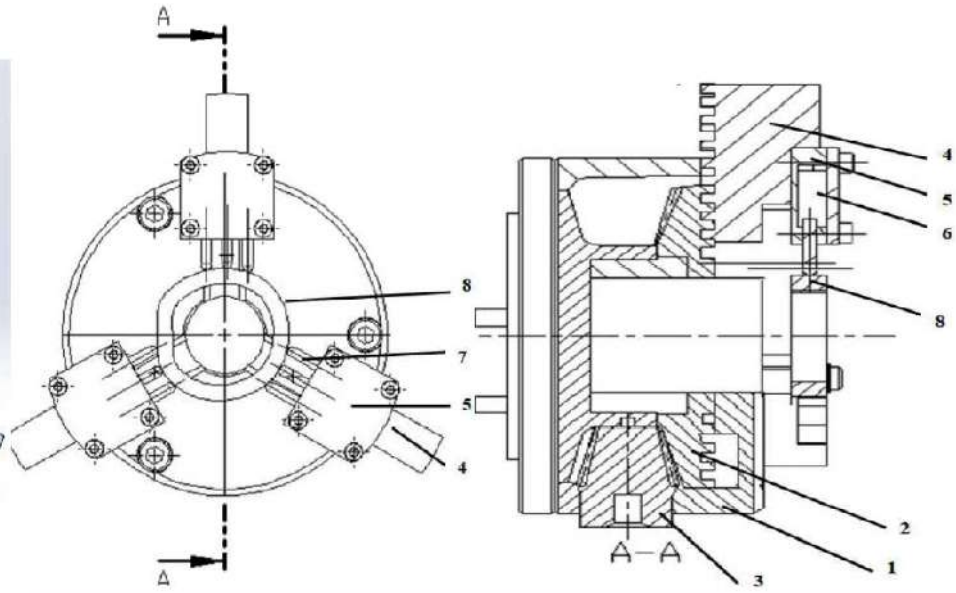
Universal chuck with jaws, plunjer and hydroplast
Mandrina universală cu fălci, plunjere și hidroplast

Cerere brevet (Patent application): 5315/01.04.2021

Inventatori (Inventors): Seghedin Eugen Neculai, Chitariu Dragoș-Florin, Articuci G., Clipa M., Diaconu Al., Dron S., Moldovanu F., Pântea F., Rusu A., Scorţanu C., Sofia I.







Rezumat

Invenția se referă la un dispozitiv de tip mandrină autocentrantă utilizată la strângerea și centrarea pieselor cu pereți subțiri și a celor cu profil neregulat la prelucrarea pe mașini-unelte.

Mandrina universală cu fălci, plunjere și hidroplast, autocentrantă, conform invenției, este compusă dintr-un corp 1 pe care este amplasat un disc turnant 2 care prezintă un canal arhimedic, discul rotindu-se sub acțiunea unui pinion 3, la rotirea discului turnant 2, produce deplasarea radială a unor fălci 4 (3 bucăți) care angrenează cu canalul arhimedic, în fălcile 4 fiind practicate niște incinte 5 în care este amplasată o masă plastică- hidroplast 6, fălcile 4 prezentând niste plunjere 7 care realizează prinderea piesei 8, legătura între plunjere realizându-se prin intermediul masei plastice 6.

Mandrina universală cu fălci, plunjere și hidroplast, autocentrantă, conform invenţiei, prezintă următoarele avantaje: permite aplicarea forțelor de strângere pe mai multe direcții, permite prinderea pieselor cu pereți subțiri, permite prinderea pieselor cu profil neregulat.

Abstract

The invention relates to a self-centering chuck used for tightening and centering thin-walled parts and with an irregular profile when machining.

The self-centering chuck according to the invention is composed of a body to which is attached a rotating disk with an archimedical channel, the disk rotating under the action of a pinion, which produces the radial displacement of three jaws engaging with the archimedical channel of the rotating disk, in each jaw being practiced an enclosure in which oil is introduced, and each jaw has some plungers that hold the piece, the connection between the plungers being ensured by a plastic material.

Benefits:

- allows the application of clamping forces in several directions;
- allows the attachment of thin-walled parts;
- allows the attachment of parts with an irregular profile

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SHOE LASTS MODELLING METHOD FOR CUSTOMIZED FOOTWEAR

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Gheorghe Asachi Technical University of Iasi, mariana.costea@academic.tuiasi.ro

The invention relates to a method of modeling the shoes for personalized footwear, by modifying, in **a validated order**, the dimensional parameters corresponding to the anthropometric data of the feet.

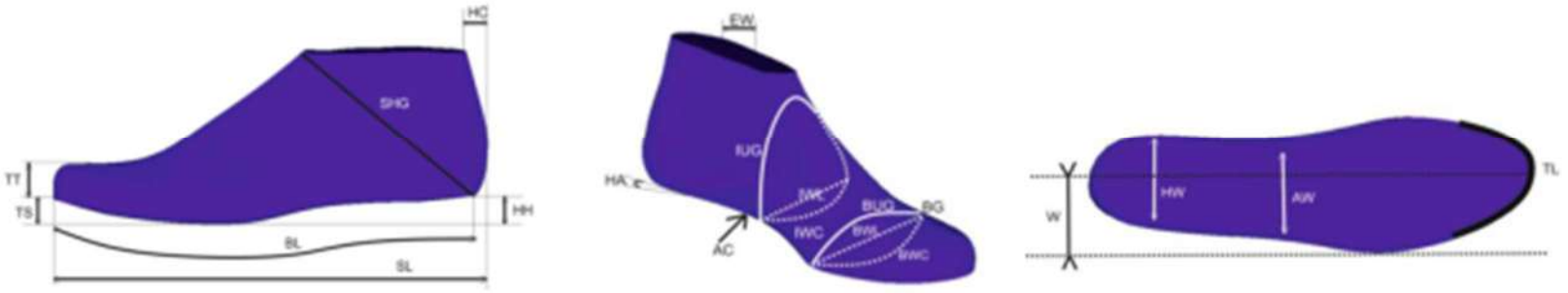

Figure 1. Illustrated methodology for measuring dimensional parameters of shoe-last

The method according to the invention consists in modifying nine main dimensional parameters of the shoe, using the triangulation technique or the design based on the structural matrix, as follows:

1. stick length (SL)
2. toe girth (BG)
3. Width (LW)
4. instep girth (IUG)
5. heel height (HH)
6. heel curvature (HC)
7. heel width (HW)
8. toe spring (TS)
9. toe thickness (TT)

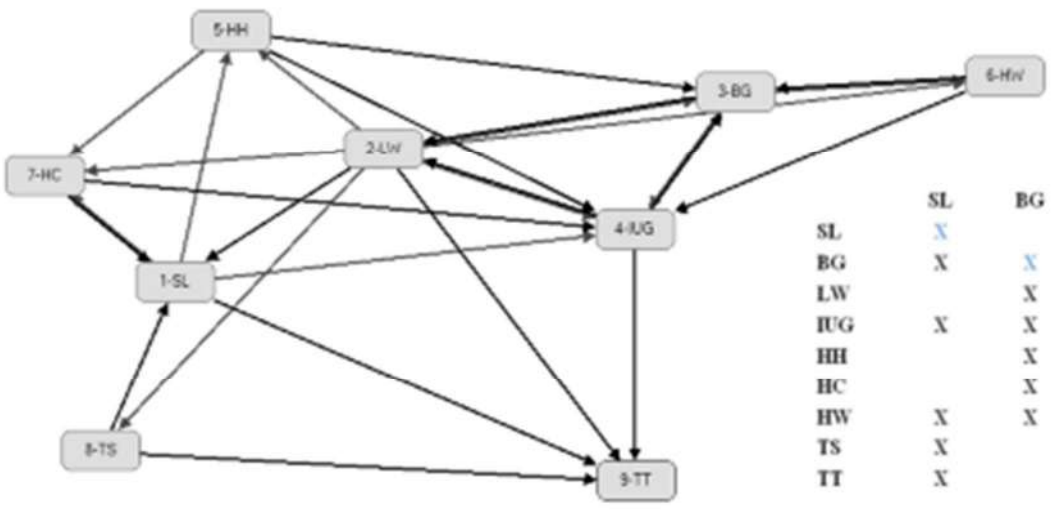

Figure 2. The dependences between main parameters

	SL	BG	LW	IUG	HH	HC	HW	TS	TT
SL	X		X			X		X	
BG	X	X	X	X	X		X		
LW		X	X	X					
IUG	X	X	X	X	X	X	X		
HH		X	X		X				
HC		X	X		X	X			
HW	X	X	X				X		
TS	X		X					X	
TT	X		X	X	X			X	X

Figure 3. Structural Matrix

Except those nine main parameters there are also other auxiliary parameters. The procedure modification of the parameters is of successive type, so that at each step **a single main parameter is modified, which entails the modification of all the other parameters**, both main and auxiliary. The authors found the correct order of modification so the final last is suitable to the subject's feet.

Acknowledgement
This work was supported by UEFSCDI Bucharest under the Partnership Programme project MOBILITY: Preventing gait deficiencies and improving biomechanical parameters for the elderly population by designing and developing customized footwear – code PN-II-II-PT-PCCA 2013-4, contract 122/2014.

EUROINVENT 20121 - EUROPEAN EXHIBITION OF CREATIVITY AND INNOVATION

METHOD OF MODIFYING SHOE LASTS FOR THERAPEUTIC FOOTWEAR BY APPLYING LOAD-BEARING ELEMENTS

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The invention relates to a method of modifying shoe lasts for therapeutic footwear by applying **load-bearing elements**.

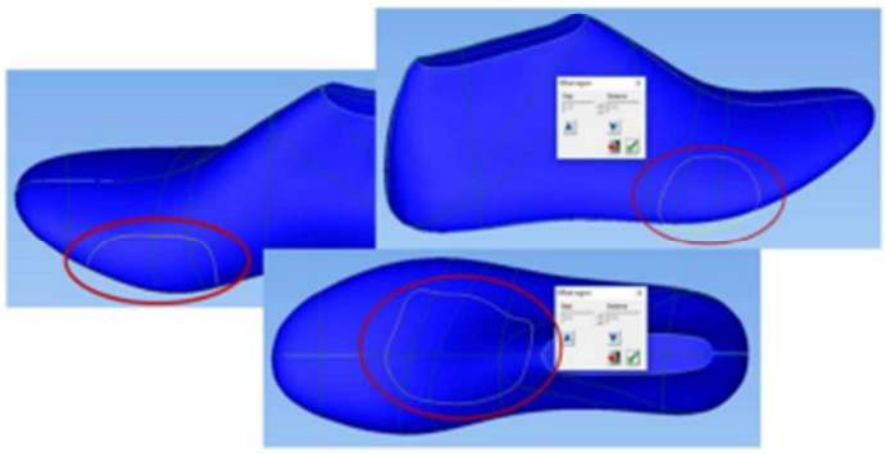

Figure 1. Defining the active section on the last

The method according to the invention consists in:

- *selecting a shoe last similar in shape and size with the subject's foot;*
- *modelling the selected last according to anthropometric parameters, but also to the shape of the foot;*
- *comparing the initial last with the modified one;*
- *extracting the differences between the two.*

The loading elements can be obtained with the help of 3D printers, thus reducing the number of used last, and keeping **a single standard last** to which the **loading elements are added** depending on the condition of the subject.

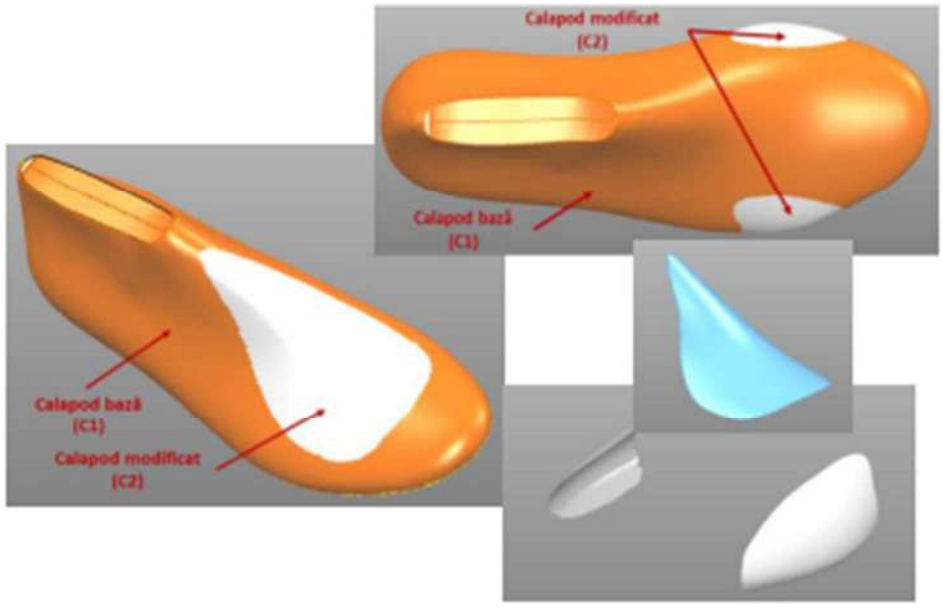

Figure 2. Extracting the load-bearing elements

Acknowledgement
This work was supported by "The development and fabrication using CAD / CAM system of individualized and therapeutic footwear – Project", P_38_898, POC A1-A1.2.1-C-2015, Stage II 2017-2019, funded by MECS – ANCSI, Romania.

Titanium alloys alloyed with molybdenum, zirconium and silicon, for medical applications

"Gheorghe Asachi" Technical University from Iasi, Romania

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Patent Application no: No. 2054 from 25.05.2020, Chisinau, Republica Moldova

Abstract:
The use of titanium and titanium-based alloys with applications in implantology and dentistry has made remarkable progress in the promotion of new technologies as well as new materials that have been developed in recent years. This is justified thanks to their excellent mechanical, physical and biological performance. Today's generation promotes new titanium alloys, with non-toxic elements, with long-term performance, without rejection of the human body.

Invention:
The invention relates to a titanium alloy alloyed with Mo, Zr, Si, for medical applications having as alloying elements, nontoxic elements, alloy intended for medical applications. The biocompatible alloy according to the invention has the following chemical composition, expressed in mass percentages: 78.50-75.50% Ti, 14.50-15.50% Mo, 6.50-7.50% Zr, 0,50-1.50%Si.

Procedures:
Obtaining consists in cutting the raw material (Ti, Mo, Zr and Si) to appropriate dimensions (maximum 5 x 5 x 5 mm), degreasing with volatile organic solvents to remove impurities, both raw materials and the crucible used, gravimetric dosing of raw materials according to the load calculation, loading the raw materials in the furnace crucible, vacuuming the installation and creating the controlled atmosphere (Ar) in the melting chamber, melting the charge by adjusting the electric power and evacuating the semi-finished products from the crucible.

Equipment used:

Selected References:

[1] M.C. Spataru, M. Butnaru, A.V. Sandu, V. Vulpe, M.D. Vlad, M.S. Baltatu, V. Geanta, I. Voiculescu, P. Vizureanu, C. Solcan, In-depth Assessment of New Ti-based Biocompatible Materials, Materials Chemistry and Physics 258 (2021) 123959.
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Acknowledgement This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI – UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0239 / 60PCCDI 2018, within PNCDI III.

Conclusion:
- ❑A ideal implant is very hard to find because of series of factors that can appear (chronic diseases, patient's age and health status).
- ❑Mechanical properties obtained are closer to the bone; The new Ti-Mo alloys demonstrates a potential medical applications with a small Young modulus and suitable hardness.
- ❑To improve the quality of life, it is our duty to improve the alloys that can be used as implants by all methods (addition of biocompatible elements, coatings, treatments etc.)

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Preliminary Processing of Floral Bio-Residues of Saffron (*Crocus sativus L.*) as a innovative source for development of high added-value cosmetic products

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INTRODUCTION

Floral bio-residues of saffron (*Crocus sativus* L.) are generated in huge amounts after collecting the stigmas, being higly perishable. Therefore appears the necesity to be valorised as a innovative source of active biocompounds. The preliminary processing of floral bio-residues consisted in obtaining of enriched extracts in high-value added compounds using different extraction methods: heat reflux extraction (HRE) and room temperature extraction (RTE) as conventional techniques and ultrasounds assisted extraction (UAE) as a „green" unconventional method. The control of extraction process was performed by assessing of the total flavonoids content (TFC) expressed in mg quercetin equivalent (QE) per ml of extract and total polyphenols content (TPC) expressed in mg gallic acid equivalent (GAE) per ml of extract.

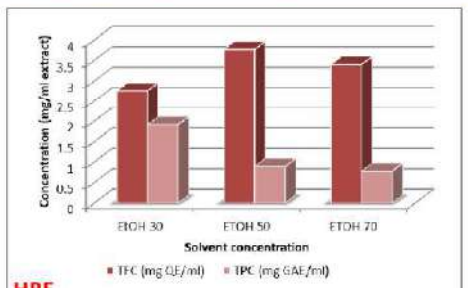
This study aimed to investigate the influence of extraction parameters (solvent concentration and solid toliquid ratio) on TFC and TPC to compare the extraction methods in order to obtain high yields of interest bioactive compounds.

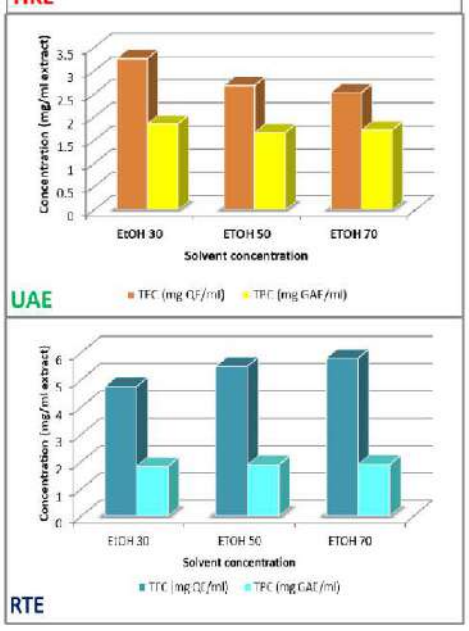
MATERIALS AND METHOD

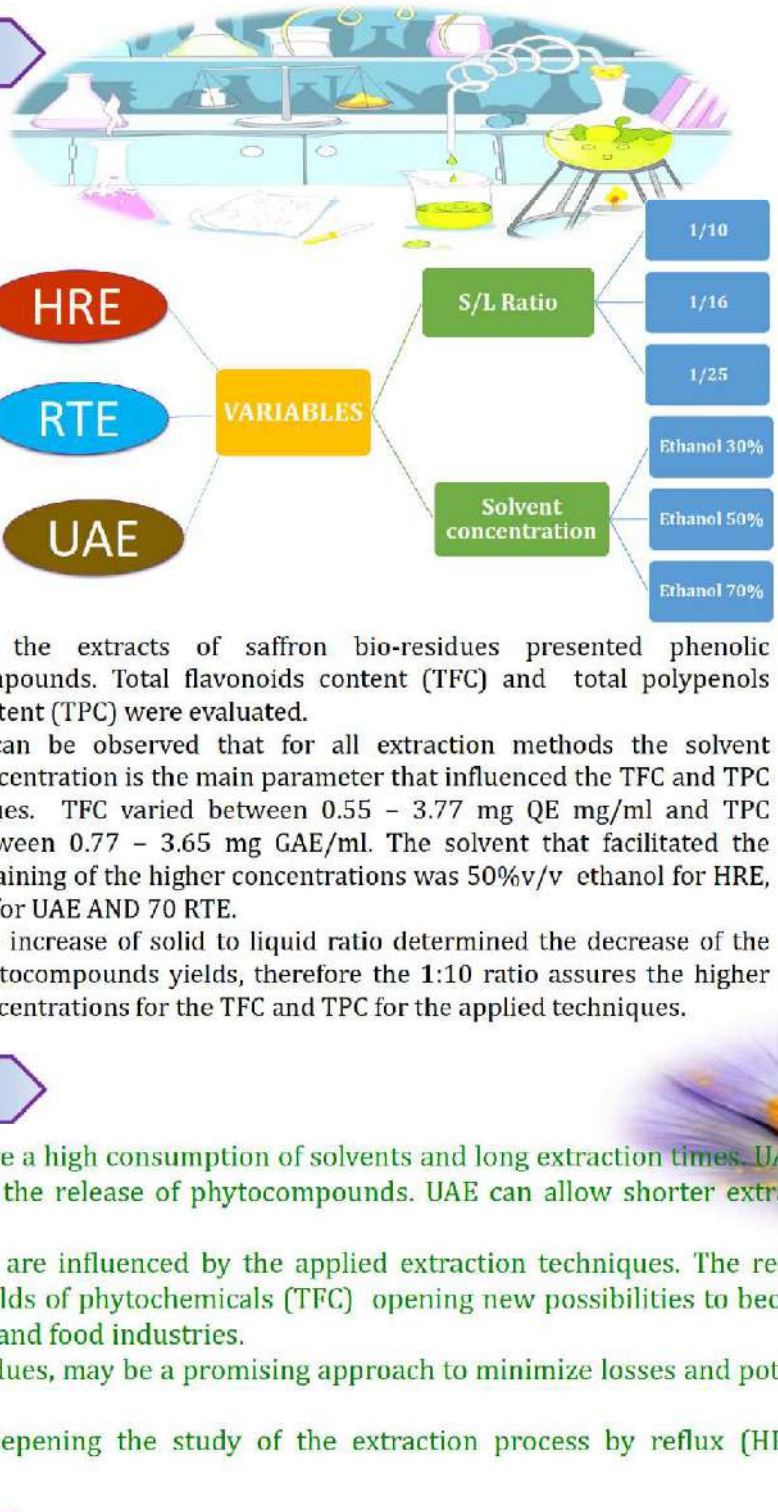
Total polyphenolic (TPC) content determined according to Folin-Ciocalteu procedure, using the gallic acid (GAE) as reference standard to register the calibration curve. The absorbance was measurement at 765 nm and the results were expressed in mg GAE/g;

Total flavonoids (TFC) content - determined according to spectrophotometer-based method using a solution of $AlCl_3$ 2% in the presence of methanol The results were expressed in mg QE/g, considering the quercitin (QE)-based reference calibration curve. (1)

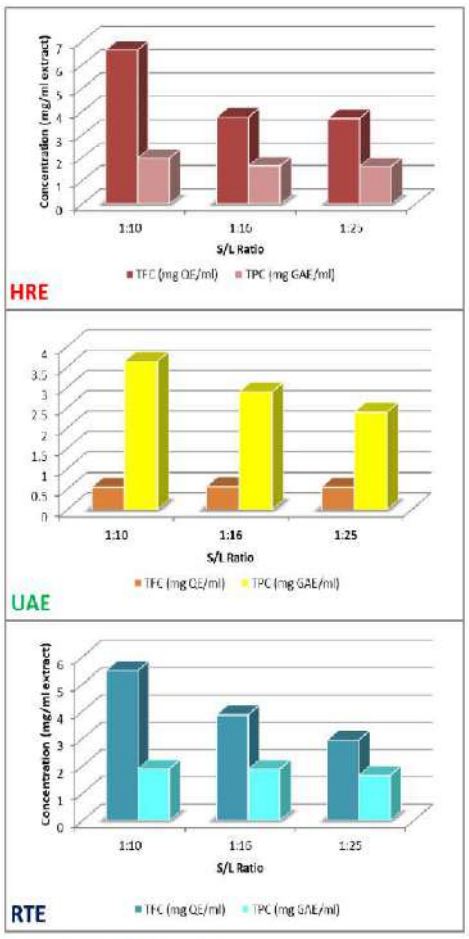
RESULTS AND DISCUTION







- All the extracts of saffron bio-residues presented phenolic compounds. Total flavonoids content (TFC) and total polypenols content (TPC) were evaluated.
- It can be observed that for all extraction methods the solvent concentration is the main parameter that influenced the TFC and TPC values. TFC varied between 0.55 – 3.77 mg QE mg/ml and TPC between 0.77 – 3.65 mg GAE/ml. The solvent that facilitated the obtaining of the higher concentrations was 50%v/v ethanol for HRE, 30 for UAE AND 70 RTE.
- The increase of solid to liquid ratio determined the decrease of the phytocompounds yields, therefore the 1:10 ratio assures the higher concentrations for the TFC and TPC for the applied techniques.



CONCLUSIONS

- ✓ Conventional methods (HRE and RTE) require a high consumption of solvents and long extraction times. UAE is a modern and green method that improve the penetration of the solvent and the release of phytocompounds. UAE can allow shorter extraction times and a lower energy cost compared to conventional methods.
- ✓ This work demonstrated that TFC and TPC are influenced by the applied extraction techniques. The results assessed that saffron floral bio-residues can be processed to obtain high yields of phytochemicals (TFC) opening new possibilities to become a valuable source of actives with applications in the pharmaceutical, cosmetic and food industries.
- ✓ Investing in this by-product, saffron bio-residues, may be a promising approach to minimize losses and potentially increase further the economic value of this crop.
- ✓ Preliminary results lead to the idea of deepening the study of the extraction process by reflux (HRE) and ultrasound (UAE) to obtain hydroalcoholic extracts of saffron.

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Enhancing antioxidant ability of resveratrol used in dermato-cosmetic products

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• Abstract

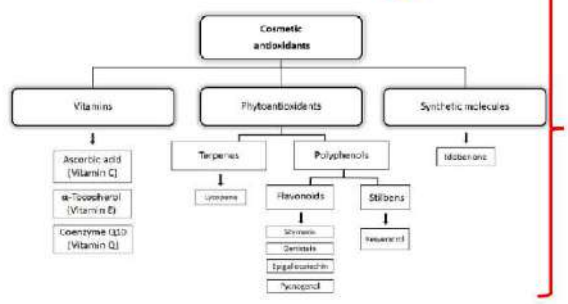
The efficiency in antioxidant activity is higher when combining different natural compounds able to combat oxidative stress impact and prevent adverse reactions of synthetic ingredients.Based on bioactive properties of resveratrol (RV), enhancing antioxidant ability was attempt, in order to obtain a new dermato-cosmetic formula with improved biological effects. For this purpose, different concentrations of resveratrol (1%, 3%, 5%) were associated with 0.5% concentration of ferulic acid (FA) and different mixtures have been studied. Results indicate that the optimum associations are 1% RV:0.5% FA 1:1 and 1:2, or 3% RV:0.5% FA 1:2, in v/v ratio. Economical cost versus benefits criteria will stand for choosing the most advantageous solution for a new dermato-cosmetic formula.

• Introduction

Human society evolution has lead to an unprecedented technological development and the most urban and modern lifestyle but also, to higher level of pollution, natural resources depletion and exhausting daily life schedules.

Oxidative Stress
The imbalance between oxygen reactive species generation (prooxidants) and their elimination by antioxidant defense system leads to oxidative damage at cellular and tissue level (intra or extracellular molecules). The body makes an effort to adapt, by increasing antioxidants synthesis.

Antioxidants are compounds which help the body to fight oxidative stress, to prevent or stop the production of free radical species, helping in removing them and ameliorate the oxidative damage in cells and tissues.



Chalenge: to establish the most efficient and safe concentration and association of natural antioxidants for a new dermato-cosmetic formula.

• Material

Resveratrol-RV
Aqueous solutions with concentrations 1%, 3%, 5%

Ferulic acid-FA
Hydro aclcoolic solution with 0.5% concentration

COMPOUND	BIOLOGICAL EFFECTS	REF
RESVERATROL	Antioxidant, Antiproliferative, Increase detoxifying, Antimicrobial, Antiviral, Antifungal, Inhibits keratinocyte proliferation	Higdon et all., 2015; Gambini et all., 2015
FERULIC ACID	Antioxidant, Antimicrobial, Antiinflamatory, Antithrombotic, Anti UV protector, Antitumoral, Vasculoprotective	O.u, Kwuok, 2004; Brenelli de Paiva et all., 2019

Mixture RV-FC (v/v) : 1:1; 1:2; 1:3 and 1:4

Determination of Antioxidant Activity

DPPH method | ABTS method | FRAP method

• Results and disscusion

The DPPH radical scavenging ability of the samples was calculated as the inhibition percentage (I%) using the equation (1).

$$I\% = ((A_M - A_P)/A0) \times 100 \quad (1)$$

A_0 = the absorbance value of the DPPH ethanolic solution of 0.1 mM; A_t = the absorbance value of the tested samples

The ABTS radical scavenging ability of the samples was calculated as the inhibition percentage (I%) using the equation (2):

$$I\% = ((A_0 - A_t)/A_0) \times 100 \quad (2)$$

A_0 = the absorbance value of the ethanolic solution of ABTS**, A_t = the absorbance value of the analyzed samples

FRAP is based on the ability of antioxidants to reduce the yellow-colored tripyridyltriazine –Fe(3+) (Fe (III) -TPTZ) complex to the blue-colored tripyridyltriazine – Fe(2+) (Fe (II) -TPTZ) complex. The measured antioxidant capacity is usuallyexpressed in mM FeSO4, Trolox equivalents

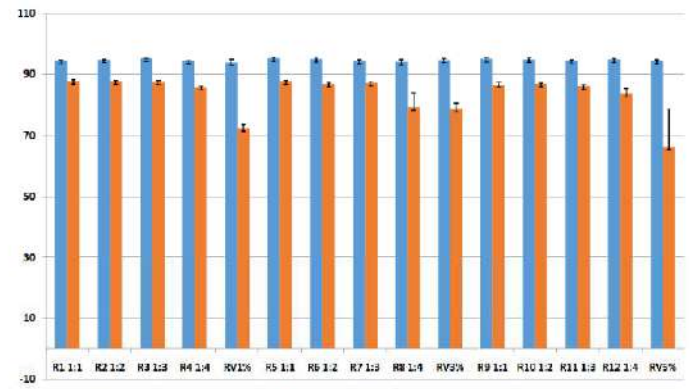


Figure 1. Comparison of DPPH and ABTS methods of antioxidant activity evaluation for the mixture of Resveratrol and Ferulic Acids. Mixture RV:AF (v/v): RV1% [R1 1:1 ; R2 1:2; R3 1:3; R4 1:4]; RV3% [R5 1:1; R6 1:2; R7 1:3; R8 1:4]; RV5% [R9 1:1; R10 1:2; R11 1:3; R12 1:4]

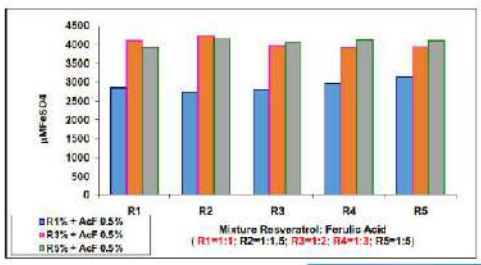


Figure 2. Comparison of DPPH and ABTS methods of antioxidant activity evaluation for the mixture of Resveratrol and Ferulic Acids. Mixture RV:AF

• Conclusions

Mixing Resverastrol with Ferulic Acid is extremely beneficial, improving the antioxidant capacity of resveratrol, while maintaining its recognized biologically active properties.

The mixtures of 1% and 3% resveratrol with 0.5% ferulic acid in a ratio of 1: 1 and 1: 2 proved to be effective in this direction.

The performance of these four final mixtures in terms of "antioxidant activity" has proved to be similar, but clearly superior to resveratrol. The criteria that will make the difference in the use of one of them in practice will be represented by the therapeutic properties of the final dermato-cosmetic preparation and the "final product-benefit" ratio.

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Valorization of residual biomass as biosorbent for removal organic chemical pollutants from aqueous media

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Abstract

The paper aims is to present new bioproducts that capitalize on industrial by-products (residual microbial biomass-RMB). RMB by immobilization in sodium alginate has been tested as a potential biosorbent for retaining organic chemical pollutants (i.e. Brilliant RRed HE-3B and Orange 16 reactive dyes) from aqueous media. In this context, it were obtained and studied biosorbents based on *Bacillus sp.* and *Lactobacillus sp.* immobilized in sodium alginate. The biosorption process has been studied in order to establish the optimum conditions of process. The effect of various experimental parameters such as biosorbent dose, temperature, initial dye concentration, dyes type, particle size and solution pH were investigated.

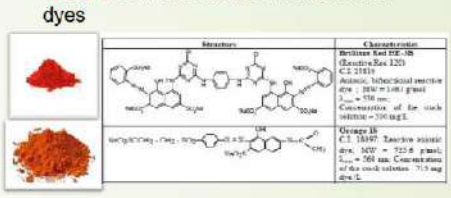
• Material and Method

Microbial residual biomass-RMB	Production
Bacillus	Removal of oils and fats (solid waste) from wastewater using a mixture of *Bacillus subtilis, Bacillus megaterium, Bacillus licheniformis* and *Bacillus amyloliquefaciens*, at 35 ° C and 150 rpm, in an aerobic system for 96 hours.
Lactobacillus	Obtaining lactic acid using *Lactobacillus rhamnosus, Lactobacillus plantarum, Lactobacillus casei* isolated in the laboratory, at 37 ° C and 250 rpm, for 48 hours.

In order to increase its biosorption properties the bacteria is firstly treated with NaOH 0.75M at 70°C for 15 minutes and dried. For immobilisation, the *biomass* cells are first mixed with a solution of sodium alginate 1% (soluble in water, which in the presence of multivalent cations, usually Ca^{2+}, forms a gel that allows the entrapment of bacteria cells). This is then dripped into a cooled calcium chloride solution of 0.2%.

Dyes. The selected dyes: *Brilliant Red HE-3B* and *Orange 16* were used as commercial products, and are characterized in **Table 1**. Aqueous stock solution of dyes, with desired concentration, were prepared using the commercial salt form of the dye and distilled water. The working solutions were obtained from stock solution by dilution with bidistilated water.

Table 1. Characteristics of the selected dyes



Note. Abbreviations: Bred - Brilliant Red HE-3B; O16 - Orange 16;

Biosorbent –microbial residual biomass-RMB immobilized in alginate

BIOSORPTION

Aqueous dyes solutions with different working concentration (25mL)

The biosorption experiments were performed in *batch method*: contacting different amounts of biosorbent with 25 mL of solution containing various dye concentrations. The *pH of solutions* was adjusted to the required value by adding HCl or NaOH 1 N aqueous solution, and was measured with a *RADELKIS OP-271 pH/Ion analyzer.*

- The system was maintained at constant temperature in a *thermostatic bath* and under *discontinuous stirring.*
- The **biosorption efficiency** of the microbial residual biomass-RMB immobilized in alginate was evaluated by determined the *amount of dye adsorbed* **q** (mg/ g)

$$q = \frac{C_0 - C}{G} \cdot V$$

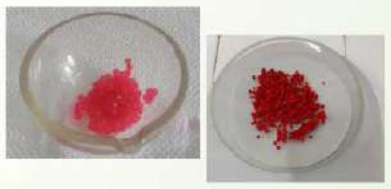
and by ***percentage of dye removal*, R** (%): $R = [(C_0 - C)].100 / C_0$ (%)

where: C_0 and C are initial and the equilibrium concentration of dye in solution in mg/L, G is the amount of *biomass immobilized in alginate granules* (g) and V is the volume of solution (L).

after 6-24 hours

Decantation

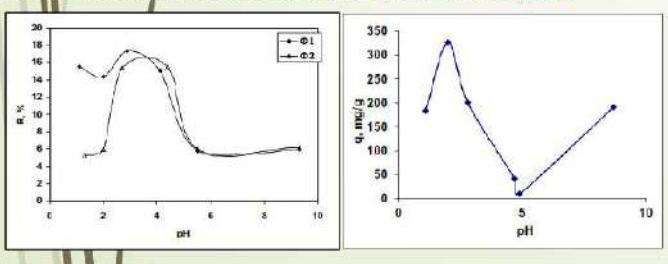
Characterization the adsorbent loaded with dye



The concentration of the dye in supernatant was determined using a spectrophotometer-based method, with an *UV-VIS Digital Spectrophotometer, model S 104D /WPA*

• Results and disscusion

Effect of solution pH, and diameter of immobilized biomass granules. The solution pH is an extremely important parameter in the study of the adsorption process, because its value depends both on the adsorption of the biosorbent surface and on the availability in a certain ionic form of the species to be adsorbed. The effect of initial solution pH on the biosorption of dyes onto immobilized biomass was examined and the results are presented in Figure 1.

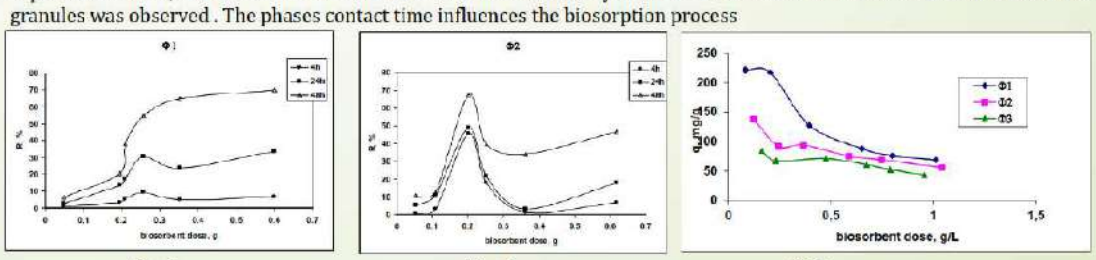


Bred **O16**

Figure 1. *Effect of pH , contact time and type of dyes on the biosorption onto immobilized biomass: Bred-Bacillus sp. : C_0=54.4 mg/L; T = 18 °C; Φ1 = 0.5mm, Φ2=1.5mm.; O16- Lactobacillus sp.: C_0=85.95 mg/L; T = 20 °C; Φ = 2mm*

Effect of biosorbent dose and phases contact time

To investigate the effect of dose of the biomass immobilized in alginate on the removal capacity of dyes from aqueous solutins in the established concentrations and favourable pH, biosorption experiments were carried out with different biosorbent amounts for 6 and 24 hours. The results, presented in Figures 2, showed that the amount of dyes biosorbed per mass unit of biomass decreases. An amount of 0.2 g wet biosorbent/L assures adequate biosorption capacity and was chosen for subsequent experiments. Also, an increase in the amount of biosorbed O16 dyes with the decrease of diameter of immobilized biomass granules was observed . The phases contact time influences the biosorption process



Bred **Bred** **O16**

Figure 2. *Effect of adsorbent dose , phases contact time and diameter of granules on the biosorption of dyes onto immobilized biomass : Bred - Bacillus sp.: C_0=54.4 mg/L; pH= 2, T = 18 °C/ Φ1 – 0.5mm, Φ2-1.5mm ; O16-Lactobacillus sp.: C_0=85.95 mg/L; T = 20 °C; pH= 2, (Φ1 – 2mm, Φ2-3mm; Φ3 - 4mm)*

Effect of initial dye concentration and the temperature

It can observe an increase in biosorption capacity of Brilliant Red HE-3B with the increase of the initial dyes concentration and temperature. The sorption capacity is more efficient at T = 18°C for both Φ1 = 0.5 mm and Φ2 = 1.5 mm, being higher (approx. 275mg / g biosorbent) in the case of granules with Φ1 = 0.5 mm, due to a larger contact surface of the phases.

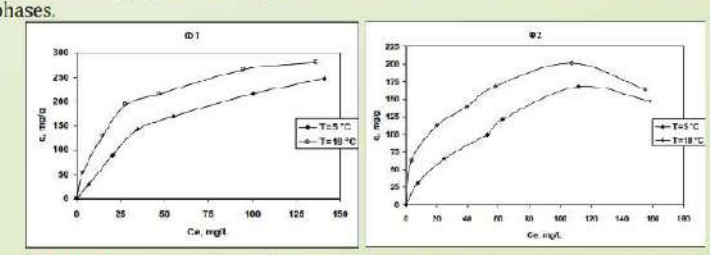


Figure 3. *Effect of initial Bred dye concentrations and temperature on the biosorption onto immobilized biomass of Bacillus sp.: pH = 2; Φ1 = 0.5mm, Φ2=1,5mm.; 24h;*

• Conclusions

Alginate immobilization of biomass (*Bacillus* sp. and *Lactobacillus* sp.) granules leads to a biosorbents efficient in removing dye from different wastewaters

The biosorption capacity of the immobilized biosorbent is influenced by initial solution pH, dye concentration, dose and particle sizes of biosorbent, diameter of immobilized biomass granules and phases contact time.

This work was supported by a Grant of The Romanian Ministry of Research and Innovation, CCDI-UEFISCDI, project number PN-III-P2-2.1-PED-2019-1063, within PNCDI III.

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BUSINESS SUSTAINABILITY ASSESSMENT OPERATED TO IDENTIFY AN ASSOCIATED PROFILE

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OBJECTIVE

The project purpose is to improve business sustainability assessment process. Thus, the research results aim to identify firm's sustainability profile and to propose solutions to business sustainability improvement.

INTRODUCTION

Organizational sustainability is an approach that aims to create long-term value for stakeholders by implementing a business strategy that focuses on financial, environmental, ethical and social issues. Business sustainability in essence represents the synergy between three organizational dimensions: environmental, social and economic. Significant deviations associated to operational symmetry between these key components could generate a decrease in organization's market value. Business sustainability assessment represents a complex statistical approach, presented in some cases as unclear in the literature, but characterized by an ongoing need for flexible instruments with a wider spectrum of applicability.

MATERIALS & METHODS

The studied population is represented by listed Romanian companies. Thus, in order to achieve the research objectives, the studied population is mainly represented by companies listed on the Bucharest Stock Exchange (BSE), and the final sample proposed for analysis includes 30 large national companies. Starting from the specialized literature, the following model - associated with organizational sustainability - is considered - Figure 1.

In this research project to obtain the estimated results, the data analysis was performed using IBM SPSS 22.0 (Statistical Package for the Social Sciences). Business sustainability profile identification was operated using multiple correspondences analysis (MCA).

The variables related to the three dimensions of sustainability as well as the one related to the sustainability score were introduced in MCA.

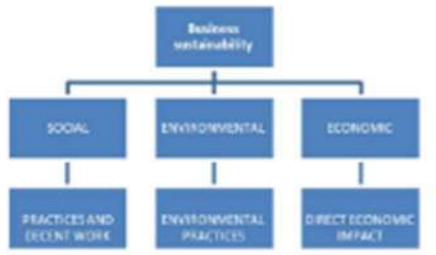

Figure 1 Framework model associated with business sustainability

The analyzed variables are categorical obtained starting from the previously estimated scores (on each component separately), taking into account the marks: minimum, Q1, Q3, and maximum; hence: (i) for the values between minimum and Q1 the category Low was considered; (ii) for the values between Q1 and Q3 the Medium category was considered; (iii) for the values between Q3 and maximum, the High category was considered.

RESULTS & DISCUSSION

Based on the data analysis in MCA, were obtained the following results (Table 1 & Figure 2):

The diagram in Figure 2 shows the sustainable performance profile according to belonging to one of the categories related to the three dimensions (economic [financial], environmental, social). Thus, a company whose sustainability score is high can be characterized by a high financial, environmental and social performance. At the same time, a firm whose sustainability score is average, can be characterized by average values of financial performance, average values of environmental performance and average and low values of social performance. Last but not least, a company with a low sustainability score can be characterized by a low financial, environmental and social performance.

In order to develop solutions, based on research results, is proposed the following:

(1) in the business case that are characterized by a low level of value associated with environmental dimension, it is recommended to significantly reduce water consumption, and NOx and SO2 emissions (process improvements, analysis of used materials and raw materials, refurbishment, end-of-pipe control mechanism implementation, etc.);

Statistics

		Dim_Fin	Dim_Env	Dim_Soc	Score_Sus
N	Valid	300	300	300	300
	Missing	0	0	0	0
Mean		,0000000	,0000000	,0000000	,0000000
Minimum		-1,89821	-1,55384	-,78539	-1,01236
Maximum		4,59836	2,04359	2,67988	2,45924
Percentiles	25	-,5305416	-,4726497	-,4750433	-,5454921
	50	-,0078969	-,2952648	-,3624209	-,3956578
	75	,2622643	,1617591	-,2634364	-,0560599

Table 1 Statistics for MCA - sustainability profile identification (for obtaining categorical variables)

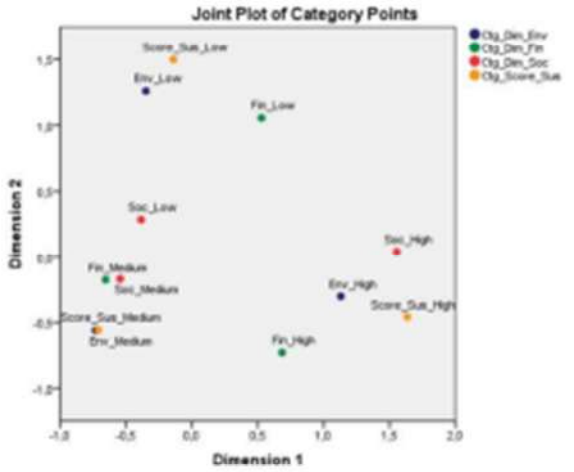

Figure 2 Business sustainability profile

(2) in the business case that are characterized by a low level of value associated with the economic (financial) dimension, it is recommended to analyze the environmental impact induced by past or present investments; notes the need for investment in non-polluting technologies;

(3) in the business case with a low level of value associated with the social dimension, it is recommended to raise awareness regarding the importance of human resource skills development through training, operate safety training, and maintain local community employees at a reasonable level.

CONCLUSIONS:

It was found that the assessment of organizational sustainability is a complex statistical approach, presented in the literature as sometimes contradictory and unclear, but characterized by a current need for flexible tools, which have a wider range of applicability. The purpose of this approach was determined by the need to improve the process of assessing organizational sustainability, by combining basic research with applied research. Consequently, the results of this research approach aimed to complete the literature associated with organizational sustainability and to identify a business sustainability profile.

Currently, the literature presents the fact that approaches associated to indicators and evaluations operated through them on business sustainable development is vast and follows the progress associated to theoretical approach and proposals in this case paradigm. However, research in this area, although growing, does not seem to have advanced in terms of assessment tools application related to current contexts challenges.

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Acknowledgement
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This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS - UEFISCDI, project number PN-III-P1-1.1-TE-2019-1642, within PNCDI III.

STATISTICAL MODEL ON TECHNICAL SYSTEM POWERED BY ARTIFICIAL INTELLIGENCE

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PROBLEM

The analysis of the influence of Production (P) and Quality (Q) strategies on the parameters of the safety in operation: reliability (MTBF) and maintainability (MTTR).

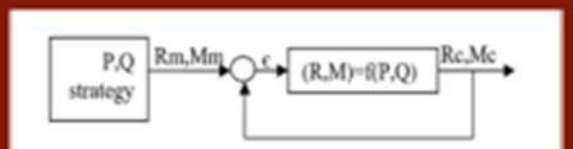


Figure 1. Safety management as a first order feedback system

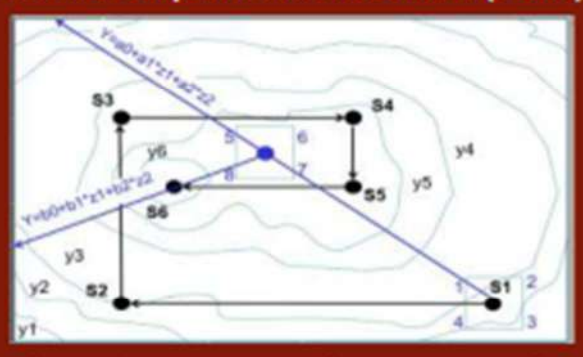
This problem can be considered systemically as a first order feedback system (figure 1), where ϵ represents the error between the measured values of reliability (Rm) and maintainability (Mm) and calculated values of reliability (Rc) and maintainability (Mc) by mathematical modeling of technological process (R,M)=f(P,Q).

METHODS

1. Statistic methods

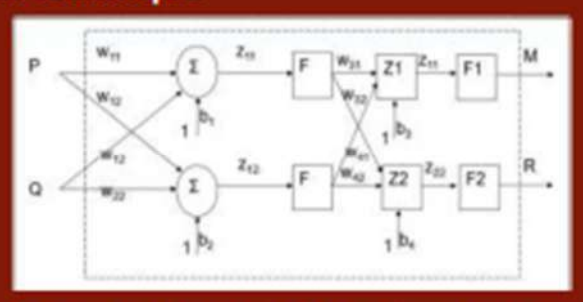
Statistical methods are used to analyze the regression model and and testing the normality of the series.

2. Programmed experiment method (PEM)



The method of the programmed experiment determines a solution for the optimization problem by looking for it in the solution space on the 2 directions given by the independent parameters that minimize the objective function error.

3. Neural technique



Neural modeling is a bio-inspired technique that consists of an interconnected structure, trainable for the modeled system (supervised learning), which provides, synchronously, values for the output parameters (M, R) depending on the values of the input vectors (P, Q).

4. Hybrid genetic algorithm

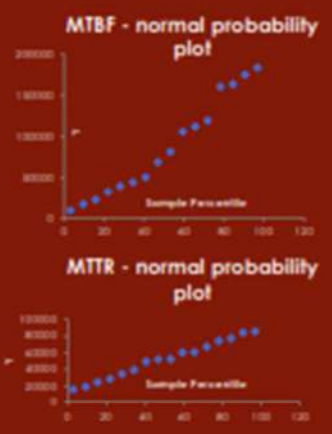
In this approach, genetic algorithms are used to determine the coefficients of the regression equation based on their search for the optimum throughout the solution space.

EXPERIMENTAL RESULTS

1. Statistic methods and 2. PEM

The set of experimental values resulting from the application of the programmed experiment method are:

Production kg/month	Quality %	Reliability MTBF (s)	Maintainability MTTR (s)
3424	1,801	38863	39138
3987	2,591	8756	18673
4215	1,721	49797	60204
4671	2,519	16309	15947
5144	2,449	21700	24042
5431	2,498	31712	28021
6624	1,823	43917	34012
7308	1,699	68146	52290
8210	1,761	80709	51771
10556	1,722	111108	66929
10878	1,791	118600	77241
11175	1,707	105177	60423
11531	1,521	159823	49434
13350	1,498	162790	85610
13488	1,459	174365	74035
19152	1,365	1802904	84296



MTBF

Regression Statistics	
Multiple R	0,967
R Square	0,936
Significance F	1,68541E-08

	Coefficients	P-value
Intercept	93335,11	0,028687
X1 (P)	9,570876	1,05E-05
X2 (Q)	-48468,4	0,006608

MTBF=93335,11+9,571*P-48468*Q

MTTR

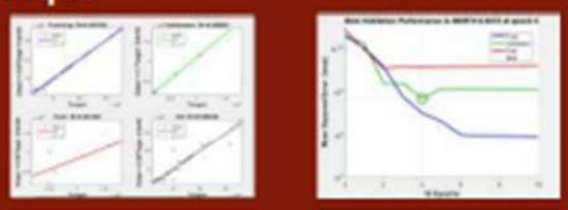
Regression Statistics	
Multiple R	0,906
R Square	0,821
Significance F	1,3735E-05

	Coefficients	P-value
Intercept	92880,86	0,0021
X1 (P)	2,116	0,0326
X2 (Q)	-32030,206	0,0054

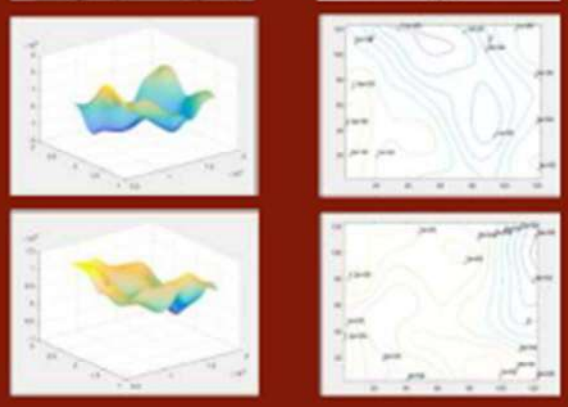
MTTR=92880+2,116*P-32030,206*Q

3. Neural technique

Neural network training



MTBF surface and contours



MTTR surface and contours

4. Hybrid genetic algorithm

Model: y=a0+b1x1+b2x1^2+c1x2+c2x2^2+d1x1x2

	d1	c2	c1	b2	b1	a0
MTBF	32,1119	333932	-2E+06	0,00012	-48,7	2E+06
MTTR	32,5162	168066	-9E+05	0,00075	-65,5	1E+06

Conclusions

Absolute approximation error for each model (h)

Statistic		Neural		Mathematic		Genetic	
MTBF	MTTR	MTBF	MTTR	MTBF	MTTR	MTBF	MTTR
30	31	20	24	29	27	28	27

GHEORGHE ASACHI TECHNICAL UNIVERSITY OF IASI
FACULTY OF CIVIL ENGINEERING AND BUILDING SERVICES

Dome City

Dome City is made of several circular arches intersected in the center and having their ends joined using cables, like buttresses, thus presenting a flexible behavior, best fitted for seismic areas. The innovative concept here is given by the way of vertically arranging the buildings, namely lifting them on cables, therefore starting the construction on top. A cable will be lowered from the point given by the intersection of the arches and from other carefully calculated points, and will be attached at the base of the construction foundation.

This principle can be applied to build the highest building in the world, as well, as the cables on which the building is formed could be lowered from a satellite, orbiting the Earth, and fixed in a very solid foundation in the ground.

Rendering representing the way of putting the idea in the theme

Rendering representing the climbing model of the cable structure

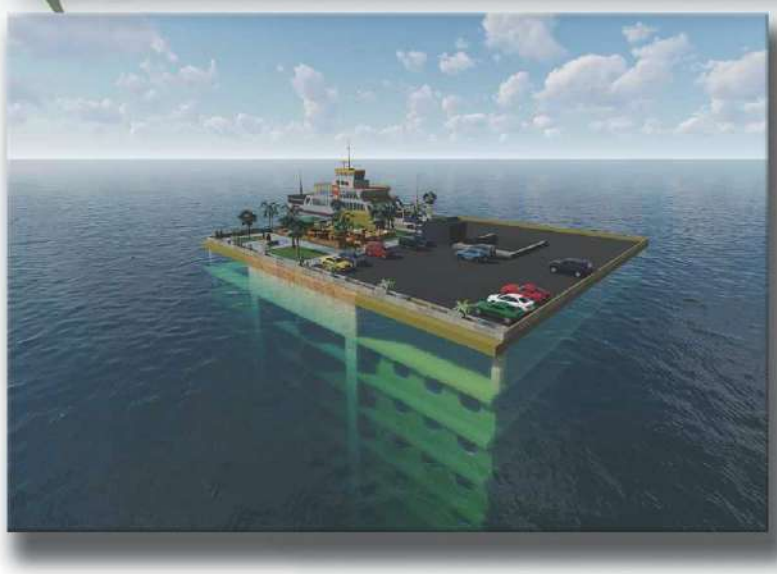
In this way we can build literally to the sky and beyond!

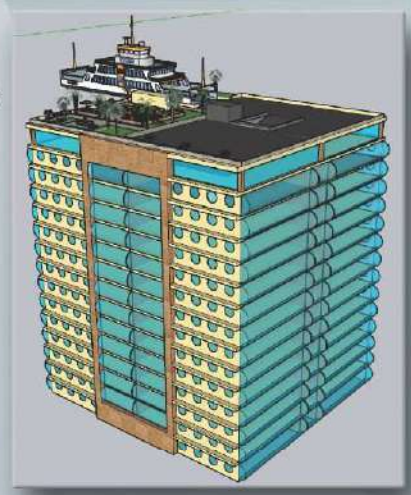
Neculai Oana , Barbu Marian Bogdan
Technical University "Gheorghe Asachi" of Iasi

Gheorghe Asachi Technical University of Iasi
Faculty of Civil Engineering and Building Services

Under the sea hotel – Hotel Halkida

Neculai Oana, Cămară Alexandru — Technical University "Gheorghe Asachi" of Iasi





The concept of this hotel is based on the idea that people could not just explore the sea from a ship or by diving, but they could also spend holidays there. The idea involves a hotel situated under the sea, for people to have a unique experience, in the tranquility of the sea.

Thus, the people can admire the beauty of the sea environment from the window of their hotel apartment. All sides of the hotel and the middle facades have semi-cylindrical shaped window - walls, which give a wider perspective angle.

The hotel has a structure type with a central core made of reinforced concrete, the floors are in console and the glass of the windows is well sealed.

The hotel has a parking area on the first two levels, as the visitors will reach the hotel by a ferry. The project involves also the following facilities on the roof: a recreation area with green areas with palm trees. On the first floor there is a restaurant, a café, the reception and the parking. The access from the roof to the hotel is done by four elevators, in the central reinforced concrete core of the structure. Starting from the second floor there are rooms and apartments, placed around the central core of the structure.

The ventilation system is the mechanical ventilation heat recovery type (MVHR). The heat recovery unit is placed on the roof. Extra fresh air and recreation areas are provided by greenhouses placed at the submerged levels, with luxurious green plants that can ensure fresh air even under the sea.

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Simultaneous infrared photo-stimulation with physiotherapy exercises, in the rehabilitation of post-traumatic hand

Ilie Onu, Doru Andrițoi, Călin Corciovă, Rober Fuior, Cătălina Luca, Anca-Irina Galaction

University of Medicine and Pharmacy "Grigore T. Popa" Iasi, Faculty of Medical Bioengineering

Infrared therapy is a new and innovative light-based method to treat pain and inflammation in various parts of the body. Unlike ultraviolet light, which can damage the skin, infrared light enhances cell regeneration. Infrared light is delivered to the site of injury or inflammation at certain wavelengths, promoting cell repair.The key characteristic of infrared light is its ability to penetrate even the deep layers of the skin, providing better pain relief. Also, infrared light is safe, natural, non-invasive, and painless. Thus it may be able to provide a broad range of health benefits.

A Infrared (IR) is electromagnetic radiation with wavelengths between 760 nm and 100.000 nm. IR can improve the healing of skin wounds, pain relieve, stiffness relieve, fatigue of rheumatoid arthritis, and post-traumatic recovery. Post-traumatic hand rehabilitation is a sensitive area of physiotherapy, due to the complexity of the anatomical structures of the forearm, fist and fingers. The most common injuries are those in the field of orthopedics, traumatology, closely followed by specific injuries from plastic and reconstructive surgery. From the perspective of rehabilitation with physiotherapy, the biggest challenge is to restore the function of the hand, the prehension, opposability of the fingers and pluridigital grips (bidigital and tridigital). In hand physiotherapy, pain and stiffness in active and passive mobilization is the biggest challenge. Classical physiotherapy protocols do not include forms of simultaneous therapy, which could facilitate the exercises performing's, losing important time in recovery. Simultaneous IR therapy - physiotherapy exercises, shorten working time, bringing benefits to the patient from the perspective of pain and stiffness.

The novelty is the conception of an optimal physiotherapeutic protocol using the combination IR with exercices during the standard treatment, reducing the local pain, stiffness and accelerating the of rehabilitation process. A physiotherapy treatment design was created so that the standard passive and active exercices was supplemented with IR in order to accelerate the rehabilitation process.

Results and advantages:

Ø pain management without drugs;
Ø reduction of local inflammation;
Ø reduction of stiffness;
Ø good management of the rehabilitation program, reducing in half the recovery time;
Ø the procedure is non toxic and safe for the patient
Ø low costs and it's versatile.

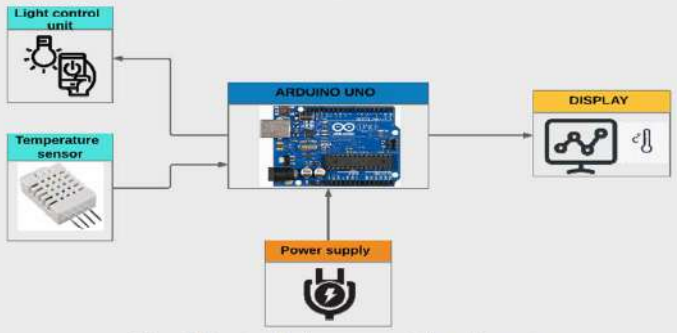

Fig. 1 Control diagram of the IR system

IR parameters was:
- source – two Philips bulbs PAR38 IR 175W E27 230V Red 1CT/12;
- exposure time 15 minutes
- face-to-face orientation of the bulbs

Physiotherapeutic protocol exercices:
- the patient's hand is between the two light sources;
- the physiotherapist performs passive mobilizations of the fingers and wrist for 4-5 minutes;
- the patient performs for 10-11 minutes active mobilizations at the command of the physiotherapist with previously demonstrated exercises.

Fig. 2 Patient exercises under guidance of the physiotherapist

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A Combined sEMG and Sensors System for Monitoring Functional Activity in Medical Rehabilitation

Corciovă Călin, Andriţoi Doru, Luca Cătalina, Fuior Robert

University of Medicine and Pharmacy "Grigore T. Popa" Iasi, Faculty of Medical Bioengineering

INTRODUCTION

Rehabilitation process due to stroke or accident related injuries are based on clinical assessment tools which can be executed by self-report (home-based) and observer-rated (done at rehabilitation centre). Observer rated by caregivers can be time consuming and patients require to have repeated observations at rehabilitation centre which can be costly. However, early home-based rehabilitation proved to promote a better physical health because it appeared to permit motor and functional gains that occurred with natural recovery and satisfaction with community integration. Continuous monitoring of physical activity is an important subject in the area of rehabilitation. The results obtained from these observations can be used to determine the progress and effectiveness of a rehabilitation program.

A. System Architecture

The system involves attaching devices to the affected human limbs in order to monitor patient's physical activity. Miniaturized sensors such as accelerometers, flex sensors and force sensitive resistors are widely used in developing this assistive device. Accelerometer is a device which measures acceleration indirectly through inertial force. Due to this ability, accelerometers have been used to track motion of human. Flex sensor can effectively measure movement and flexibility of muscle. Force sensitive resistor can detect flexion and extension of individual muscles.

Sensory unit:

Flexible sensors: Resistance value of the sensor is about 8,000 Ω (8K) at 0°. The resistance will gradually increase if the flex sensor as being bent inward. At 90° the resistance value is about 10-14K Ω. The flex sensor may be bent greater than 360° depending upon the radius of the curve; this will further increase the resistance value to increase further. Its life cycle is more than 1 million bend.

Force Sensitive Resistors: A force sensitive resistor (FSR) is also another type of resistor which is composed of polymer thick film. Its resistance changes when physical pressure applied to the active surface.

Accelerometer: Analog Device ADXL 355 (3g) This accelerometer is a thin, low power and small 3-axis accelerometer which can give analog voltage output.

Muscle sensor: The MyoWare board acts by measuring the filtered and rectified electrical activity of a muscle. It gives the output from 0 to Vin Volts depending on the amount of activity in the selected muscle

Main unit:

Arduino Mega 2650 microcontroller

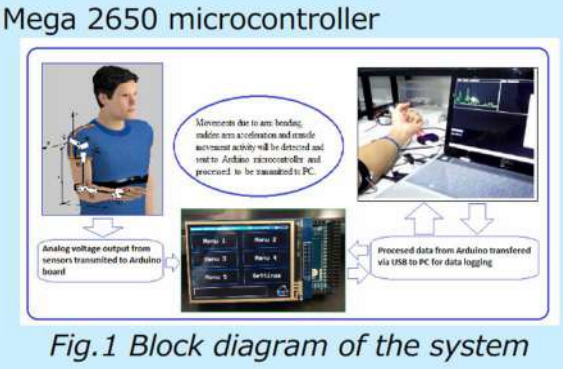

Fig.1 Block diagram of the system

B. Results and discussions

Any movements due to arm bending, sudden arm acceleration and muscle movement activity will be detected and sent to Arduino microcontroller and processed to be transmitted to PC via USB connection for online real - time data logging or SD card data logging.

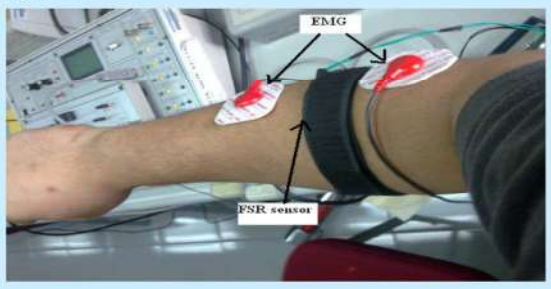

Fig. 2 Location of sEMG and FSR targeted medial extensor carp radials on the lower arm.

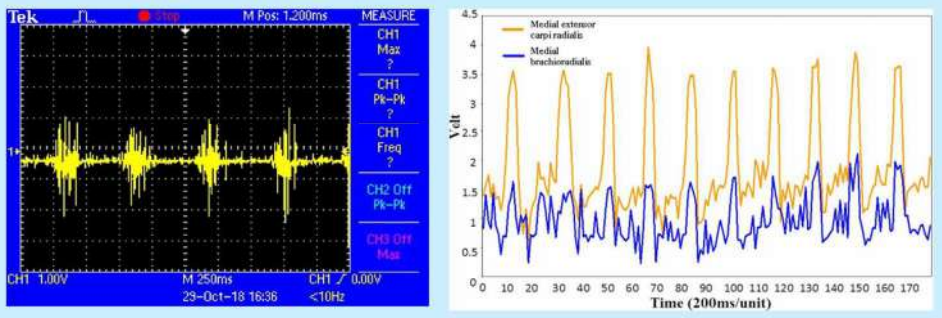

Fig. 3 sEMG and force sensitive resistor's results based on hand grasping activity

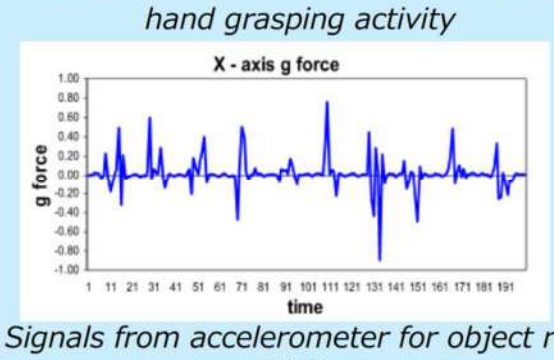

Fig. 4 Signals from accelerometer for object reaching activity

In order to successfully validate the signals, a set of validation indicators was calculated. Each indicator was selected based on a different criterion. Spearman's correlation: assesses the monotonic relationship of two variables. It can move between −1 and 1, 1 when signals are identical and −1 when signals are fully opposed an Energy ratio: compares the amount of energy step by step, testing if the sEMG waves have the same shape.

Conclusion and Future Scope

As health care services are important part of our society, automating these services lessen the burden on humans and eases the measuring process. Also the transparency of this system helps patients to trust it. The device could be used for high intensity repetitive task without the presence of therapist which has potential to adopt a home based therapy. The objective of developing of this systems is to reduce health care costs by reducing physician office visits, hospitalizations and rehabilitation testing procedure.

13th European Exhibition of Creativity and Innovation

SMART DEVICE FOR INDOOR AIR QUALITY MONITORING IN HOSPITAL UNITS

Fuior Robert, Andriţoi Doru, Luca Cătălina, Corciovă Călin
University of Medicine and Pharmacy "Grigore T. Popa" Iasi, Faculty of Medical Bioengineering

INTRODUCTION

In the context of widespread transmission of the SARS Cov2 virus, isolation policies have become the norm. The hospitalization of critically affected patients, in isolation units, requires remote monitoring of patient and environmental parameters. Also, certain dangerous situations can be noticed by releasing a large amount of oxygen in the rooms, which can become catastrophic. As oxygen is a flammable gas, so it maintains combustion, it can become a real danger, when sources appear nearby to contribute to the triggering of an unpredictable event. Air quality could have an influence on the well-being of the patient. The purpose of this project was to develop an intelligent monitoring system of the oxygen levels, temperature and humidity in the isolations units of the Covid19 patients. The proposed system wants to bring an improvement of the O2 concentration monitoring in the salons, respectively in the ATI sections. It is composed of an Arduino Nano development platform that represents the central core of the system to which is attached a set of sensors for Oxygen, temperature and humidity. Since the monitoring data will be stored on an SD card where you can view the history of all recorded data, and the alarm part will be done in two steps, one in which an automatic message will be sent to the default phone number when the value the concentration in the room is exceeded and an acoustic one through a buzzer. For the display part, it was decided to choose a small OLED .

A. SYSTEM ARCHITECTURE

In the context of widespread transmission of the SARS Cov2 virus, isolation policies have become the norm. The key public healthcare interventions to limit the intra-community spread of the SARS-Cov2 virus are isolation and quarantine of close contacts. Among the critically ill about 65% require intensive care and associated mechanical ventilation.

The monitoring of environmental parameters can be part of an integrated care system aimed at reducing adverse events for the patient. Improper handling of the oxygen delivery systems associated with electrical faults can lead to adverse events (burns, explosions) which could seriously affect patient safety. The monitoring of indoor oxygen levels could be serve as a warning system for the possible error of oxygen leakage.

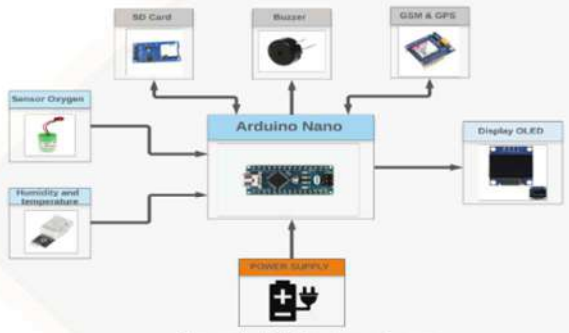

Figure 1. Arhitecture diagram

B. DESIGN METOHODOLOGY

1. OXYGEN SENSOR:

The oxygen sensor was used for determinig oxigen levels in the isolation units for recovering post-covid 19 patients which require special care. The sensor has an electrochemical cell which detects indoor oxygen levels.

Figure 2. Oxygen sensor

2. TEMPERATURE SENSOR:

The DHT22 sensor is a small, inexpensive and handy humidity and temperature sensor. Use a capacitive mois-ture sensor and a thermistor to measure ambient air and body surface. It can be placed in the upper limbs, but also in the heart area. It provides a digital signal on the D2 data pin.

Figure 3. Temperature & humidity

3. ARDUINO NANO:

The Arduino Nano development board contains a microcontroller that operates at a supply voltage between 3.3-5.5V. It contains 16 external input and output ports, 6 PWM ports.

Figure 4. Arduino NANO

4. DISPLAY OLED:

For the display of information from the sensors a new techology OLED display was incorporated, which has a low energy consumption for a 128x64 resolution.

Figure 5. Display OLED

5. SD & GSM MODULE:

The SD shield is powered by a 5V power supply and also has a set of ports through which the connection between the module and the Arduino development platform is made. The GSM module transmission of emergency messages to the dedicated service is done automatically when the entire system will detect that the degree of oxygen concentration is above the allowable limit

Figure 6. GSM & SD module

C. CONCLUSION AND FUTURE SCOPE

The device proposed could be implemented in a system that improves patient safety in the intensive care units or isolation units of patients using oxygen ventilation systems for the prevention of adverse events.

The advantage of this device stems from the capacity to detect changes in real time and to send warning signals to healthcare personnel in case of exceeding indor oxygen levels.

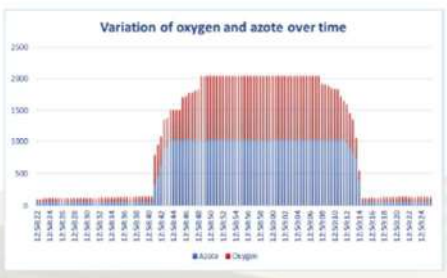

Figure 7. Variation of oxygen and azote

NEW METHOD APPLIED FOR THE OBTAINING OF FUMARIC ACID

Lenuța Kloetzer[1], Mădălina Poștaru[2], Dan Caşcaval[1], Anca Irina Galaction[2]

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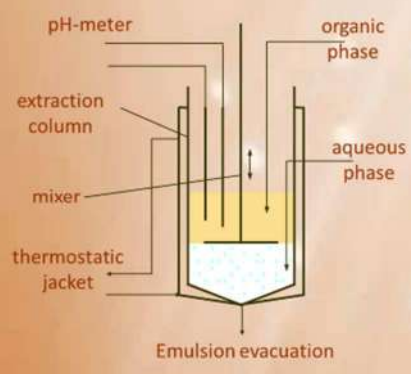
Fumaric acid, with chemical name trans-butenedioic acid, is an organic acid, intermediate in the citric acid cycle, being widely found in nature. Due to its excellent properties, fumaric acid has applications in various domains, being used in food and farming industry, resin industry, pharmaceutical, and biomedical field (fumaric acid esters are involved in formulation of drugs used for treatment of psoriasis, drug delivery system).

Fumaric acid is produced via chemical conversion of maleic anhydride, but this process involves the use of petrochemical substrates which are non-renewable resources and there is an increasing concern over sustainability. Thus, biotechnological route for production of fumaric acid has been studied using fungi from *Rhizopus* especially *R. nigricans*, *R. arrhizus* and *R. oryzae* species.

Extraction column equipment



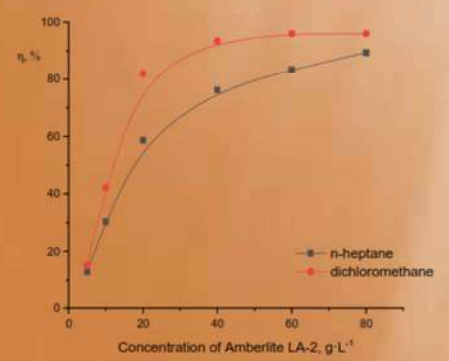
The aim of this study was to recover fumaric acid from aqueous solutions by a non-conventional method of separation, namely ***reactive extraction***.

The experiments have been carried out using an extraction column with vibratory mixing, which offers high interfacial area and the possibility to reach rapidly the equilibrium state.

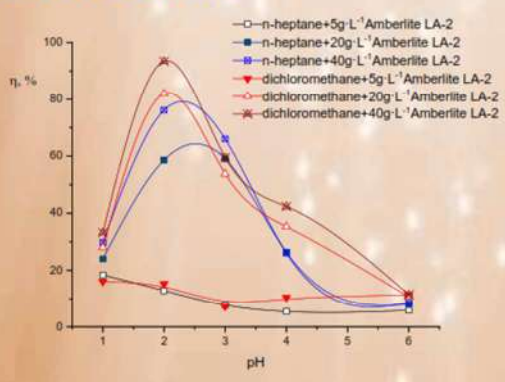
- the initial concentration of fumaric acid in aqueous solution was 5 $g \cdot L^{-1}$, pH between 1 and 8
- the extractant, Amberlite LA-2, concentration varied between 5 and 80 $g \cdot L^{-1}$
- solvents: dichloromethane, n-heptane the phase modifier, 1-octanol , was dissolved in each solvent with a volumetric fraction of 0.10
- HPLC determinations of acid concentration

Results

Reactive extraction without 1-octanol



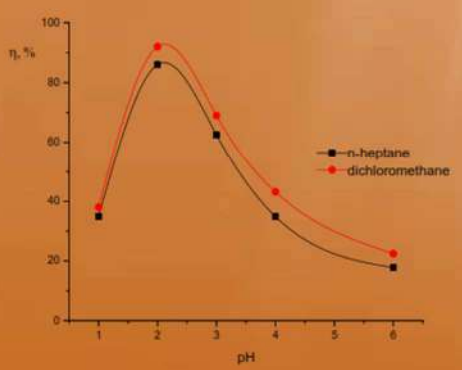
Influence of the Amberlite LA-2 concentration on the reactive extraction efficiency of fumaric acid without 1-octanol in the organic phase



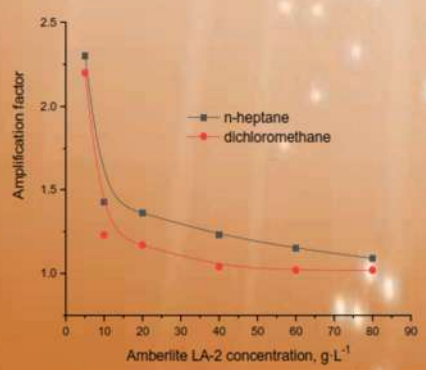
Influence of pH of aqueous phase on efficiency of fumaric acid reactive extraction without 1-octanol in the organic phase

Extractant	Solvent	Extraction constant	Value
Amberlite LA-2	n-heptane	$K_E = \frac{[FA(COOH)_2 \cdot Q_{2(o)}]}{[FA(COOH)_{2(aq)}] \cdot [Q_{(o)}]^2}$	$1.31 \cdot 10^3$ ($L^2 mol^{-2}$)
	dichloromethane	$K_E = \frac{[FA(COOH)_2 \cdot Q_{(o)}]}{[FA(COOH)_{2(aq)}] \cdot [Q_{(o)}]}$	$1.89 \cdot 10^2$ ($L\,mol^{-1}$)
	n-heptane + 10 vol. % 1-octanol	$K_E = \frac{[FA(COOH)_2 \cdot Q_{(o)}]}{[FA(COOH)_{2(aq)}] \cdot [Q_{(o)}]}$	$1.85 \cdot 10^2$ ($L\,mol^{-1}$)
	Dichloromethane + 10 vol. % 1-octanol	$K_E = \frac{[FA(COOH)_2 \cdot Q_{(o)}]}{[FA(COOH)_{2(aq)}] \cdot [Q_{(o)}]}$	$2.55 \cdot 10^2$ ($L\,mol^{-1}$)

Reactive extraction with 1-octanol



Influence of the pH of the aqueous phase on the efficiency of the reactive extraction of fumaric acid in presence of 10 vol. % 1-octanol (Amberlite LA-2 concentration = 20 g·L-1)



Influence of the Amberlite LA-2 concentration the amplification factor for the reactive extraction of fumaric acid (pH = 2, 1-octanol volumetric fraction = 0.1)

- In the extraction systems without 1-octanol, the reduction of the polarity of the organic phase promotes the formation of amine adducts and the modification of the interfacial equilibrium expression.
- For all studied systems, the addition of 1-octanol into the solvent phase led to the improvement of extraction efficiency, the most important effect being recorded for the solvent with the lowest polarity (n-heptane) the extraction degree being 86 % compared to 58 % without 1-octanol.

NON-CONVENTIONAL METHOD FOR SELECTIVE SEPARATION OF 2-KETOGLUCONIC ACID

Alexandra Cristina Blaga[1], Mădălina Poștaru[2], Dan Caşcaval[1], Anca Irina Galaction[2]

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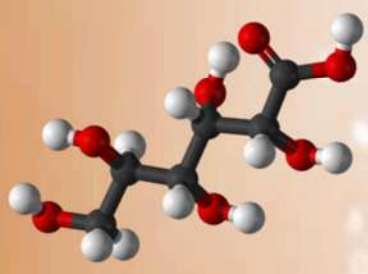
[2]"Grigore T. Popa" University of Medicine and Pharmacy of Iasi, Faculty of Medical Bioengineering, Dept. of Biomedical Sciences, M. Kogălniceanu 9-13, 700454 Iasi, Romania; e-mail: anca.galaction@bioinginerie.ro

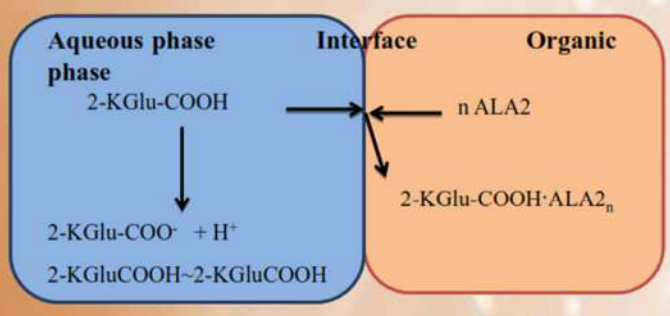


2-Keto-D-gluconic acid (2KGA) is a mild organic acid with multiple applications in food, cosmetic and pharmaceutic industries. This compound is produced over 40,000 tons/year due to its wide use as food antioxidant, its properties to maintain food color, flavors and aroma, and its ability to block the formation of ammonium nitrite (carcinogenic) during food processing.

Various bacterial strains are used for its production from glucose or starch hydrolysates: *Gluconobacter*, *Preudomonas*, *Pseudogluconobacter*, *Artrobacter*, *Serratia*, *Erwinia spp.*, but 2KGA is also a byproduct in the vitamin C production by biotechnological process using two stages and mixed cultures.

The downstream purification process for 2 KGA involves several steps, being associated with high energy consumption, releasing high amount of wastewater and demanding relatively high manpower.

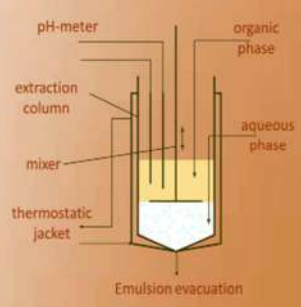
The aim of this study was to separate high purity 2- ketogluconic acid by a clean, energy efficient and economical method – ***reactive extraction***.



Materials and method

- Extraction column equipment
- 2KGA initial concentration was 1 g/L
- Amberlite LA-2 concentration varied between 0 and 120 g/l
- pH value of the aqueous phase varied between 1 and 6
- pH value of the stripping phase was 12

Extraction column equipment



Results

Extraction efficiency

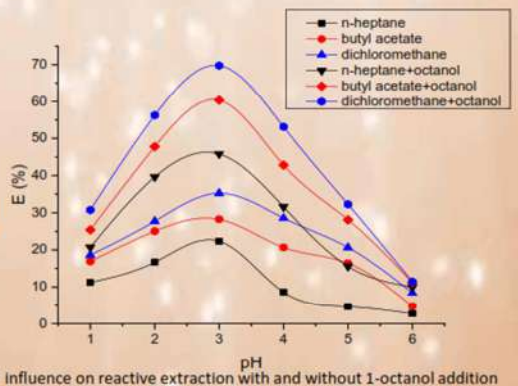
$$E = \left(\frac{C_0 - C}{C_0}\right) \cdot 100, \%$$

Amplification factor

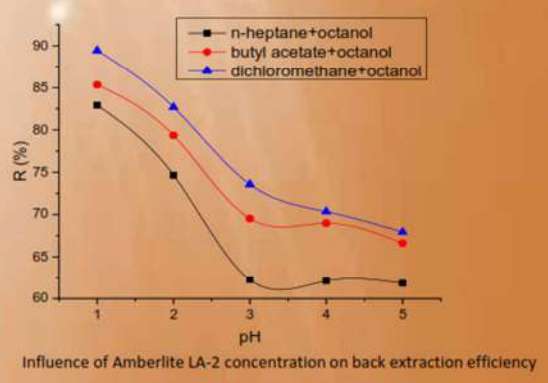
$$F = \frac{E_{oct}}{E}$$

The amplification factors values corresponding to 1-octanol addition

Solvent/pH	1	2	3	4	5	6
n-Heptane	1.84	2.38	2.49	3.68	3.38	3.72
Butyl acetate	1.5	1.19	2.35	2.07	1.71	2.38
Dichloromethane	1.35	2.03	1.98	1.86	1.56	1.38

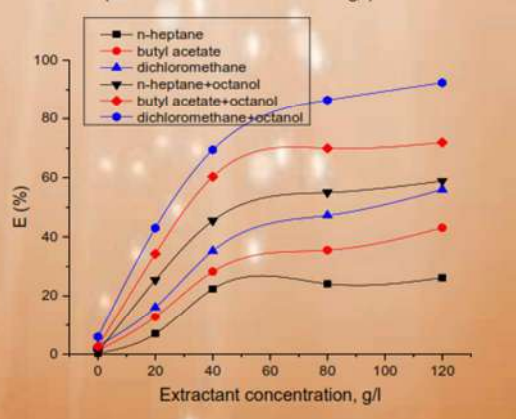


pH influence on reactive extraction with and without 1-octanol addition (Amberlite LA-2 concentration 40 g/l)

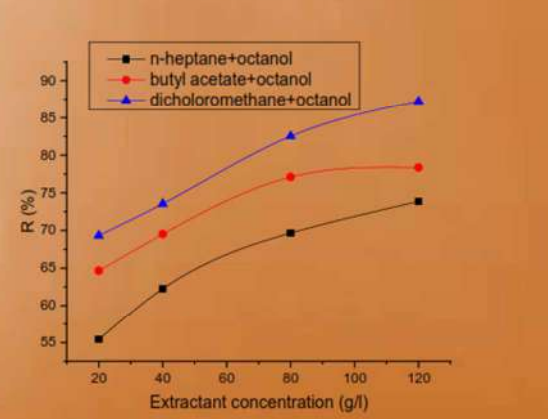


Influence of Amberlite LA-2 concentration on back extraction efficiency

- The highest extraction yield and distribution coefficient are achieved for pH value of 3 and 120 g/l extractant, for all the studied solvents. The reactive extraction is based on H bond formation between the 2-ketogluconic acid and Amberlite LA-2.
- The addition of 1-octanol as polar modifier strongly increased the extraction efficiency for all solvents, with biggest values for the inactive organic solvent with the lowest dielectric constant (n-heptane).



Influence of Amberlite LA-2 concentration on reactive extraction with and without 1-octanol addition (pH = 3)



Influence of initial phase pH on back extraction efficiency

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SARS-COV2 INFECTION DETECTION DEVICE FOR HIGH-RISK WORKERS

Petrescu Paul-Costin, Corciovă Călin, Stihi Andreea, Fuior Robert, Parfeni Cristian

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INTRODUCTION

Over the past two decades, mankind has witnessed several outbreaks of infectious diseases, which have revealed a high rate of spread. Currently, there is growing concern about the continued spread of the SARS-Cov-2 pandemic in some parts of the world and the challenge is the maintaining a low rate of spreading to others.

Protective measures are needed to prevent the biological danger to which health workers are exposed. The use of disinfectants and monitoring of vital functions are key measures to reduce the spread of the virus. These practices will help prevent the spread, especially of asymptomatic transmission of the virus.

SYSTEM ARCHITECTURE

The project aims to help workers at high risk of biological danger who are exposed daily by monitoring and implementing protection measures. The complete system contains an hardware interface and a graphical user interface for user interaction and for the display of measured parameters. Electronic hardware interface consists a microcontroller, a moisture sensor, a peristaltic pump, LCD, and a health sensor platform. The health sensor module is developed from Maxim Integrated who capture biosignals and it's configured to communicate with the software applications on PC and Android systems. The MAXREFDES100 contains pulse sensor, oximetry sensor, a barometric pressure sensor, a Bluetooth low energy(BLE) and pinouts for ECG measurement. Signal which came from the moisture sensor is processed by the Arduino Mega, which communicates with the LCD shield placed above the microcontroller. Also, microcontroller commands the peristaltic pump after the application, either on PC or Android is receiving a signal from user.

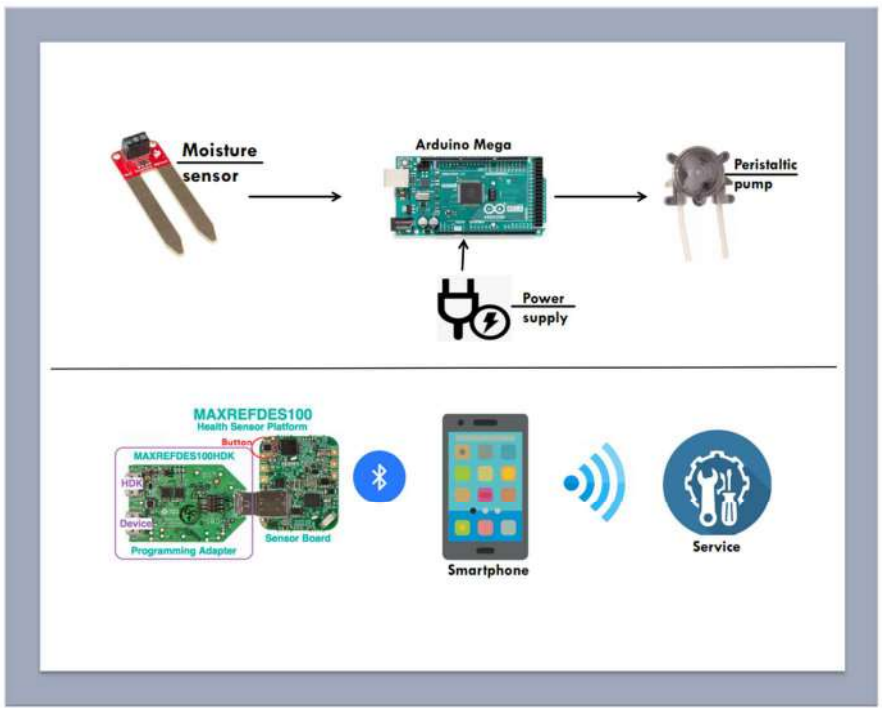

Figure 1. Architecture design of the system

ELECTRONIC HARDWARE AND GRAPHICAL USER INTERFACE

The central element of the system is represented by Arduino Mega which is based on microprocessor ATMega2560. It offers a fast processing information, enough I/O ports for further development and enough memory.

This product's key features include a high-performance 8-bit processor, low power, 256 KB ISP flash memory, 86 I/O ports of which 16 PWM ports, 4 USARTs. It also include 16-channel 10-bit A/D converter and a JTAG interface for on-chip debugging. The microcontroller achieves a throughput of 16 MIPS at 16 MHz and operates between 4.5 – 5.5 V.

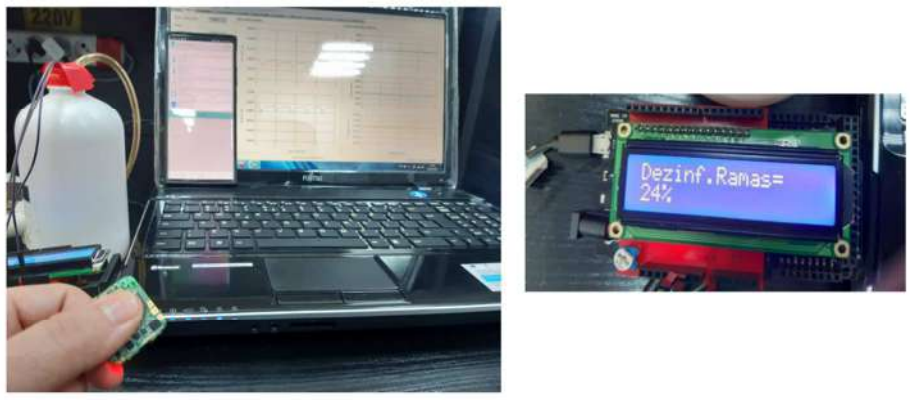

Figure 2. An overview for the practical implementation of the system

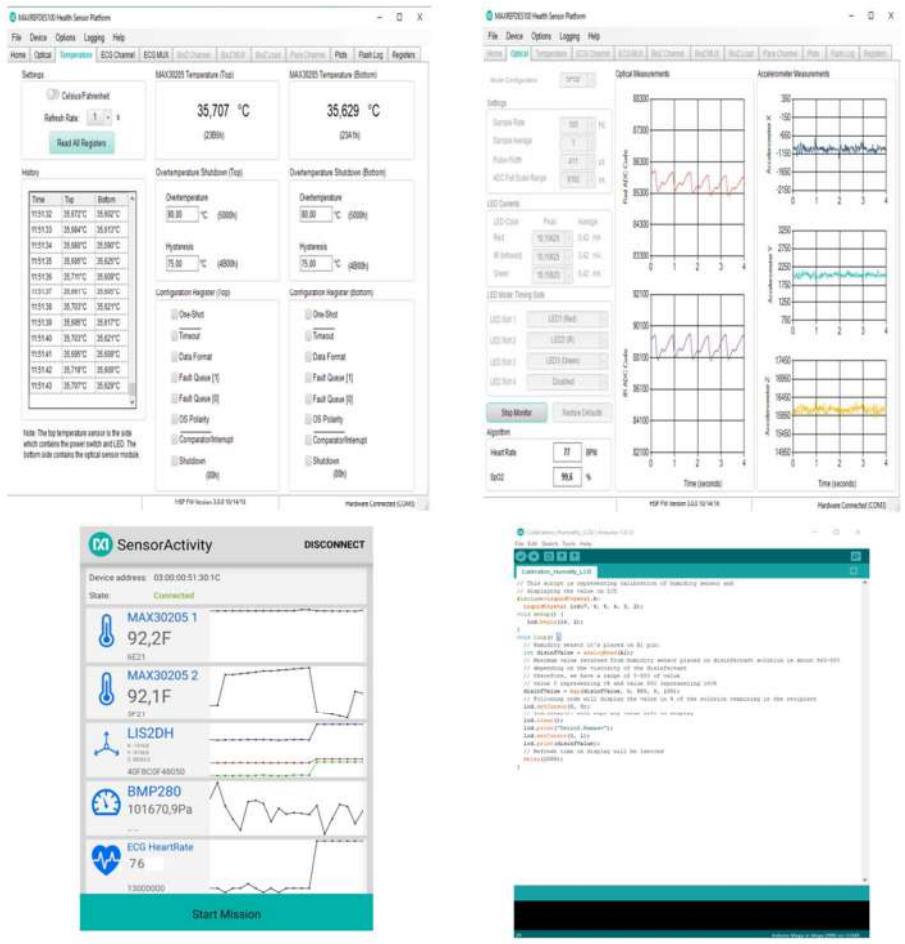

Figure 3. Software application implementation for PC and Android. Calibration of humidity sensor and displaying on LCD

CONCLUSION AND FUTURE SCOPE

System was projected for daily use to manage the protection of the important measures of stopping spreading the viral infections. Also the transparency of this system helps patients to trust it. The system could be used by any high-risk workers for a long time within a strong collaboration with the service department. The direct communication between service and system it's possible to be made with the help of the Wi-Fi function of the Android device. The efficiency can be increased by collaboration multidisciplinary teams in the field: medicine, engineering, software and hardware.

GRIGORE T. POPA UNIVERSITY OF MEDICINE AND PHARMACY IASI

Intelligent orthosis in the correction of postural defects

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This study aims to present the technical data of an intelligent orthosis designed to correct vicious positions. Also in the study were performed in vitro and in vivo testing of intelligent dynamic orthosis that can detect postural changes in the variation of the curvature of the spine. This orthosis is intended for use in the prevention of postural injuries and in guiding patients to maintain a correct posture of the spine during daily activities. At this time, the existence of an intelligent orthosis in the prevention of postural defects would lead to an improvement in health among the population. Also, this prosthesis would crown the work of physiotherapists by maintaining the results obtained.

INNOVATION: It is the first device designed specifically to relieve colic pain in the newborn that is based on the thermal effect. It is a very easy to use system that respects the sterilization nobles that are imposed on its applicability to newborns.

The orthosis designed in our laboratory can be used for a complete monitoring of the vertebral curvature because we used inertial sensors and Flex type sensors. By permanently determining the variation of the curves of the spine, we can also provide real-time feedback to the patient. The block diagram of the smart orthosis proposed by us includes: Flex sensors, inertial sensors, a GPS / GSM module, Bluetooth module which are all controlled by an Arduino Mega 2560 central unit

Tests have shown that the intelligent orthosis is able to monitor the curvature of the spine when the patient changes position. In order to be able to adjust to the highest parameters and to become a medical device adaptable to any type of patient, in vivo tests must continue and include as diverse pathologies as possible. All patients included in the study stated that they also noticed an improvement in the quality of life and from a psycho-emotional point of view as a result of wearing this smart orthosis.

ADVANTAGES:

- Low cost of production
- Simply to use
- Innovative design and
- This system gives comfort, accessibility and security

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UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE GRIGORE T. POPA IAȘI

THE IMPORTANCE OF A MULTIDISCIPLINARY APPROACH TO IMPROVE THE LIFE QUALITY FOR PATIENTS WITH PARKINSON'S DISEASE

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Introduction

Parkinson's disease is defined as a complex degenerative neurological disease with progressive evolution, which is part of motor system of the brain disorders, being the second degenerative disease as a frequency after Alzheimer's disease. It is characterized by tremor when muscles are at rest (rest tremor), increased muscle tone (stiffness), slow voluntary movements and difficulty maintaining balance (postural instability).

➢ Occupational therapy helps Parkinson's patients improve their ability to perform daily tasks. The intervention consists in assisting patients in developing a self-care routine, taking into account the limitations of functional mobility, encouraging patients to maintain maximum function of daily activities for as long as possible, learning adaptive techniques to reduce tremor.

Materials and method

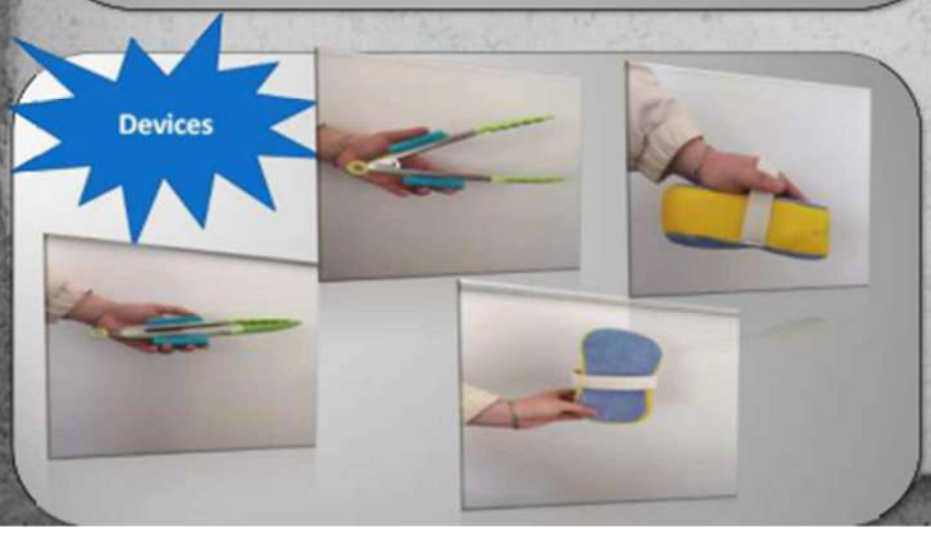
➢The devices used for this purpose are commercially available but they are quite expensive, which is why we wanted to make devices made of material as cheap and affordable as possible.

➢ Some of the devices can be successfully made of material that every person has in their home. We also took into account the variant of making them without the need to use complicated tools and devices that are not available to patients.

➢Starting from these premises, we thought and made in our occupational therapy laboratory various devices designed to offer patients a variety of techniques and exercises and also a flexible work environment.

➢ We also manufactured a device designed to help patients with household chores such as dish washing.

➢ The device is provided at one end with a washing sponge, its handle being a detergent tank. The size and shape have been adapted to the needs of patients with Parkinson's disease.



Results and discussions

➢ This project stimulated creativity and developed the students' craftsmanship for making assistive devices to recover the deficits presented by patients. These devices must be varied, not boring, but especially not expensive. (The price of the plates made by students is much lower than those of the trade)

Conclusions

➢ Using the devices made during the physiotherapy sessions, significant improvements of the life quality for patients with Parkinson's disease were observed.

The use of the sensory carpet as an integrated part in occupational therapy in children with hypersensitivity

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Introduction

The literature defines hypersensitivity, or sensory processing sensitivity (SPS) as an innate / congenital trait characterized by an increased sensitivity of the central nervous system, so a more detailed processing of external and internal stimuli. The incidence of SPS worldwide is 15% -20%.

Occupational therapy, the branch of medical recovery, which started from the idea of incorporating / combining different activities in the field of work, but also various recreational activities with the objectives of medical recovery lead to an increase in motivation from the patient. The use of various activities such as browsing books, cutting paper and cutting paper in a shorten shape, making paper balls, making toys and handmade objects, making lego-type constructions, sewing, braiding, plasticized modeling and clay proved to be effective in this without.

The integration of the sensory carpet in the recovery program helps to: increase the child's ability to communicate with the world around him by improving sensory discrimination; works on the tactile and poprioceptive senses, maturing and improving motor activity; the spatio-temporal development is more and more present, the child can discriminate the place where people and objects are, as well as the place where he is in relation to them; causes joy and good mood when meeting a different material, what a different composition and structure.

Materials and method

The sensory carpet was built of nine pieces with a base made of Ethyle Vinyl Acetate (EVA).

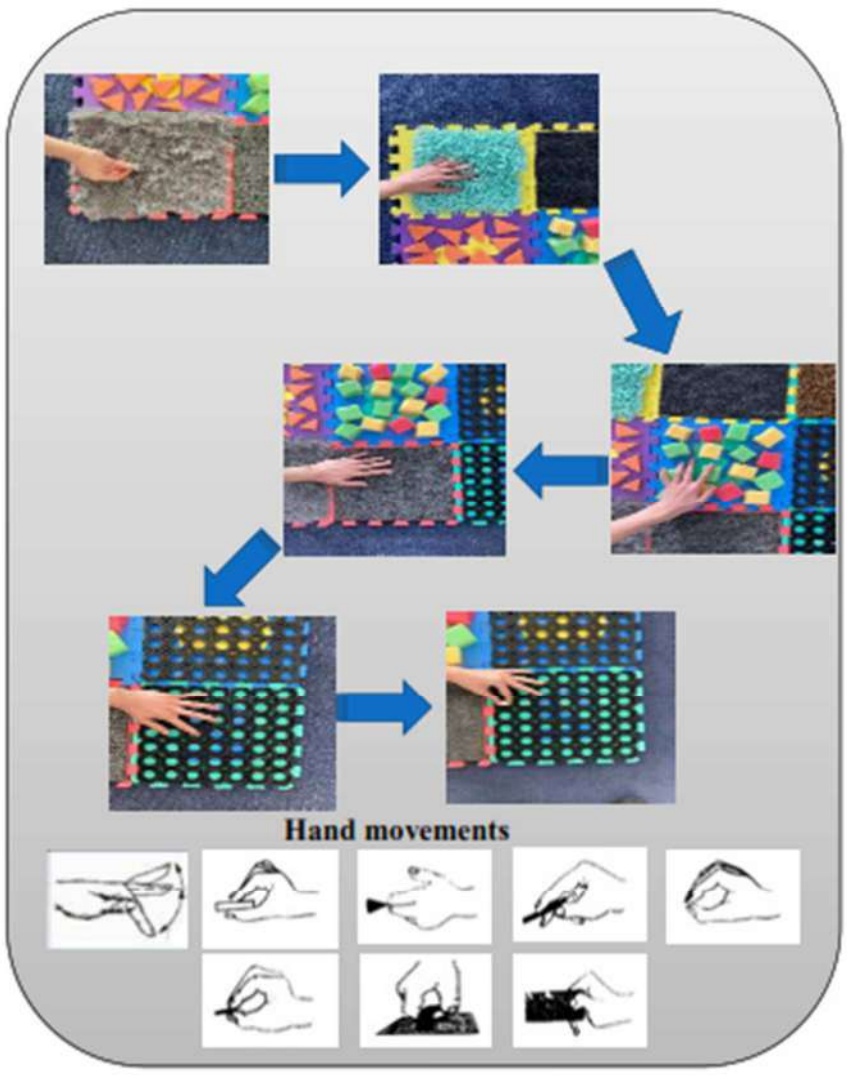
Each piece is different without deviating from the kinetic principle - from simple to complex, so the child starts from a simple material, such as wool and will end up with a much more complex like hard synthetic fiber. When the sensory carpet consists of large puzzle pieces (over 1 meter) it is used for sensory rehabilitation of the feet, and when the puzzle pieces are small (less than 1 meter) it is used for sensory rehabilitation of the hand. .

The nine pieces used in the sensory carpet presented are made up of:

1. wool imitation material designed to provide a pleasant touch sensation;
2. microfiber material pleasant to the touch, but at the same time having a different consistency from the first material;
3. EVA material that offers a fine feeling to the touch, but due to the material the friction force is high;
4. sponge type material, made of a special foam, offers the optimal transition from a fine touch material to abrasive surfaces;
5. three carpeted material with curly thread, on a real felt support, with a characteristic of rare thread (the carpet is finer to the touch), medium (increases the degree of sensitivity to touch, the carpet being rougher) and often (the degree to the touch being very high, the carpet being very rough);
6. two rubber pieces with different striations, stimulating the child's proprioception in terms of adhesion, striation, composition, structure, etc.

The pieces of the carpet come together like a puzzle, so that depending on the progressiveness, different pieces can change so that the child's sensitivity is permanently stimulated.

Device and movements



Hand movements

Results and discussions

The sensory carpet used in the recovery of children with SPS brings a plus quality in the kinetotherapeutic programs as well as in the occupational therapy and occupational therapy programs destined for this syndrome.

Recovery through the sensory carpet is done in a pleasant atmosphere and full of fun due to the movements and activities that must be done through the sensory carpet.

Conclusions

By integrating the sensory carpet in the kinetic sessions, we can decrease the time allocated to each recovery goal, automatically leading to a decrease in the actual recovery time, while maintaining the child's motivation and interest in the recovery process.

Purchasing / making a sensory mat can be done at a fairly low cost, bringing an extra quality to the recovery treatment of children with SPS, reducing the time required to recover the child.

Combining several pieces and dressing an entire room can turn that place into a sensory room, which can also be used to re-educate gait sensitivity.

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cost
EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

Anthropometric study for morphology of the nose – tools for facial reconstruction in Romanian population I: nose width

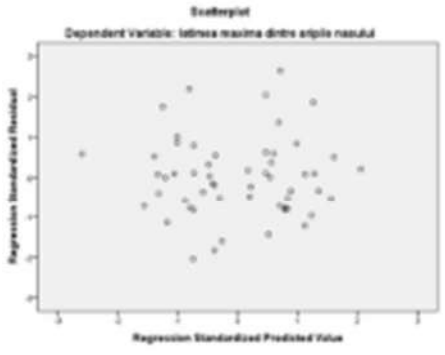
CA 16101 – MULTI-modal Imaging of FOREnsic SciEnce Evidence – tools for Forensic Science

Introduction
Craniofacial reconstruction represents a final step in medico-legal identification procedures and may facilitate forensic identification. Reconstruction of human faces on skeletal remains is dependent on the facial tissue thickness measurements and feature shape estimation. The nose and the lips are, almost certainly, two components of the face that are very important in the facial reconstruction. In recent years, there are many studies regarding the correlation between the hard tissue and the soft tissue, which have looked closely at this relationship. A series of regression formulas were developed in light of such research. In spite of this, there is no information on the particularities of facial soft tissue of the Romanian adult population.

Objective
The aim of this study is to create a reliable and readily reproducible method of predicting the nasal morphology; in this case the maximum width of the nose based on the maximum nasal aperture width for Romanian adult population.

Material and methods
A sample of 55 CT scans consisting of Romanian adult subjects was selected from a database of a Neurosurgical hospital. These were operated visualised in In Vesalius exported as 3D surfaces order for the facial reconstruction to be undertaken using 3D Systems Freeform Modelling Plus Software at FaceLab, Liverpool John Moores University, UK. The software was used to take craniometrics measurements on the 3D models. The craniometrics measurements consisted of a first measure of maximum nasal aperture width and second measure of the maximum nose width.

Results and Conclusions
Correlations analysis indicated a significant moderate link between the maximum width of the nasal opening and the maximum width of the nose [r (53) = 0.462, p < 0.001]. Also, the partial correlation between the maximum width of the nasal opening and the maximum width of the nose was analyzed, by controlling the sex of the participants. The results indicate a significant moderate link between the maximum width of the nasal opening and the maximum width of the nose, by controlling the sex of the participants [r(52) = 0.405, p = 0.002 < 0.05].
Regression analysis showed that the maximum width of the nasal opening and sex form a statistically significant regression pattern [F (2, 52) = 13.39 p < 0.001]. Next, the analysis of the predictors that contribute to the efficiency of the model was performed. In the predictive model, the most important predictor of maximum nose width is the maximum width of the nasal opening (β = 0.371, p = 0.002 < 0.05), followed by the sex of the participants (β = 0.367, p = 0.003 < 0.05).
Regression equation: maximum width of the nose = 18.22 + 0.813*maximum width of the nasal opening + 3.115*sex. Male is represented by code 1 and female by code 0. All conditions of a multiple linear regression are met.



Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	36.949	.777		47.539	.000
	Sex	3.894	1.035	.459	3.761	.000
2	(Constant)	18.220	5.915		3.080	.003
	Sex	3.115	.986	.367	3.158	.003
	latimea max a aperturii nazale	.813	.255	.371	3.190	.002

a. Dependent Variable: latimea maxima dintre aripile nasului

The preliminary results obtained are impressive. The equation gives very small error – close to zero, demonstrating that the method provides reliable predictions of maximum nose width for facial reconstruction based on maximum nasal aperture width measured on a skull.

Funded by the Horizon 2020 Framework Programme of the European Union

Romanian Inventors Forum | "Dr. Iacob Czihac" Military Emergency Clinical Hospital | Faculty of Medical Bioengineering

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Romania, 20-22 May 2021

LOW-COST DEVICE FOR EARLY DETECTION OF TOXIC GAS LEAKS IN THE PROTECTIVE MASK

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INTRODUCTION AND OBJECTIVES

The research refers to a protection device against dangerous gas poisoning experimentally implemented in an M74 type gas mask with a role in protecting the person who uses it. These masks are used by personnel from industry, the army, agriculture, mines, the categories of personnel who respond first in case of emergency or disaster and wherever air contamination is a possible threat. A dangerous gas for firefighters is carbon monoxide (CO) whose physico-chemical properties make it very difficult to detect through the human senses, being odorless, colorless and tasteless.

Accidental inhalation of this gas may cause tissue hypoxia leading to a number of symptoms such as headache, nausea, vomiting, chest pain, weakness, blurred vision, dizziness, muscle aches and slight confusion, dyspnea, hypotension, cardiac arrest, respiratory arrest.

Given all these negative effects, we set out to develop a low-cost assistance tool to monitor the presence of CO in the air to be inhaled by the gas mask user.

MATERIALS AND METHODS

A device has been designed and developed consisting of a microcontroller (A), a sensor (B) for measuring the concentration of carbon monoxide in the respiratory air, a series of electronic components (C, D) capable of emitting signals (acoustic, visual) in order to generate a safe feedback to the user (Figure 1).

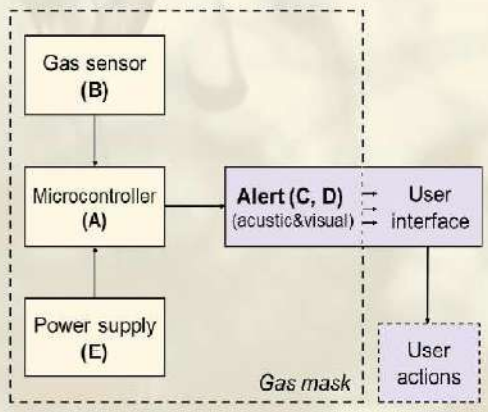

Fig. 1 – The block diagram of the device

Fig. 2 – Prototype of the device

The classic M74 mask (Figure 2) has been transformed into a smart mask capable of filtering inspiratory air, but also of constantly monitoring the CO concentration.

Upon detection of the presence of CO inside the mask, the system generates audible and visual alarms to the user to take the necessary measures in order to eliminate the danger.

RESULTS AND DISCUSSION

To test the functionality of the assistive device, carbon monoxide leaks were simulated inside the mask. Through a tube that made the connection between the mask enclosure and the external environment, different volumes of carbon monoxide (CO) were introduced to determine the effectiveness of the instrument in the accidental leakage of dangerous gas inside the mask. The volumes of gas introduced were 10, 20, 30, 40 and 50 ml, at a constant concentration of CO.

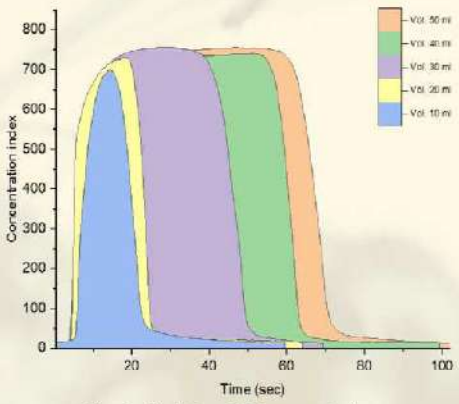

Fig. 3 – Variation of CO concentration over time inside the mask

The time required to decrease the CO concentration was measured, depending on the concentration index measured by the assistive instrument (Figure 3). In the event of a real leak, there is a high risk that the user will be prone to inhalation of the odorless toxic gas, which will be exposed for a period of time proportional to the volume of carbon monoxide leakage.

CONCLUSIONS

The test showed that early detection and alarming of the presence of carbon monoxide in the air reduces exposure to toxic gas and saves time for the mask user to ensure safety measures, to avoid incidents and eliminate the risks of compromising health and mission.

Such a portable device can be a variant of intelligent improvement of the classic gas masks that are currently used, in order to increase the safety of rescuers exposed to dangers.

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A fiber glass reinforced composite for CAD CAM aplications in dentistry

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Introduction

In the last three decades, exciting new developments in dental materials and computer science have led to the success of contemporary dental computer-aided design - computer-aided manufacturing (CAD-CAM) technology. Each year, new materials appear with improved properties and qualities.

The **objective** of the work was to develop a new cad cam milling material using fiber glass reinforced composite.

Figure 1. CAD-CAM restorative materials

Materials and method

A selection of 2 different types of resins (R1 composed from 25%Bis-GMA, 40%UEDMA, 35%DMTEG and R2 composed from 65%Bis-GMA, 35% DMTEG) with 2 different types of hybrid filler (F1 with 42% quartz, 42% radiopaque glass and 16% hydroxyapatite and F2 with 90% quartz and 10% colloidal silica) and 3 different types of E type fiber glass geometries (veil 30g/m2, twill 163g/m2 and stratimat 300g/m2) in 4, 6, 8 and 10 layers were used in this in vitro study. Inside of a silicon cube of 1 cm side, layers of resin and fiber glass were placed one above another. After each layer a light curing process of 10 seconds was done in 5 different points. 2 mm thick samples were cut with a precision saw (Isomet 1000, Buehler, USA) and investigated with SEM and Raman spectroscopy. Data were analyzed with dedicated software.

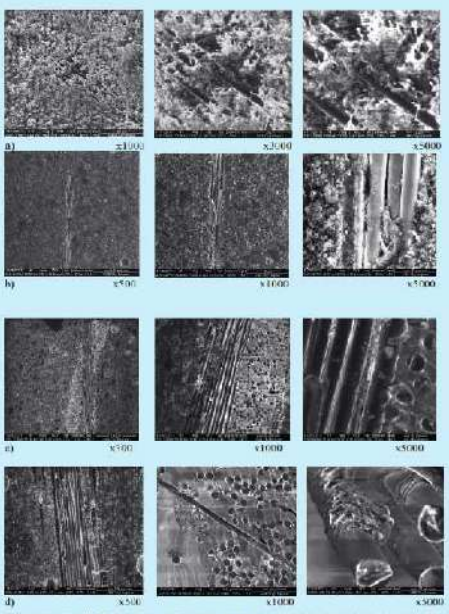

Figure 2. SEM images of fiber glass reinforced composite a) FRC1; b) FRC2; c) FRC3; d) FRC4

The following studies were performed:

- Design of FRC components for applications in CAD / CAM technology
- Formulation of a series of resins / glass fibers / coupling agent
- Study of the polymerization mechanisms of particulate composites using various initiation systems
- Preparation of a series of FRC using fiberglass with different architectures
- Structural characterization of the obtained material, at nanometric level
- Studies on the cytotoxicity of FRC components and material
- Development of the experimental model of FRC material for the CAD / CAM processing
- Manufacture of experimental restorations from the tested FRC disks
- Testing the optical properties of FRC
- Validation of the system in laboratory conditions

Figure 3. Evolution of the homogeneity

Figure 4. Different E type fiber glass geometries

Type	Resin	Hybrid filling	Fiber glass geometry	Number of layers
FRC1	R1	U1	Veil	6
FRC2	R2	U2	Veil	10
FRC3	R2	U2	Twill	8
FRC4	R2	U2	Stratimat	4

Results

Raman analysis showed a powerful interaction between the polymer and the fiber glass. SEM data revealed that the different fiber glass geometries were well incorporated inside the resin, resulting an acceptable homogeneity. The invention relates to a composition of fiber glass reinforced composite material based on thermo-baro-photopolymerizable composite resin and fiber glass fabric type E in the form of a veil and / or Stratimat, being indicated for obtaining a material to be used for prosthetic restorations using CAD / CAM technology. The material has superior mechanical properties and corresponding radiopacity. The dental product is presented in the form of a composite disc reinforced with solid fiberglass, with a diameter of 98.5 mm and a height of 10 mm, dimensions specific to dental CAD/CAM technology.

Conclusions

Within the limitation of this study, it seems that it is possible to achieve a fiber glass reinforced composite for the use of CAD CAM technology. Further investigation must be done in order to test all the properties of the new material.

Key words: CAD CAM, composite, fiber glass

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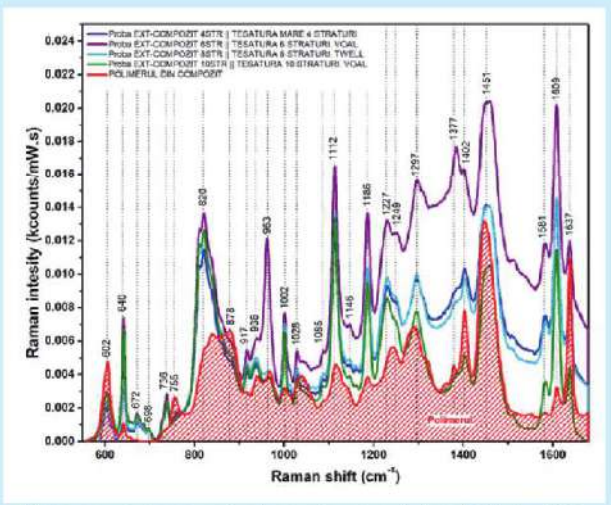

Figure 5. Raman spectra averages measured on the pure polymer, respectively on the 4 classes of FRC materials

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Natural antiplatelet agents based on *Allium cepa L.* extract used in primary cardiovascular prevention

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PRESENTATION

The present invention relates to the composition of the solid, lyophilized formulation, presented in encapsulated form, obtained on the basis of *Allium cepa L.* extract. The presented formulation is intended for primary cardiovascular prevention, **for the demonstrated antiplatelet effect**. According to this patent, the encapsulated formulation consists of a liquid extract obtained from the white variety of Allium cepa L stabilized with excipients to decrease the degree of hygroscopicity and increase the stability in lyophilized form.

THE NOVELTY ACCORDING TO THE CURRENT PATENT - it is the composition of the product used in the antiplatelet effect, by obtaining a solid, lyophilized formulation, in encapsulated form, based on *Allium cepa L.* extract, with proven antiplatelet effect, used in primary cardiovascular prevention.

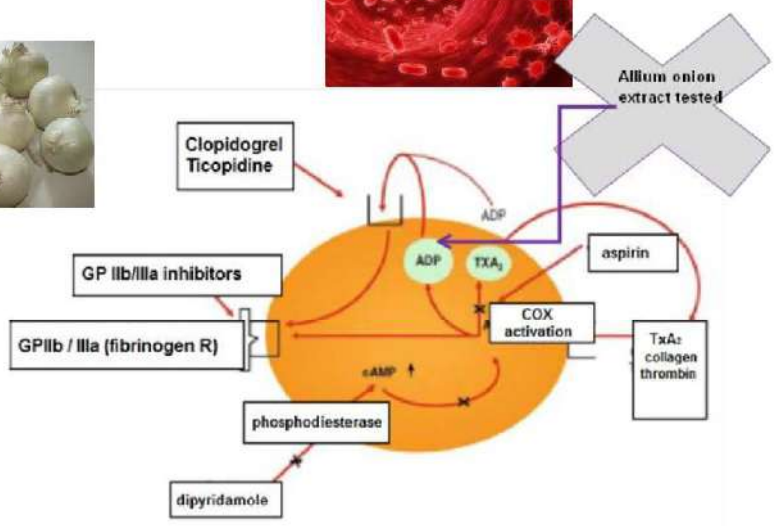
FIELDS OF USE

The obtained product from this patent is ideal for:

- **Primary prevention in patients with cardiovascular risk factors for atherothrombotic pathology;**
- **Primary prevention in the patient with intolerance / allergy to the synthetic antiplatelet agent;**
- **Primary prevention of atherothrombotic pathology in the elderly patient.**

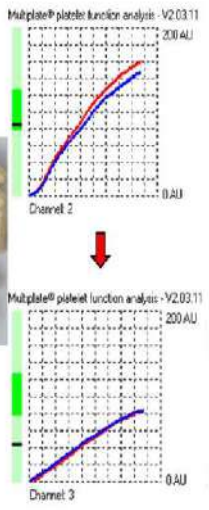
TECHNICAL CHARACTERISTICS

- Synthetic antiplatelet agents - among the most used drugs by the cardiologist.
- Numerous studies attesting - similar effect, exerted by extracts obtained from various varieties belonging to the family Alliaceae (Allium cepa, Allium sativum, Allium ampeloprasum) - they contain organosulfur compounds, with inhibitory effect on platelet aggregation, formed by S-alk lysis) il-L-cysteine sulfoxide under the action of the specific enzyme, aliinase.



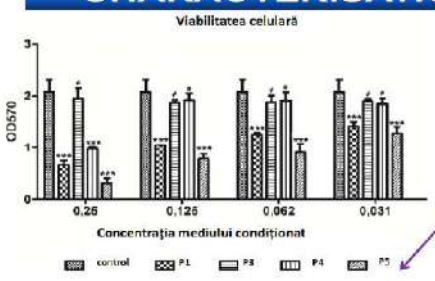
Mechanism of action of *Allium cepa L.* extract, at the level of platelet aggregation process

Obtaining the encapsulated formulation and demonstrating its antiplatelet effect by *in vivo*, prospective clinical study



DO NOT FORGET the real and viable alternative for many cases of cardiovascular disease

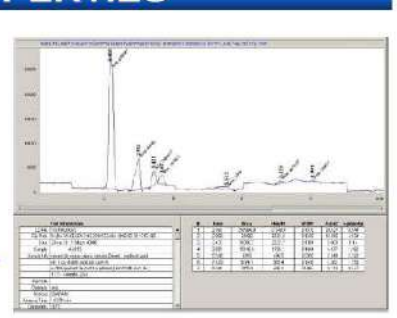
CHARACTERISATIONS and PROPERTIES

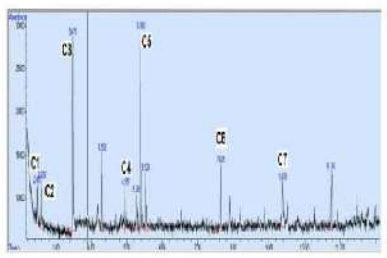


Effect on cell viability (cytotoxic)

Antibacterial effect

Antiplatelet effect





HPLC-MS and GC-MS chromatograms of a test sample

❖Advantages of use

Antiplatelet effect demonstrated;
Reduced side effects, being a compound based on natural extract;
High biocompatibility;
Low cost price.

❖Contraindications

Cardiovascular secondary prevention (no studies);
Known allergy / intolerance to the excipients used.

NEW

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SOLID PLASMONIC SUBSTRATE BASED ON SILVER NANOPARTICLES FOR SURFACE ENHANCED RAMAN SPECTROSCOPY

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The large-scale application of the SERS method in clinical practice implies reaching certain goals that are vital to achieve in order to implement the technique in routine diagnostics. These characteristics are: the robustness of the method, a low cost per sample and last but not least an easy to operate and translate workflow.

As part of this invention we present a simple procedure used to obtain solid substrates for SERS investigations. These substrates are capable of providing high intensity SERS signals from low molecular weight molecules found in biological liquids such as: plasma, serum, saliva, cellular lysates, without the need for a preliminary deproteinization step and at high reproducibility rates. The method is based on the self-assembly of highly concentrated and purified silver nanoparticles (obtained by reducing silver ions with hydroxylamine) on a Raman transparent CaF_2 glass slide. The colloidal solution used to prepare the substrates was obtained using the Leopold-Lendl method. Purification and concentration of the samples was performed by running the colloid through a tangential flow filtration device equipped with different sized porous filters (10-100 kDa).

The efficiency of the substrate was analyzed by performing measurements on reference molecules that posses good Raman cross-sections such as methylene blue and rhodamine 6G, and also on biological liquids such as plasma, serum, saliva, etc. We have observed a variation coefficient of the SERS signal below the 10% margin.

The spectra recorded using these substrates have been employed for early breast cancer detection by means of Multivariate Analysis of the spectra collected on blood samples.

Creation

Testing

Results

plasma

DNA

saliva

lysate cells

serum

Brest cancer detection:

Patient
Control

Principal Component 1

Sensitivity: 90%
Specificity: 89%
Accuracy: 89%

2021

METHOD FOR OBTAINING BIOCAPSULES FOR PHOTHERMAL APPLICATIONS IN HEPATOCARCINOMA THERAPY

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(54) **PROCEDEU DE OBŢINERE A UNOR BIOCAPSULE DESTINATE APLICAŢIILOR FOTOTERMALE IN TERAPIA HEPATOCARCINOMULUI**

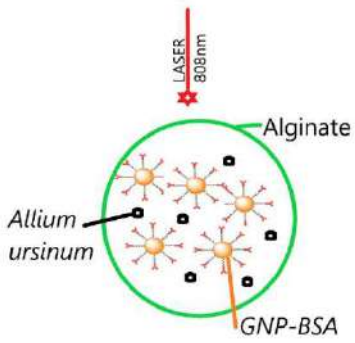
DESCRIPTION

Synthesis of gold nanoparticles: 98mg HAuCl4 * 3H2O are dissolved in 200mL H2O dist. under continuous stirring and the solution heated to 100 ° C. Add 25 mL of soil. sodium citrate (15mg / mL) and the reaction is allowed to continue at 100 ° C with continuous stirring for 120 minutes.

AuNP functionalization : 20 mg BSA are dissolved in 20 mL (NH 4) HCO325 mM, pH = 7.8 and incubated for 60 minutes at 37 ° C. Then 2 lmL of AuNP solution, obtained in the previous step, is added and the reaction is allowed to proceed for 90 minutes under continuous stirring at room temperature. The obtained AuNP-BSA solution is subjected to a 16000RPM / 30min centrifugation step. followed by re-dispersing the sediment in dist. H2O to remove by-products.

Obtaining of *Allium ursinum* extract, 22g of the vegetable matrix of Allium ursinum is crushed with the help of a homogenizer ('ultraturax' type) in the presence of 100mL of absolute ethyl alcohol and then left under magnetic stirring for 60 minutes. The extract is further filtered through a membrane with pores of 0.45µm and concentrated, under vacuum and at room temperature with the help of a 'wheel-evaporator' up to a volume of 10mL.

Encapsulation in alginate, the two solutions: 15mL AuNP-BSA and 10mL *Allium ursinum* extract, obtained in the previous steps, are added to a solution of 1.5% sodium alginate which is then added, in drops, using a syringe, in -a CaCl2 bath with a concentration between 0.6% and 1.6%. The formation time of the biocapsules in the curing bath is between 180 and 600 seconds. The biocapsules thus obtained are removed from the CaCl2 bath, and washed with bidist H2O.



Applicability Domain:

Health

Aplication/testing of invention:

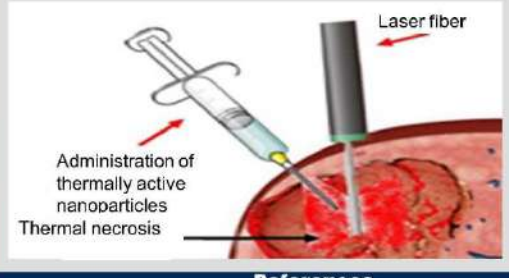
Proposed invention have been developed as laboratory prototype. It is under current experimental effect evaluation.

Distinctions obtained at other Inovation Events:

Proposed invention has not been previousely presented at any innovation event.

DISCUSSIONS AND CONCLUSIONS

-Selectivity pentru tumor cells (hepatocarcinoma).
-Designed for selective photothermal ablation of hepatocarcinoma.



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2. Oliveira-Cunha M, Hawman WG, Siriwardena AK. Epidermal growth factor receptor in pancreatic cancer. Cancers. 2011;3(1):1320-1329. doi:10.3390/cancers3011320
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Method and system for power supplying isolated electrical consumers

Ciprian BEJENAR, Marian BEJENAR, Dan-Laurențiu MILICI, Daniela IRIMIA,
Ciprian AFANASOV, Vasile-Eusebiu TOADER, Oana-Vasilica GROSU, Ovidiu-Magdin ȚANȚA
Patent Application no. A 2020 00776

The invention involves the transformation of an electrically propelled vehicle that features electrical connection capability, into a mobile source of electric energy and a mobile electric generator, using a system that ensures the implementation of the method, which allows the selectivity of the source of electric energy and the distribution path of the electric energy from outside/inside of the vehicle to inside/outside.

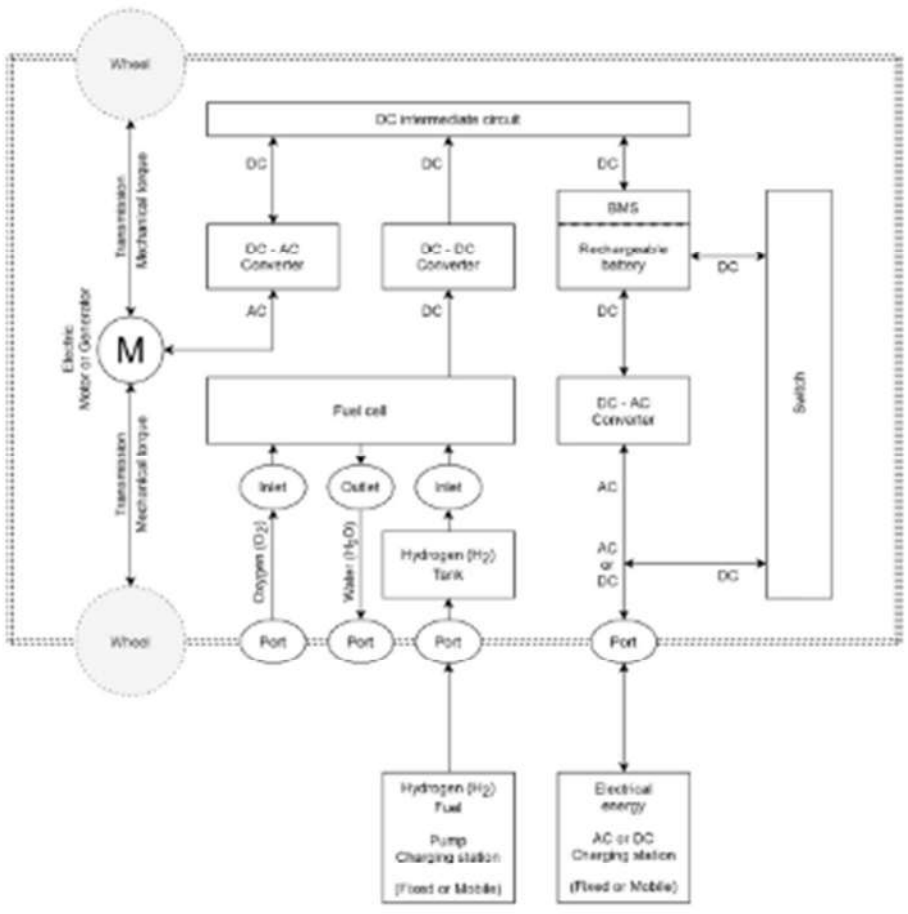

Fig. 1. Power supplying system architecture of an electric vehicle.

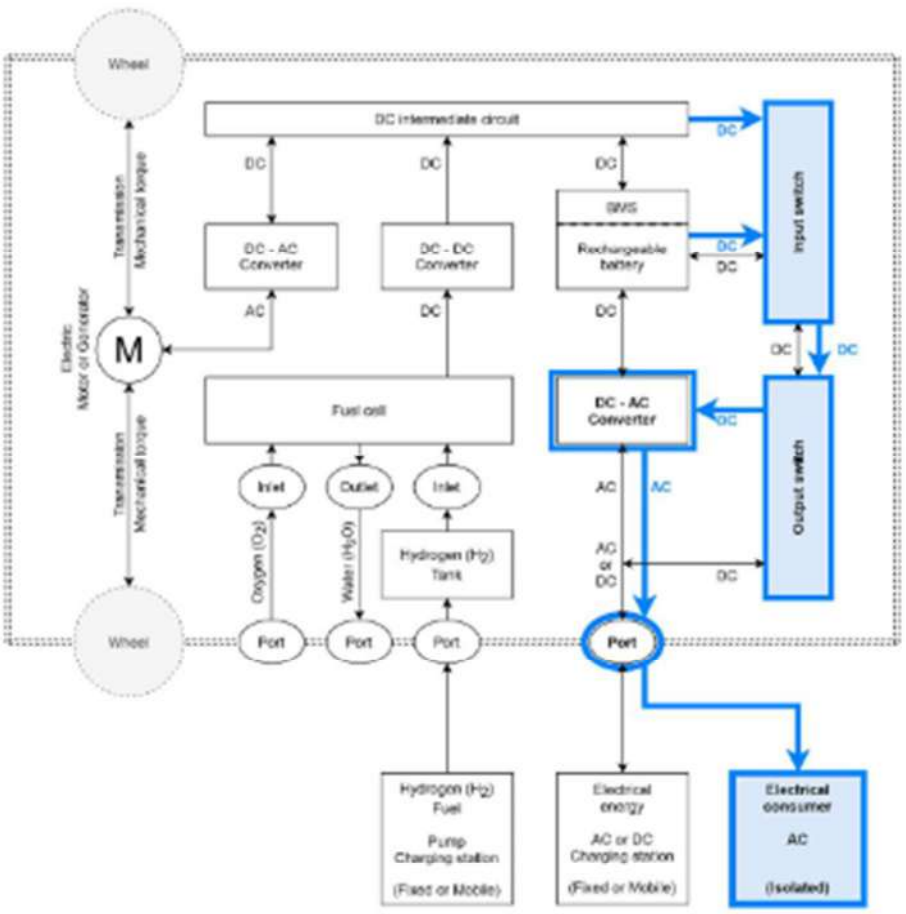

Fig. 2. Method and system (variant) for alternating current power supplying isolated electrical consumers.

ADVANTAGES

- ✓ preserves the functionality of the current state of technical solutions;
- ✓ introduces new functionalities and new possibilities to operate an electric vehicle;
- ✓ introduces new possibilities to power supply isolated electrical consumers;
- ✓ flexible and compatible with multiple architectures and different variants of power supplying isolated electrical consumers;
- ✓ capability of power supplying various isolated electrical consumers.

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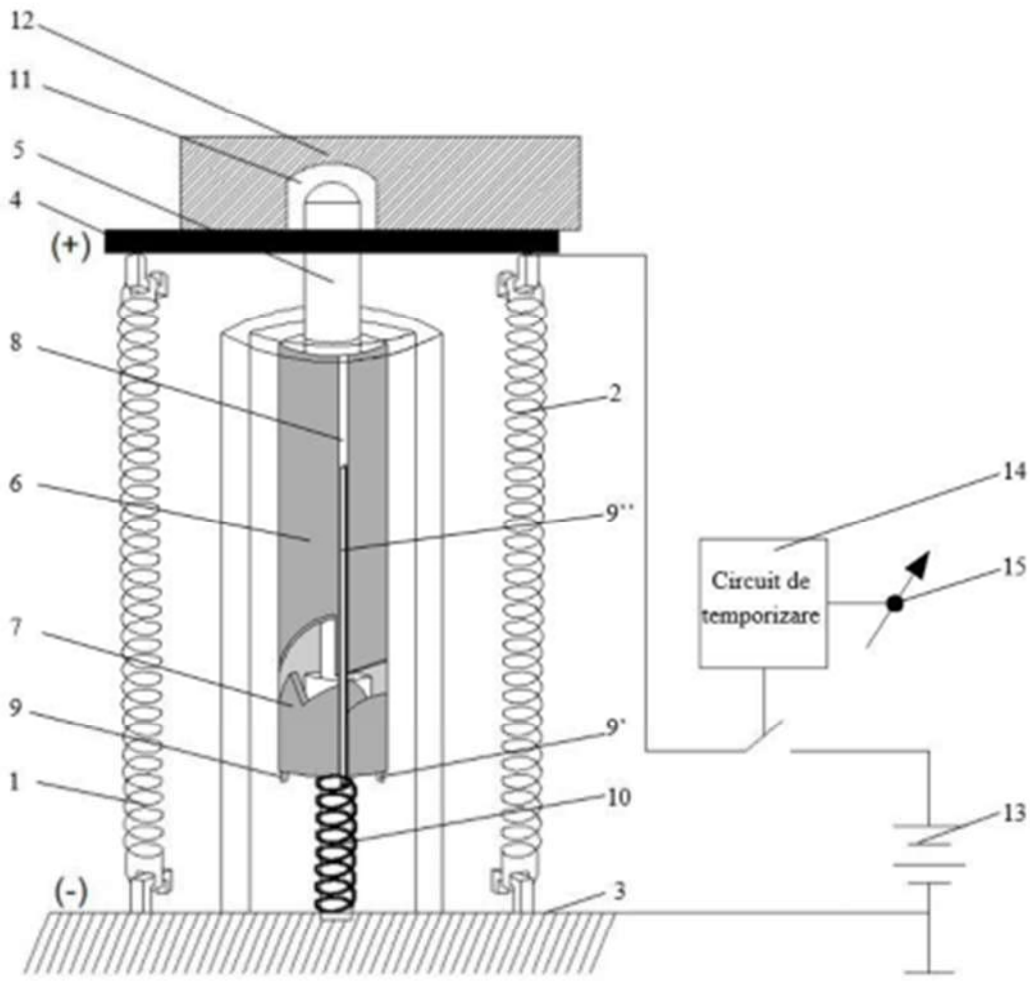
INTERLOCKING SYSTEM

NIȚAN Ilie, MILICI Laurențiu-Dan, POIENAR Mihaela, CERNUȘCĂ Dumitru, PAȚA Sergiu Dan, PIANÎH Alexei, PENTIUC Radu Dumitru, POPA Cezar, RAȚĂ Mihai, UNGUREANU Constantin

European Patent No. EP3536880/2020

The pumping system according to the invention consists of a cylindrical container (1), provided with a piston (2) which is moved by means of a rod (3) terminated with a T-shaped profile, provided at the lower end with a support (4) fixing two nitinol springs (5) and (5 '), and the upper part of the rod profile (3) acts at the ends of the stroke the double microcontacts (M_1), (M_1') and (M_2) respectively , (M_2'), which controls the closing and opening of the electrovalve (6), the fans (7) and (7') and disconnects the heating circuits of the nitinol springs (5) and (5') controlled alternately by the relay contacts (k_1) and (k_2) by means of a microcontroller (8).



ADVANTAGES:

- constructive simplicity;
- safety in exploitation;
- reduced gauge; the ability to remotely command.

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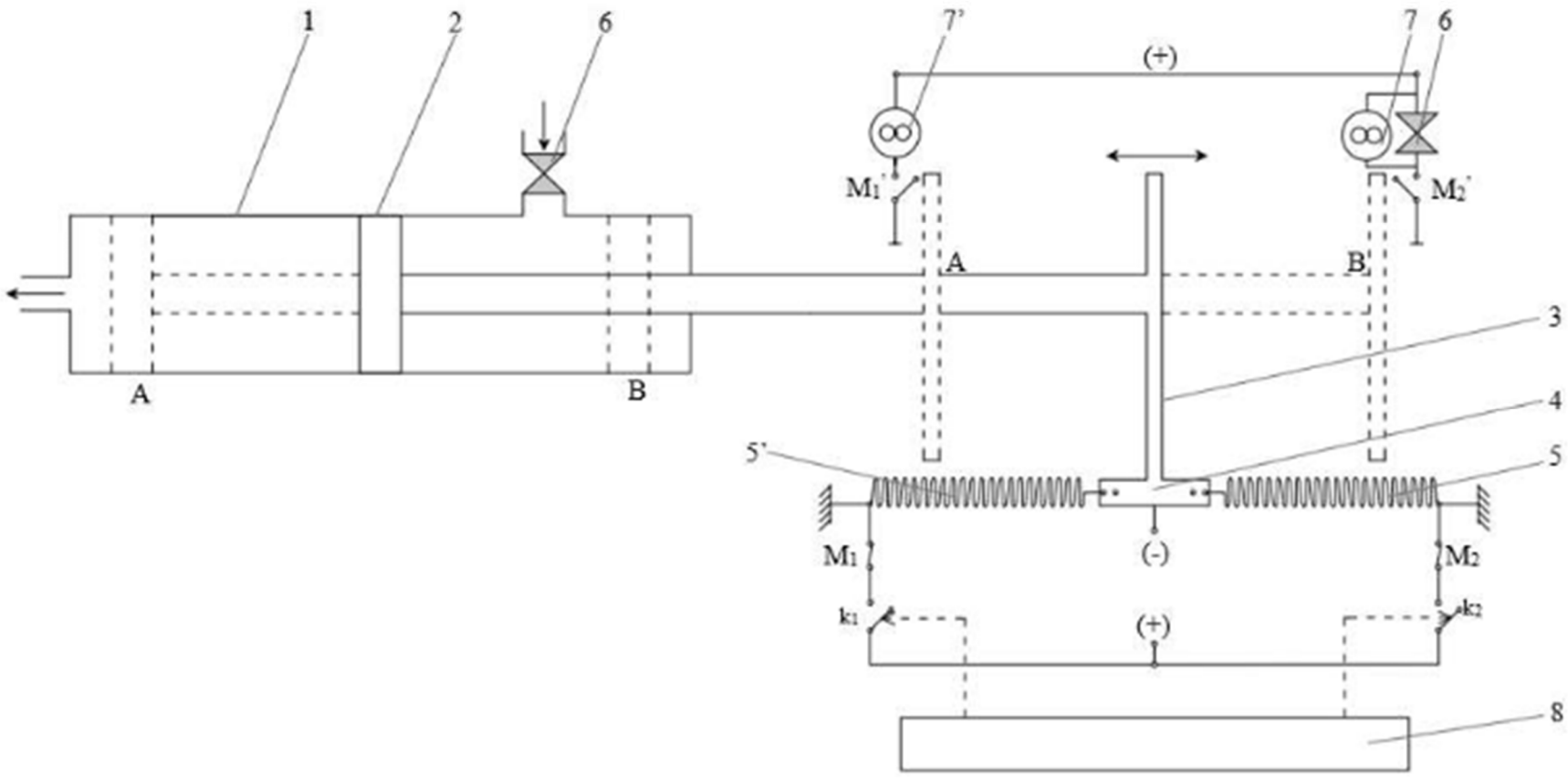
PUMPING SYSTEM

Ilie, PATOADER Eusebiu, NIȚAN VĂL Mihaela, MILICI Dan Laurenţiu, CERNUȘCĂ Dumitru, MILICI Mariana Rodica, GRAUR Adrian, DIMIAN Mihai, UNGUREANU Constantin

Patent application A00503/2020

The pumping system according to the invention consists of a cylindrical container (1), provided with a piston (2) which is moved by means of a rod (3) terminated with a T-shaped profile, provided at the lower end with a support (4) fixing two nitinol springs (5) and (5 '), and the upper part of the rod profile (3) acts at the ends of the stroke the double microcontacts (M_1), (M_1') and (M_2) respectively , (M_2'), which controls the closing and opening of the electrovalve (6), the fans (7) and (7') and disconnects the heating circuits of the nitinol springs (5) and (5') controlled alternately by the relay contacts (k_1) and (k_2) by means of a microcontroller (8).



ADVANTAGES:

- ✓ elimination of pumped flow control errors;
- ✓ high operational safety and increased reliability;
- ✓ high fluid control accuracy.

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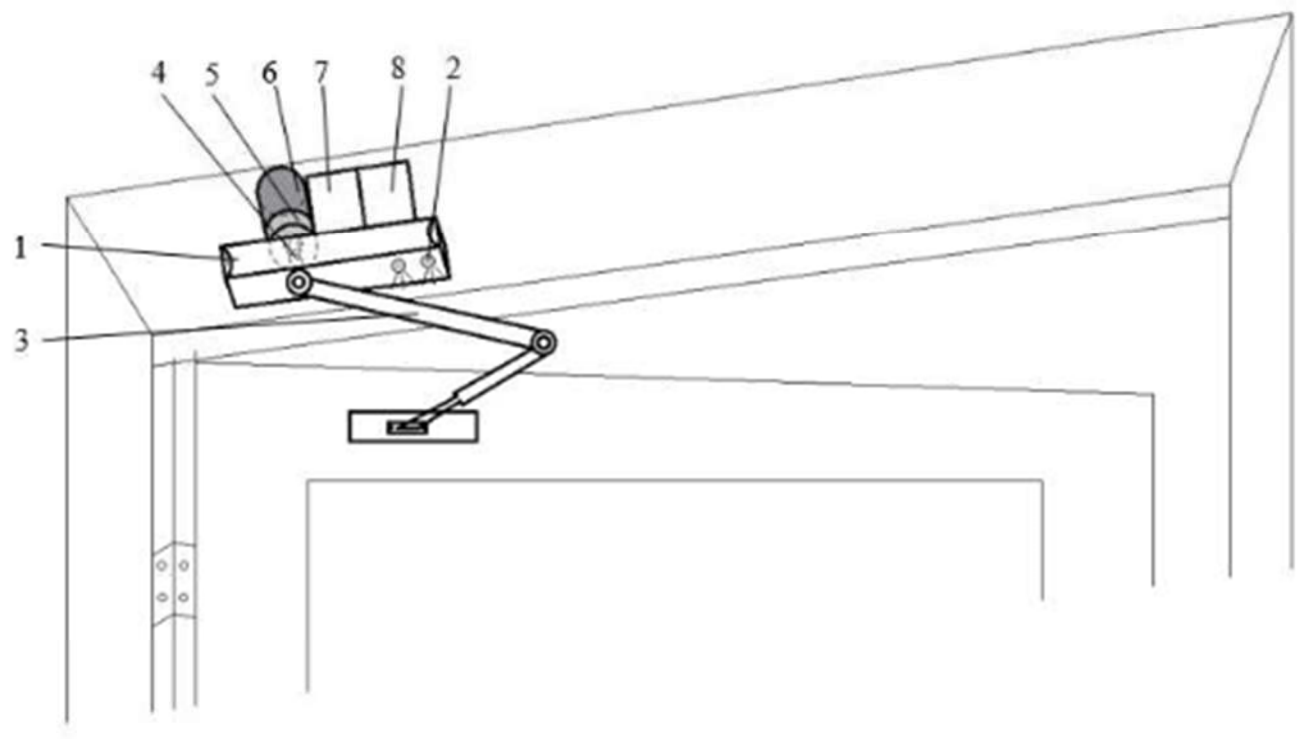
Energy recovery system

MILICI Dan Laurenţiu, PAVĂL Mihaela, NIȚAN Ilie, GROSU Oana Vasilica, TOADER Eusebiu, POPA Cezar Dumitru, ATĂNĂSOAE Pavel, BOBRIC Crenguţa Elena, IRIMIA Daniela

Patent application A/00519/2020

The energy recovery system according to the invention consists mainly of a fixing body 1 with LED light sources 2 facing downwards for the illumination of the access path and an articulated arm 3 connecting to the hinged door / pivoting window, provided with an axis 4 whose movement is multiplied by means of a mechanical multiplier 5 and is taken over by the direct current generator 6, and by means of the battery charging system 7 the battery 8 is charged and supplies the LED light sources 2 placed on the fixing body 1 , the system counting the number of openings by noticing the double change of the direction of the voltage generated by the direct current generator 6.



ADVANTAGES:

- ✓ the possibility of using the recovered energy with the electric generator to illuminate the access road or for other purposes;
- ✓ monitoring the use of doors / windows through the energy recovery system;
- ✓ constructive simplicity by removing the shock absorber with the direct current generator with mechanical multiplier.

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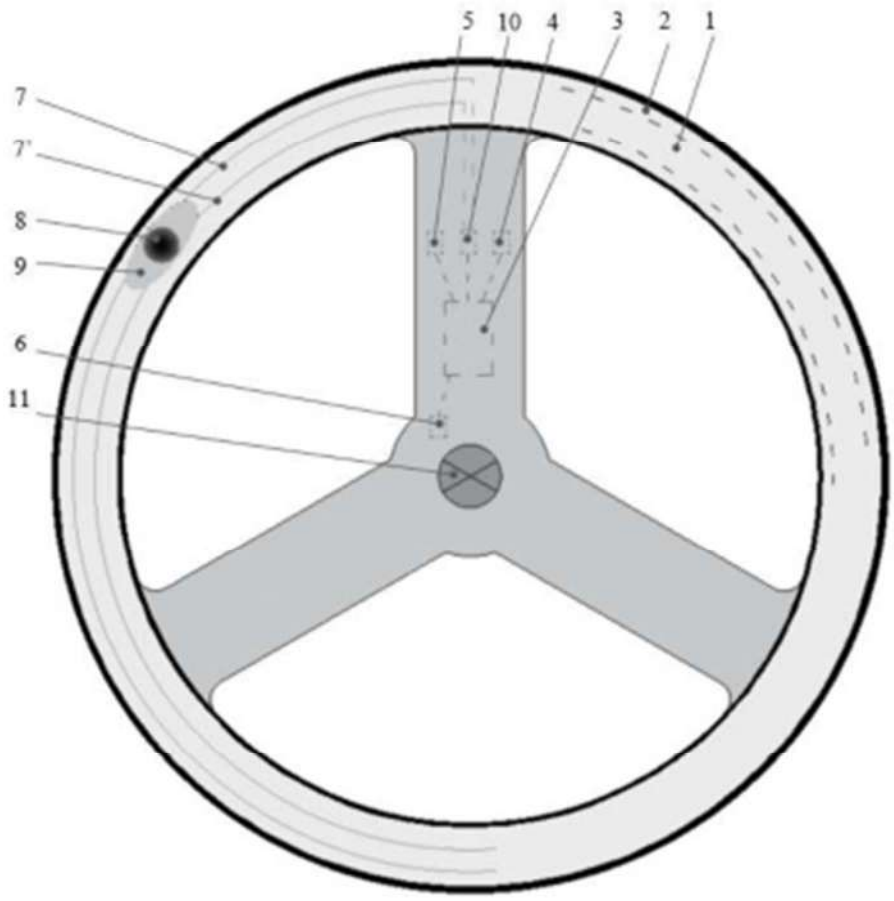
AUTOMATIC SYSTEM FOR MONITORING DRIVERS' ATTENTION

TOADER Eusebiu, PAVĂL Mihaela, MILICI Dan Laurenţiu, BOBRIC Crenguţa Elena,
IRIMIA Daniela, VLAD Valentin, NIȚAN Ilie, GRAUR Adrian
Patent application A/00319/2020

The automatic system for monitoring the attention of drivers according to the invention consists of a system of two sensors for evaluating the electrodermal resistance (7) and (7 ') at the driver's hand, pulse (9), hand contact force and the steering wheel (8), the acceleration of the vehicle (4), the angular displacement of the steering wheel (5) and its vibrations (6), place on the steering wheel by means of a cover. The retrieved data is processed using a microcontroller procurement system that will determine if the position of the hands on the steering wheel is correct and if the driver's condition allows him to drive.



ADVANTAGES:

- ✓ the possibility of identifying the driver's state of fatigue / drowsiness or tense states of stress or anxiety;
- ✓ the possibility to evaluate the correct driving position of the driver;
- ✓ the system does not require additional space being placed on the steering wheel;
- ✓ easy adaptation to any car steering wheel, simplicity of construction and low volume.

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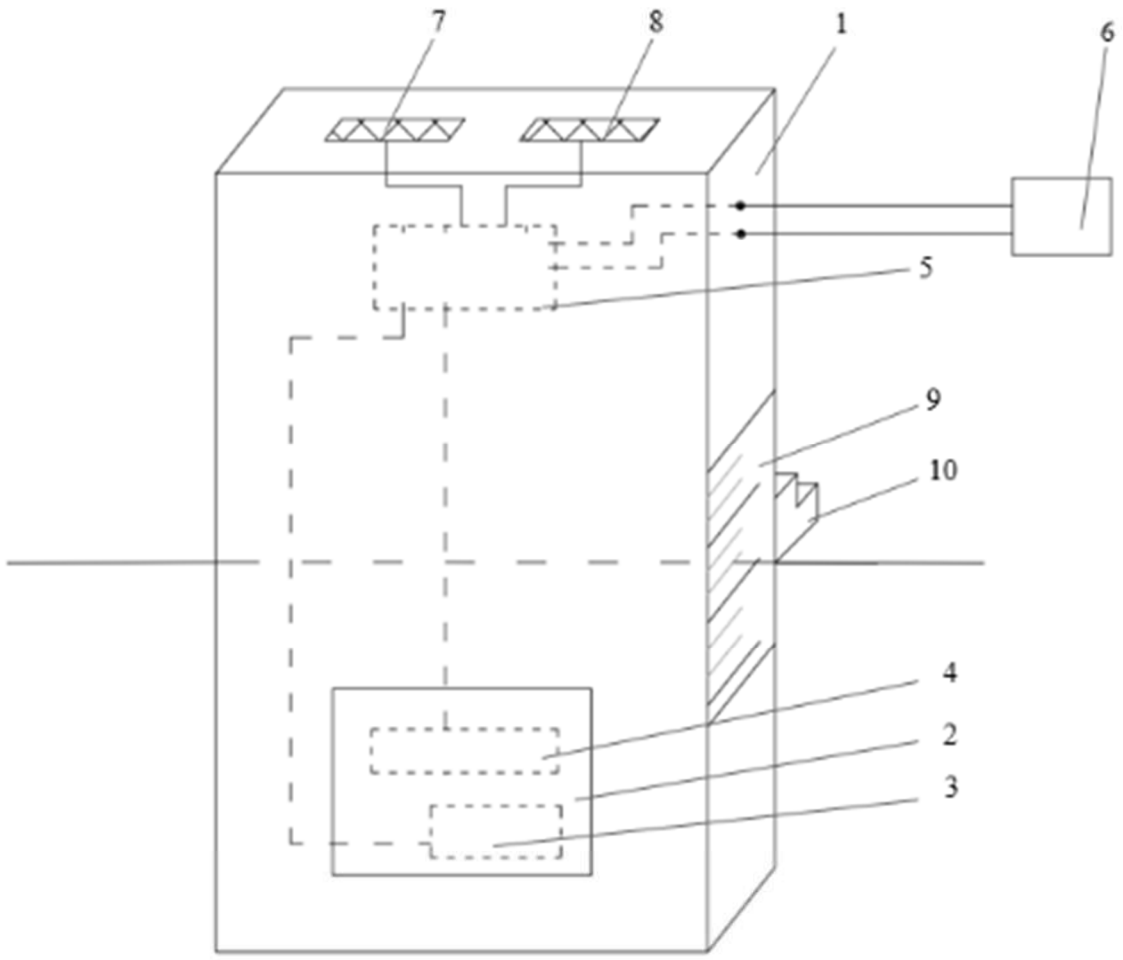
EQUIPMENT FOR FLIP TURN LEARNING IN SWIMMING LESSONS

VIZITIU, E.; MILICI, D. L.; PAVĂL M.

Patent application A/00092/2020

Equipment for flip turn learning in swimming lessons, according to the invention, consists mainly of a parallelepipedic panel (1), which is immersed in the pool at the end of the athlete's flip turn zone and which contains at the bottom the impact area (2), equipped internal with a force sensor (3), and a light source (4), connected to a command and control microsystem (5), together with the presence sensor (6) used to detect the presence of the swimmer and provide information at the time the return procedure must be started



ADVANTAGES:

- ✓ the equipment is mobile, easy to transport and mounted in the return area;
- ✓ the equipment can be easily adjusted according to the configuration and performance of the learner;
- ✓ the equipment allows learning the flip turn procedure by indicating the optimal moment to start the movement, indicating the optimal place to achieve the impact for propulsion and indicating the dynamic parameters of the movement at the end of the procedure.

Economical system for automatic adjustment of the power factor, with capacitor banks, in three-phase low-voltage installations

Patent A 00491, 04.08.2020

Authors: Popa Gabriel Nicolae, Diniș Corina Maria, Popa Iosif

The invention relates to an economical system for automatic regulation of the power factor with capacitor banks in three-phase low-voltage installations. The technical problem is the realization of an economical system of automatic regulation of the power factor, with capacitor banks, from three-phase low voltage installations, which uses a three-phase static electronic power relay common to all stages of capacitor banks. to improve the power factor in three-phase low-voltage installations. It consists of a current transformer (which measures current in a phase), a VAR-metric controller with microprocessor, two small capacity PLCs, a three-phase static electronic power relay, twelve electromagnetic contactors and six capacitor banks.

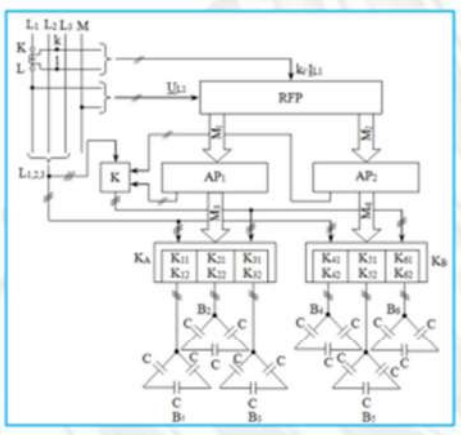


Fig.1. Block diagram of the economic system for automatic adjustment of the power factor

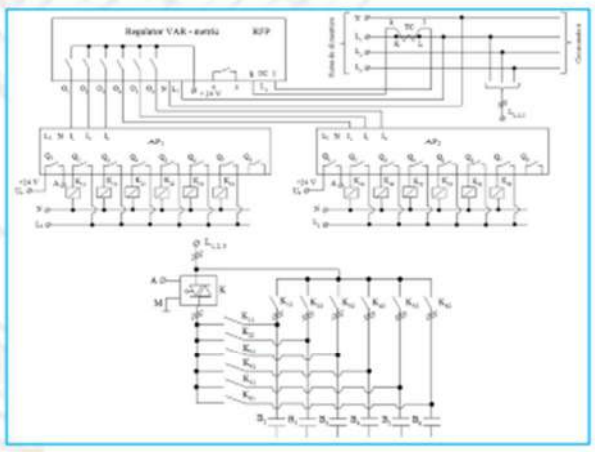


Fig.2. Wiring diagram of the economic system for automatic adjustment of the power factor

The advantages of the invention are the following: the currents at the connection of the capacitors are much diminished, from (20-50) xIn to In; switching is done at zero voltage; no electric discharge occurs at switching; high reliability; lower costs than when using a three-phase solid state relay for each capacitor bank; very high input/output isolation voltage; does not generate disturbing electromagnetic fields; superior service life compared to systems where the connection of capacitor banks is made with conventional contactors.

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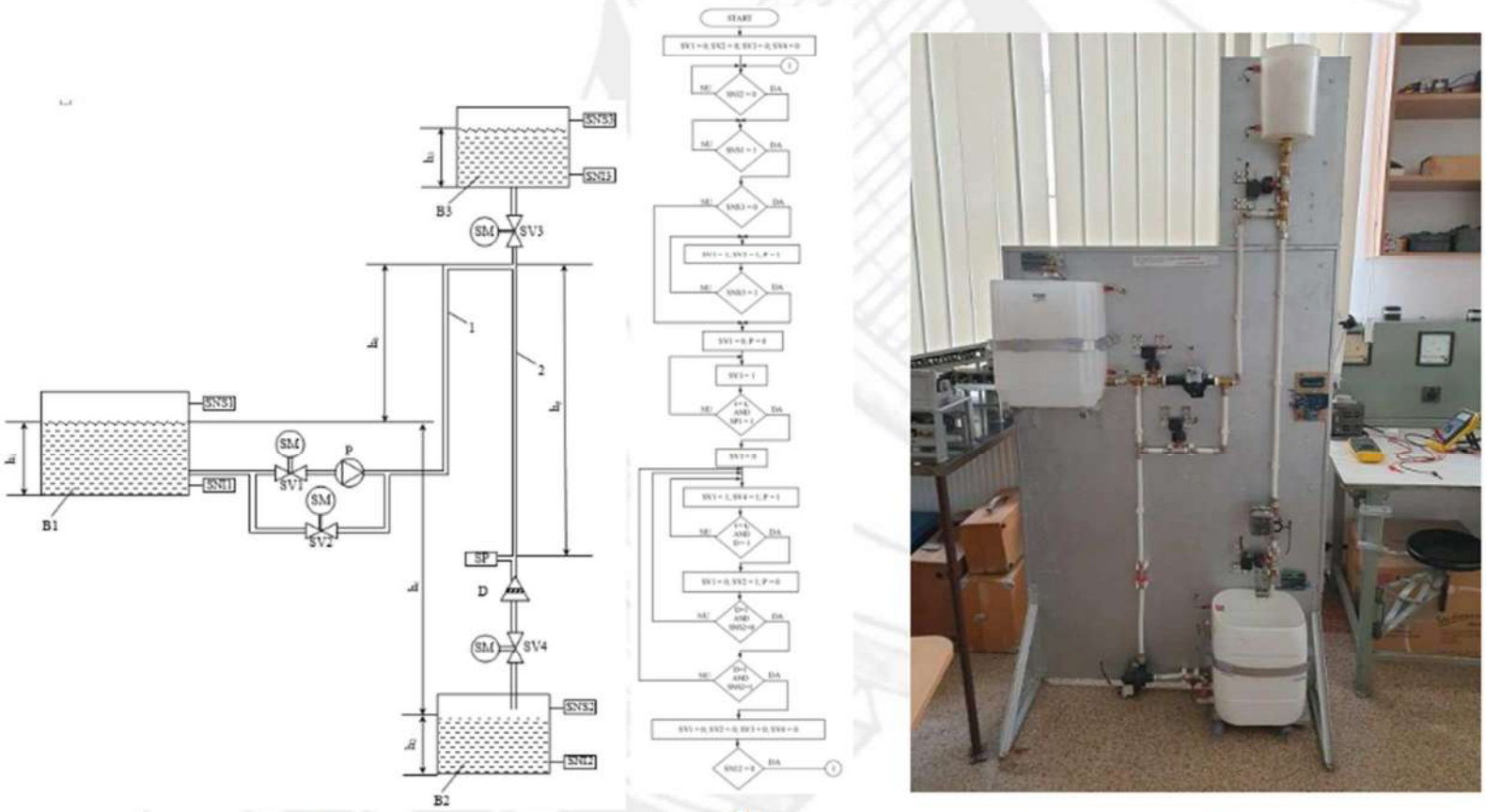
Automatic siphon installation

Patent A 00492, 04.08.2020

Authors: Popa Gabriel Nicolae, Popa Iosif

Description: The invention relates to a hydraulic installation which can be used to transfer a liquid between two basins, the first for storage and the second for feeding consumers, located at different levels at which the route of the supply pipe must pass, due to natural causes, over the water level in the accumulation basin. The hydraulic flow pump is used for a short time, and the principle of the siphon is used to transfer the liquid. The proposed installation has the role of transferring the liquid between two basins by achieving a significant saving of electricity. The hydraulic installation is connected between three basins: two main basins and one for filling and aeration of small capacity (Fig.1.a). The control of the siphon system can be done with microcontroller or PLC (Figs.1.b,c).



a. b. c.

Fig.1. a. Block diagram of the automatic siphon system can have various fields of use; b. The flowchart of the program; c. Picture of the laboratory stand.

The automatic siphon system can have various fields of use:
-at the drinking water supply installations of the localities;
-in mining operations;
-other industrial branches;
-in agriculture.

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20-22 may 2021, 13th edition, Iași, Romania

Metodă de control pentru un compensator capacitiv automat destinat îmbunătățirii factorului de putere și echilibrării sarcinii în rețele electrice trifazate cu patru conductoare

Control method for an automatic capacitive compensator meant to improve the power factor and to load balancing in three-phase four-wire electrical networks

Nr. Brevet: RO 131297 B1

Autor: Pană Adrian,
Universitatea Politehnica Timișoara

Dacă un condensator monofazat se conectează între două dintre fazele unei rețele electrice trifazate, va determina o absorbție de putere reactivă, în părți egale pe cele două faze, ceea ce este evident. Se va produce însă și un efect asupra circulației de putere activă, condensatorul absorbind din rețea putere activă pe una dintre faze și returnând-o în rețea pe cealaltă fază. Iar acest fapt este, chiar pentru un inginer electrician, mai puțin evident. Se poate afirma că un condensator monofazat conectat între două faze face, pe lângă o compensare capacitivă transversală a puterii reactive, o redistribuire a puterii active între cele două faze a rețelei. Aceste afirmații sunt valabile și pentru un ansamblu trifazat de condensatoare monofazate legate în conexiune delta. Un astfel de ansamblu poate fi transformat într-un compensator capacitiv dezechilibrat, care pe lângă îmbunătățirea factorului de putere, poate face echilibrarea sarcinii pe cele trei faze ale rețelei. În cazul unei rețele trifazate cu patru conductoare, compensatorul trebuie să conțină și o componentă având conexiunea Y_0.

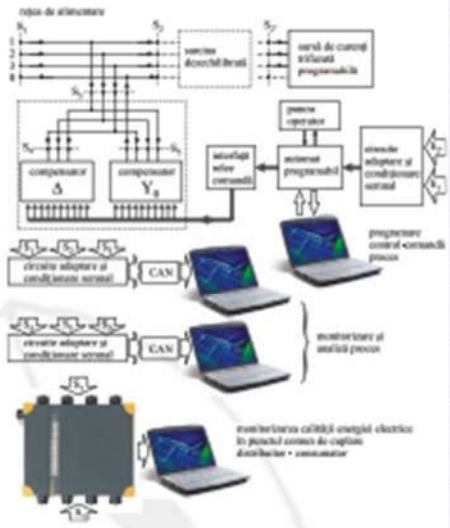
Metoda brevetată este destinată implementării prin intermediul unui software specializat, în sistemul de control al unui compensator capacitiv trifazat, format din baterii de condensatoare monofazate de putere, incluse în două circuite trifazate, unul în conexiune Δ, celălalt în conexiune Y_0, pentru a permite realizarea unei compensări capacitive trifazate dezechilibrate variabile, cu scopul îndeplinirii, pe lângă funcția „clasică" de îmbunătățire a factorului de putere, pe cea a echilibrării sarcinii rețelei trifazate. Metoda este implementată într-un model experimental funcțional și în curs de implementare, la scară industrială, într-o gamă de prototipuri.

If a single-phase capacitor connects between two of the phases of a three-phase electrical network, it will cause a reactive power absorption, in equal parts on the two phases, which is obvious. However, there will be an effect on the circulation of real power, the capacitor absorbing real power from the network on one of the phases and returning it to the network on the other phase. And this fact is, even for an electrical engineer, less obvious. It can be stated that a single-phase capacitor connected between two phases makes, in addition to a shunt capacitive compensation of the reactive power, a redistribution of the real power between the two phases of the network. These statements also apply to a three-phase assembly of single-phase capacitors connected in a delta connection. Such an assembly can be transformed into an unbalanced capacitive compensator, which in addition to improving the power factor, can balance the load on the three phases of the network. In the case of a three-phase four wires network, the compensator must also contain a component with the Yn connection.

The patented method is meant to be implemented through the medium of a specialized software in the control system of a three-phase capacitive compensator, consisting of single-phase power capacitor banks, included in two three-phase circuits, one in Δ connection, the other in Y_n connection, to allow a variable unbalanced three-phase capacitive compensation, in order to fulfill, in addition to the "classic" function of power factor improvement, that of balancing the load of the three-phase network. The method is implemented in a functional experimental model and is being implemented, on an industrial scale, in a series of prototypes.

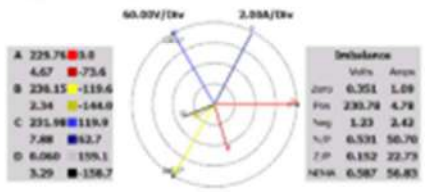
Modelul experimental și metoda brevetată sunt rezultate ale activităților de cercetare industrială, finanțate de către Guvernul României, Ministerul Educației Naționale, prin UEFISCDI, în cadrul programului: PN-II-PT-PCCA-2013–4. Parteneriat UPT – ICPE S.A. (https://www.sites.google.com/site/caeredjt/).

Contact: adrian.pana@upt.ro

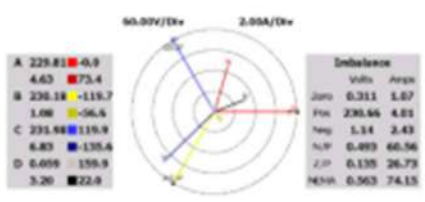


Schema bloc a modelului experimental

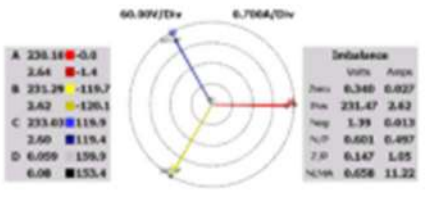
Modelul experimental funcțional
(lab. de Rețele electrice, Dep. EE al UPT).



Sarcina trifazată dezechilibrată



Compensatorul capacitiv dezechilibrat



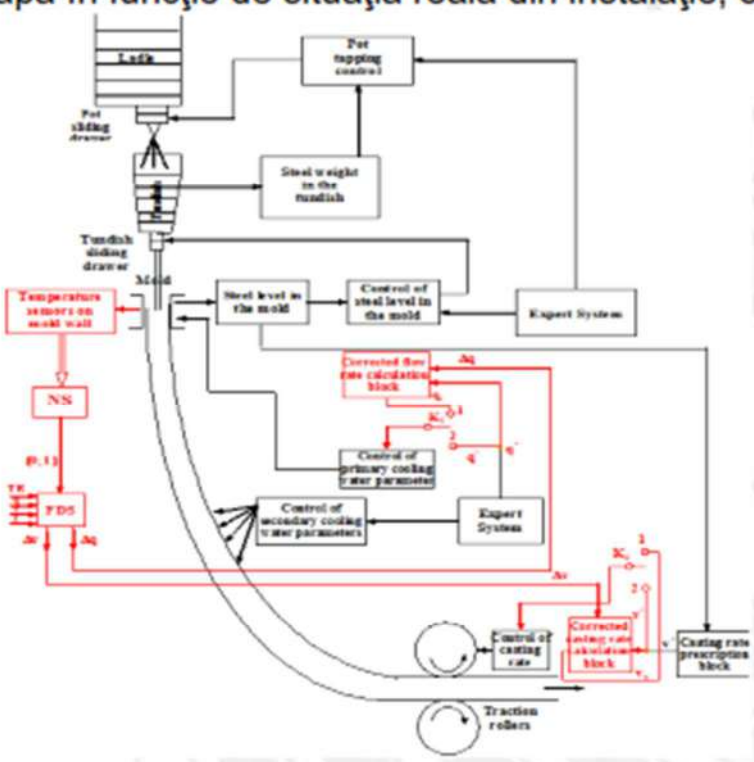
Ansamblul sarcină – compensator

Câteva dintre rezultatele monitorizării funcționării compensatorului capacitiv dezechilibrat

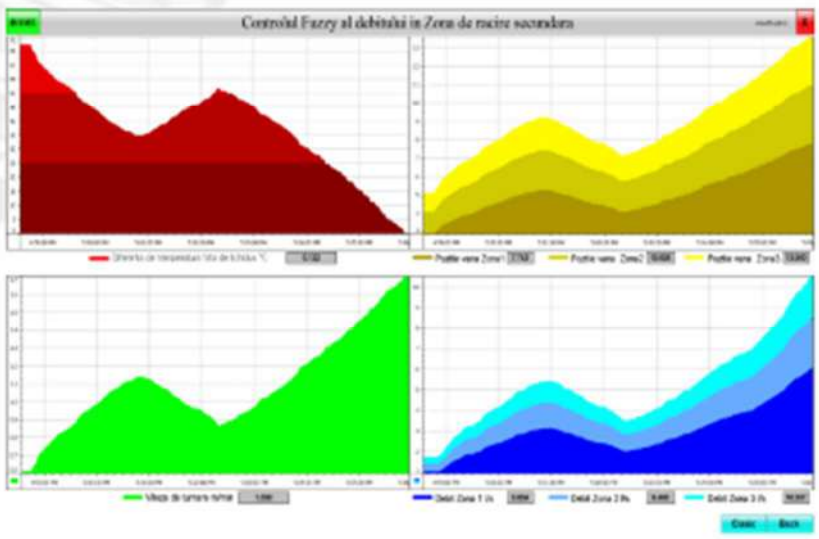
Sistem inteligent de conducere a procesului de turnare continuă pentru reglarea debitului de apă la răcirea secundară
Intelligent control system for continuous casting based on water flow control in the secondary cooling

Autor: **Gelu-Ovidiu TIRIAN**

S-a realizat dezvoltarea şi implementarea unei soluţii de conducere a procesului de turnare continuă bazată pe un sistem inteligent fuzzy, care să permită un control al debitului apei de răcire secundară, printr-o repartiţie adecvată pe zone de răcire. Această necesitate este impusă de faptul că sistemele actuale de reglare nu realizează corelarea în timp real între variaţiile multiplelor variabile aferente procesului de turnare continuă şi se limitează la o repartiţie rigidă a debitului de apă pe fiecare zonă de răcire. Sistemul inteligent are capacitarea de a elimina acest inconvenient, putând modifica în timp real aceste repartiţii ale debitului de apă în funcţie de situaţia reală din instalaţie, operând ca un sistem adaptiv.



It was realised developed and implemented, meant to control the casting process by an intelligent fuzzy-type system, allowing the control of the water flow rate in the secondary cooling, by appropriate distribution along the cooling area. This necessity is imposed by the fact that actual control systems do not correlate in real time the variations of the multiple variables related to the continuous casting process and stick to a rigid distribution of the water flow rate on each cooling area. The intelligent system is capable of eliminating this shortcoming, by controlling in real time the distribution of the water flow rate according to the real situation in the installation, working as an adaptive system.



Structure of the controlling system for the continuous casting process

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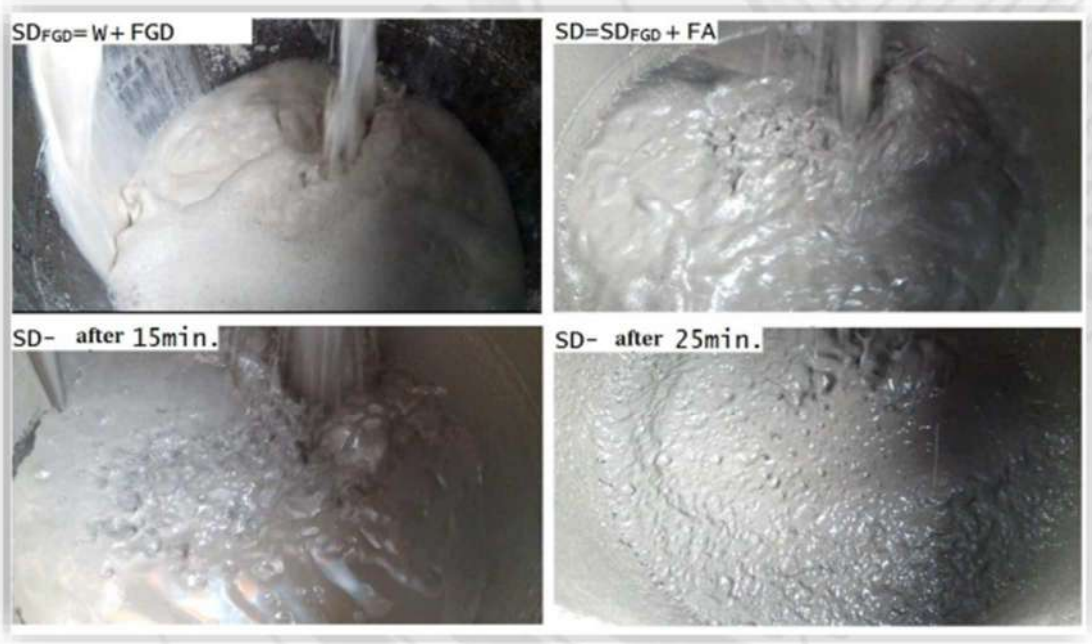
PROCESS FOR INTEGRATING THE DRY DEFLECTION BY-PRODUCT INTO THE DENSITY SLAM RECIPE FOR HYDRAULIC TRANSPORT THROUGH PIPE SYSTEMS

RO 131485 B1

Authors: **WÄCHTER Mihail Reinhold, IONEL Ioana, NEGREA Petru**

The invention relates to a process for integrating the by-product resulting from dry desulfurization by applying the dense sludge technology for hydraulic transport through piping systems, as ell the storage in the dump of the desulfurization by-product resulting from the technological process of flue gas treatment related to coal-fired power plants. The field of the invention is that of environmental protection.

The process does not influence the self-hardening properties of dense sludge, prevents the deposition phenomena on the walls of transport pipes, reduces the cost of transport and storage of desulfurization by-product, involves a low implementation cost, has a low energy consumption in operation compared to other methods and does not pollute the environment. Added to this is the outstanding light immunity, which allows for reliable results even outdoors and under suddenly changing lighting conditions. The corrective power of the glasses can also be adapted to the wearer, and the eye tracking glasses can be comfortably worn with contact lenses. With the very short calibration time compared with other options, the glasses can be quickly adapted to the wearer and made ready for use. Once calibrated, the Eye Hyper-Tracking glasses can be used again and again for hours at a time – comfortably and unobtrusively.



AD=additive;
FA=electrofilter fly-ash;
SD=dense sludge;
FGD=by-product of dry desulphurization;
W=water.

Applications: The dense sludge prepared according to the process described according to the invention solves the problem of preparing the dense sludge recipe, which also includes the desulphurization by-product, resulting in a slurry fluid, capable to be hydraulically transported through pipes to the slag and ash depot, specific to coal thermal power plants. According to the experimental results, it is found that the process of integrating the dry desulfurization by-product into the dense sludge preparation recipe according to the invention provides a technological solution for the hydraulic transport of the dense sludge containing dry desulfurization by-product.

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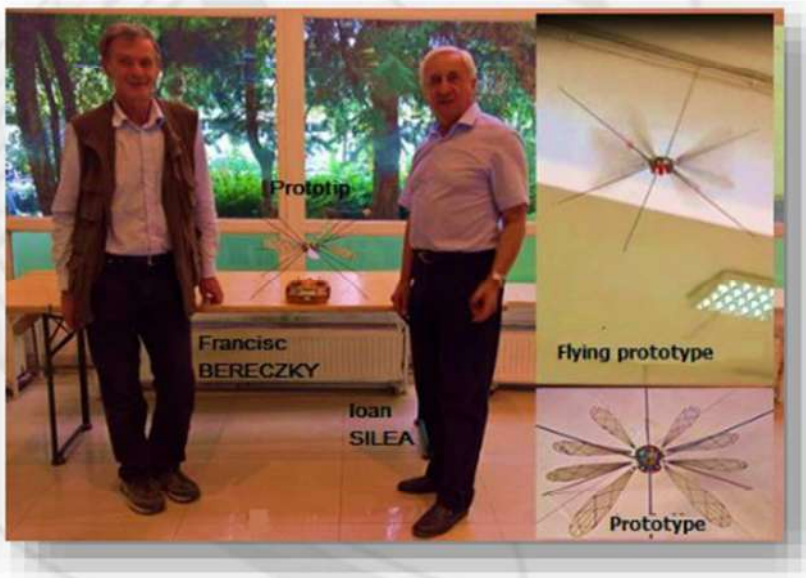
New Nature-Inspired Cycloidal Propeller for Low-Reynolds-Number Hovering Flight

Prototype (Research Project)

Authors: Francisc Bereczky and Ioan Silea

A new type of pivoting-blade cycloidal propeller having the appearance of damselfly wings, which can equip aircraft with vertical take-off and landing capability was designed and tested. This propeller is emerging as an alternative solution for electrically powered Planetary Aerial Vehicles capable ofoperating in the rarefied atmosphere of Mars.

Pivoting-blade cycloidal propeller and devices equipped with it



Authors and a prototype for testing the pivoting-blade cycloidal propeller

The theoretical analysis and experimental results proves that both forces (lift and drag) contributes to the net vertical force, and the contribution of drag is at least 50%. The results, recognized by the world of research, were published in the AIAA Journal - a scientific journal of the American Institute of Aeronautics and Astronautics, covering all areas of aeronautics and astronautics, especially in terms of new theoretical and experimental developments.

The article and auxiliary materials (films, pictures) can be obtained for a fee by accessing: https://arc.aiaa.org/doi/abs/10.2514/1.J057270

Contact: Francisc Bereczky, Telephone: +40742155930.
Email: fbereczky@echitron.ro; or Ioan Silea, email: ioan.silea@upt.ro.

METHODS TO DETERMINE THE PREVENTIVE MAINTENANCE CYCLES OF ROLLING MILLS

PhD Thesis

Author: Budiul Berghian Adina

This survey presents two mathematical models of preventive maintenance that take into account stochastic factors which influence the failure rates and working life of an entity. The models are hybrid so that they combine the reduction of proper operation time with failure rate. The starty point consists in idea that preventive maintenance is done with imperfections: it is not reduced the proper operation only but it is increased the probability of entity failure as much as the number of maintenance is increased.

The target of this survey is to determine the optimal graphic of planned maintenance activities either to reduce the related costs or to maintain the reliability above a prescribed minimum level.

Table 1. Cycles of preventive maintenance for the wire rod rolling mill, based on cost minimization

C_r/C_m	2	5	10	20	50
N	2	6	11	16	25
Continuous operation time elements between two planned interventions [hours]					
x_1	8.791	11.652	14.067	16.557	20.758
x_2	6.598	6.842	8.260	9.723	12.190
x_3		5.71	6.893	8.114	10.172
x_4		5.077	6.129	7.214	9.044
x_5		4.62	5.577	6.565	8.230
x_6		5.989	5.133	6.041	7.574
x_7			4.753	5.594	7.014
x_8			4.419	5.201	6.520
x_9			4.118	4.847	6.077
x_{10}			3.845	4.525	5.674
x_{11}			5.197	4.231	5.304
x_{12}				3.959	4.963
x_{13}				3.707	4.647
x_{14}				3.473	4.354
x_{15}				3.255	4.081
x_{16}				4.459	3.826
x_{17}					3.589
x_{18}					3.367
x_{19}					3.159
x_{20}					2.965
x_{21}					2.783
x_{22}					2.613
x_{23}					2.453
x_{24}					2.303
x_{25}					3.186

Table 2. Cycles of preventive maintenance for the wire rod rolling mill, based on limitation of failure rates

C_r/C_m	2	5	10	20	50
N	2	6	11	17	26
Continuous operation time elements between two planned interventions [hours]					
x_1	8.81	9.37	9.95	10.780	12.339
x_2	5.42	5.76	6.12	6.634	7.593
x_3		4.84	5.14	5.569	6.375
x_4		4.32	4.59	4.969	5.688
x_5		3.94	4.18	4.534	5.190
x_6		3.63	3.86	4.181	4.786
x_7			3.58	3.878	4.439
x_8			3.33	3.610	4.132
x_9			3.11	3.368	3.855
x_{10}			2.90	3.147	3.603
x_{11}			2.72	2.944	3.370
x_{12}				2.757	3.156
x_{13}				2.583	2.956
x_{14}				2.421	2.771
x_{15}				2.270	2.599
x_{16}				2.130	2.438
x_{17}				1.998	2.287
x_{18}					2.146
x_{19}					2.014
x_{20}					1.891
x_{21}					1.775
x_{22}					1.667
x_{23}					1.565
x_{24}					1.470
x_{25}					1.380
x_{26}					1.297

From Table 1 has been ascertained that operation time elements between two successive repairs are reduced, except the latest time element for which is observed a certain increase. That means that it is properly to be done a preventive maintenance work in accordance with the entity age and, in the same time, it is advisable that latest planned intervention to be executed as late as possible, because the next repair work is the overhaul one. From technical point of view, Table 2, the operation times between two planned interventions decrease because the maximum admitted failure rate is reached faster with increasing the entity working life and age.

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DYE-SENSITIZED SOLAR CELL MODULE FOR WAVELENGTH-SELECTIVE PHOTOVOLTAIC GREENHOUSE

Melinda Vajda[1,2], Miclau Marinela[1], Albulescu Daiana[1], Daniel Ursu[1*]

Project number : PN-III-P2-2.1-PED-2019-2091

[1]National Institute for Research and Development in Electrochemistry and Condensed Matter, Str. Plautius Andronescu 1, 300224 Timisoara, Romania
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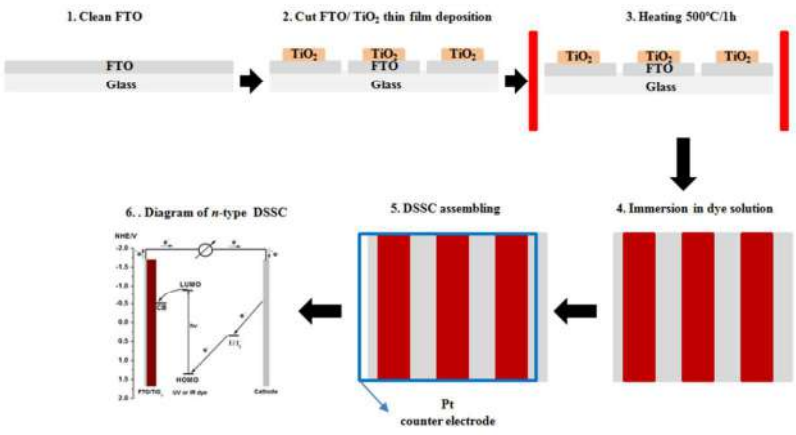
Description

A photovoltaic greenhouse must strike a balance between two contradicting requirements: maximize the flow of photosynthetic active radiation (PAR) which is essential for the growth and photosynthesis of the plants and enhance the production of energy which increases along with the increase in size of the opaque surface of the panels. The greatest challenge of a PV greenhouse is the competition between PV roofs and plants. The main limitations of the integration in greenhouse concern the fact that these PV cells do not transmit sunlight and form a permanent shadow region which has negative effects on production, reducing the crop growth or the amount of biomass.

Simple manufacturing process, the low fabrication cost, flexibility in scaling, low material usage and low light level sensitivity, but mainly the variation in color and transparency of the dye sensitized solar cell (DSSC) are essential characteristics that could make these cells the ideal candidate for greenhouse application. The selection of the color of DSSC given by the dye can act as a plant growth regulator or serve as a photo selective covering adsorbed with dye to manipulate the light spectrum entering the greenhouse.

In this context, the invention proposed to design, build, and test the wavelength-selective solar cell module (DSSC module), as a technically and economically credible alternative concept of a PV roof for PV greenhouses.

Construction of DSSC module



The working principle *of DSSC involves four basic steps:*

- *Light absorption,*
- *Electron injection,*
- *Transportation of carrier,*
- *Collection of current.*

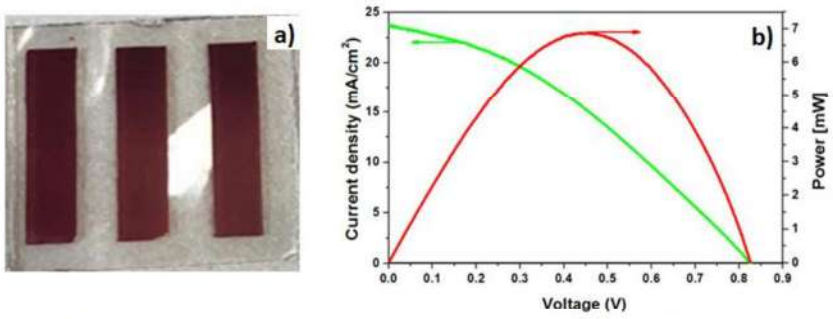
The following steps are involved in the conversion of photons into current.

➢ ***This technology could be able to deliver impressive benefits in contrast to conventional PV due to its solar radiation manipulation through the optimum choice of photosensitizer.***

Acknowledgment

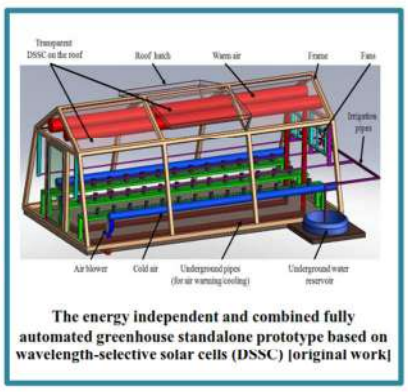
This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, UEFISCDI, Project No. PN-III-P2-2.1-PED-2019-2091, within PNCDI III.

➢ ***Simple manufacturing process, the low fabrication cost, flexibility in scaling, low material usage and low light level sensitivity, but mainly the variation in color and transparency of the dye sensitized solar cell (DSSC),***
➢ ***One of the third generation of PV cells, are essential characteristics that could make these cells the ideal candidate for greenhouse application.***



Our DSSC [original work] (a), Current-voltage and power-voltage characteristics of DSSC fabricated (b)

Future perspectives



The energy independent and combined fully automated greenhouse standalone prototype based on wavelength-selective solar cells (DSSC) [original work]

➢ ***Design, build, test and implementation of efficient and low-cost n-p type DSSC based on TiO_2 and Cu_2O using dyes (synthetic and natural) which absorb in UV and NIR***

➢ ***Design, build, test and the energy independent and combined fully automated greenhouse standalone prototype based on wavelength-selective solar cells (DSSC), as a technically and economically credible alternative concept to present day conventional greenhouses.***

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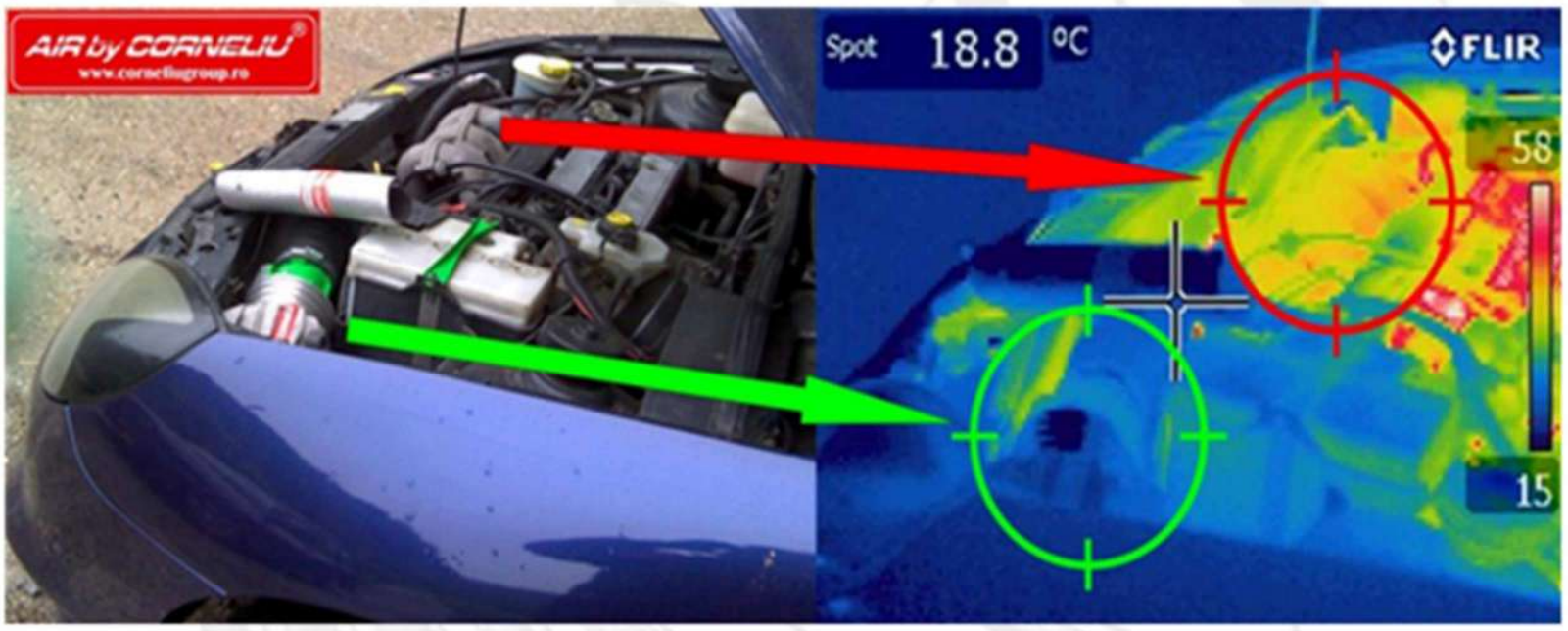
AIR by CORNELIU intake manifold insulation layer

PhD thesis

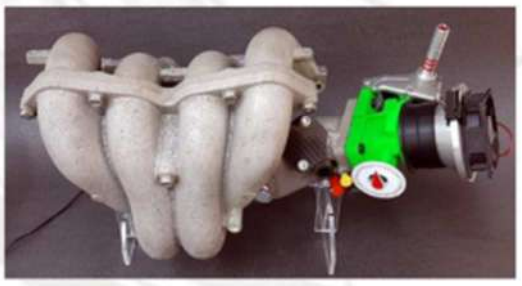
Author: Corneliu Birtok Baneasa

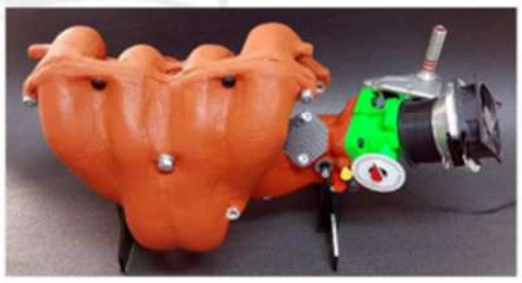
This product is dedicated to the reduction of heat transfer on the intake system, mainly in the case of the aluminum alloy intake manifold. To this end, a series of solutions for reducing heat loss have been adopted, implemented and tested. These consist in the design and insulation of the intake manifold with a new type of composite material with thermal insulation, whose composition contains natural, organic and recyclable elements.

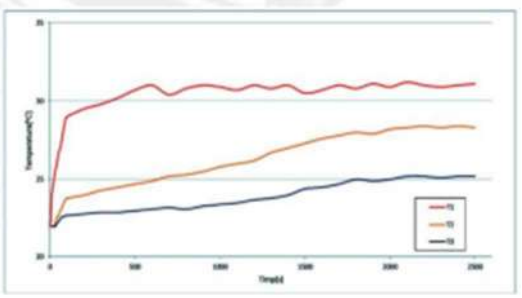
The thermal insulation layer called SPTI (Silicone Polyurethane Thermo-Insulating), offers protection to the thermally stressed components (convection, conduction and radiation) of vehicles, such as intake manifolds, air conditioning systems, various components of the braking system, etc.

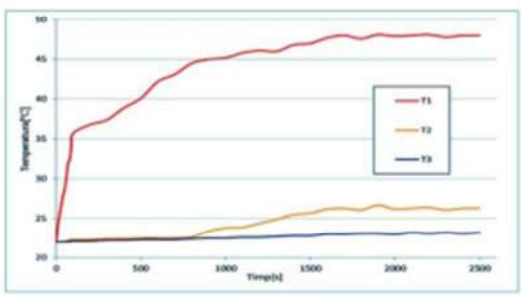


În cazul galeriei de admisie din aliaj de aluminiu se recomandă implementarea unui deflector termic din polietilenă expandată multistrat sau un strat termoizolator denumit S.P.T.I. (silicone polyurethane thermo-insulating) care oferă protectie subansamblurilor solicitate termic.









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air power by corneliu
www.corneliugroup.ro

Experimental installation for testing brake pads for successive braking

Author: **Pinca-Bretotean Camelia**

The experimental installation aims to carry out experimental research in order to test ecological friction materials designed to make brake pads for small and medium vehicles. The installation consists of the following components: electric motor with power of 2.2 kW and speed of 2950 rpm, gearbox, belt drive, vacuum pump with membrane, planetary shaft, hub, pivot, brake disk. Vacuum pump training is carried out by a trapezoidal belt transmission. The drive belt was fixed to the planetary shaft by a non-demountable mounting and the driven belt is fixed to the vacuum pump mechanism by a removable mounting with screws. Two couplings have been made for the mechanical transmission, one connecting the electric motor to the reducer and other linking the output shaft between the gearbox and the planetary shaft. The speed variation allows the speed to be changed from 0 to 200 rpm. The principle of experimental determinations implies ten successive brakes and the results obtained allow the evaluation of the behavior of ecologic friction material tested.

Description of steps of the experimental determination:

- The brake disc is mounted on the experimental installation;
- Install the brake pad to be tested;
- The experimental installation is started;
- Ten successive brakes are performed, measuring the temperature at each brake with a thermography device;
- The temperature rise is determined between two successive brakes, respectively between the first and last braking;

Observation: Captured images provide information about the evolution of the temperature in the contact area between the brake pad and the brake disc.

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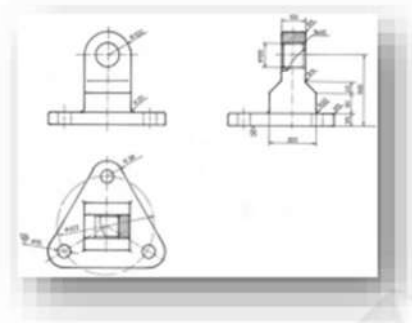
Research on the influence of moulding-casting technology on the quality of castings

research project

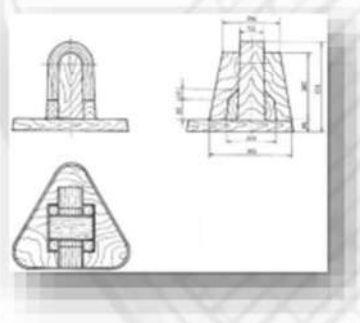
Authors: **Josan Ana, Pinca Bretotean Camelia, Rațiu Sorin, Ardelean Erika, Ardelean Marius**

The quality of castings has a particularly role in the Romanian foundries. In this context, quality assurance is the overall objective of the foundries. The critical analysis performed on moulding-casting technology of the type *Lifting mechanism* is presented. This casting is a subset of the lifting and rotating mechanism of the furnace vault. The casting analysed is a medium size, with weight of 114 kg. The current moulding-casting technology involves moulding into three mould-parts leading to the occurrence of defects (decentering of the core, displacement of the lower mould and the middle mould and occurrence of burrs in area separated. Thus, to reduce the percentage of defects registered in industrial practice is necessary to change the moulding-casting technology. Thus, to reduce the percentage of defects registered in industrial practice is necessary to change the moulding-casting technology.

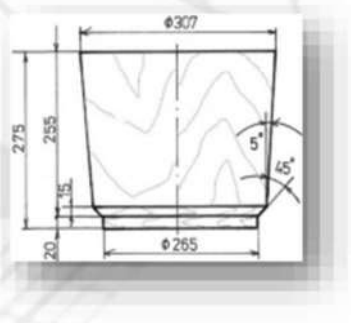
This requires the use of two mould-parts, re-dimensioning of the core and the core box and dimensioning of the runner network. The adoption of these changes in industrial practice has direct implications on the cost of casting and foundry costs default.



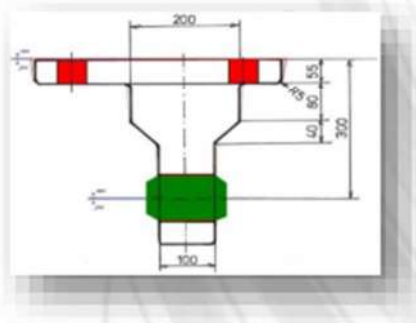
The finished piece design



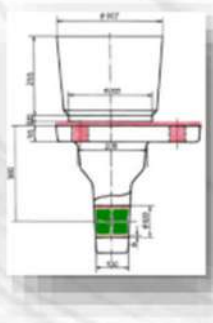
The wooden pattern of casting



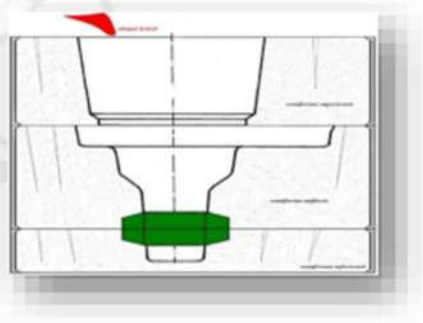
The center riser pattern (made of wood).



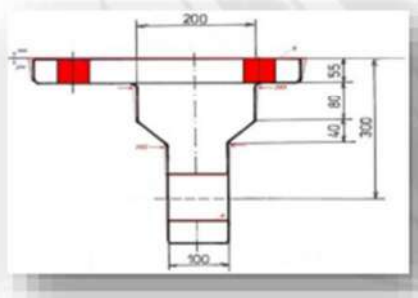
Placing the core on technological design



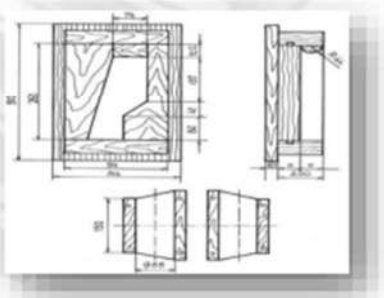
Placing the center riser on the technological design



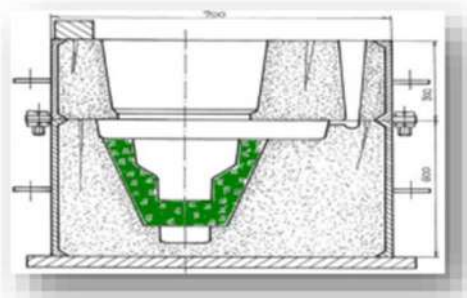
The assembled moulds for casting



The separation plane



The core box – modified



The assembled mould for casting

Application in industrial practice of all the technological method applied lead to the decrease the percentage of rejects registered from 13% to about 4%. This aspect has a positive influence in castings costs respectively in the company costs.

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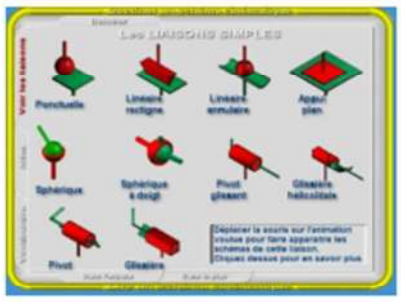
Development and implementation of an interdisciplinary virtual laboratory-classroom

research project

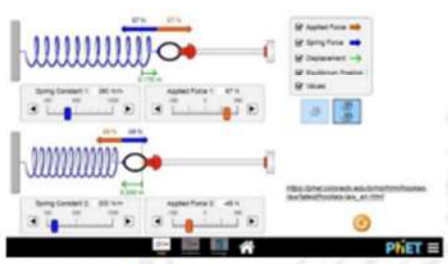
Authors: **ALIC Daniela Delia , RACKOV Milan**

Politehnica University of Timisoara, Faculty of Engineering Hunedoara, Romania
University of Novi Sad, Faculty of Technical Sciences, Serbia

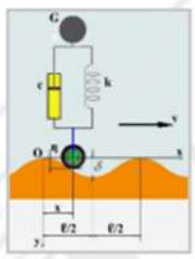
The project is focused on the development of an interdisciplinary virtual laboratory-classroom, based on the multimedia potential as learning and teaching tool. Currently operational in our faculty, the laboratory is dedicated to our students, future mechanical engineers, who have the opportunity to use, via internet or face-to-face, innovative and advanced educational software solutions.



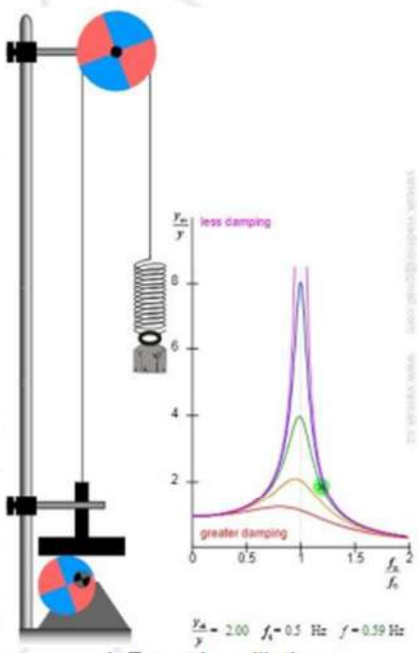
a. Educational software *SCHEMATRICE*
(source https://eduscol.education.fr/sti/ressources_pedagogiques/schematrice)



b. Hooke's Law
(source https://phet.colorado.edu/)

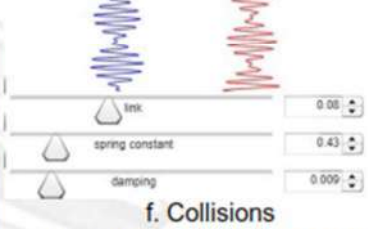


c. 1DOF model car suspension

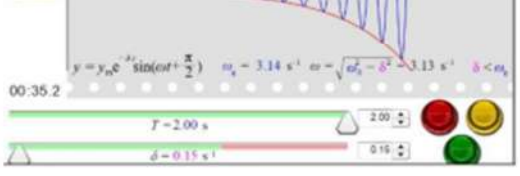


d. Forced oscillations
(source https://www.vascak.cz/)

e. Educational software *Mechanics of Deformable Solids4.1.0*
(source http://www.mdsolids.com ; https://web.mst.edu/~mdsolids/)



f. Collisions
(source https://www.vascak.cz/)



g. Damped oscillations (source https://www.vascak.cz/physicsanimations.php?l=en)

Figure 1 a-g. Teaching resources used in the virtual laboratory-classroom. Java Applets. Animations. Educational software

Conclusions:

The most important benefit provided by multimedia resources can be considered the interactivity. Results of surveys indicate that the use of multimedia educational software in the virtual laboratory-classroom was extremely well received by our students and helped in understanding the training material in mechanical engineering subjects.

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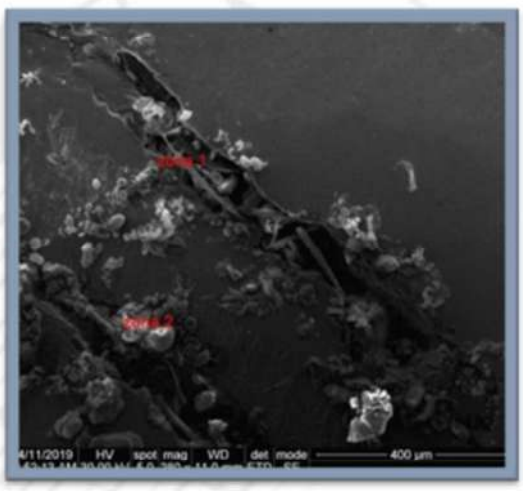
Non-metallic inclusions in steels intended for the automotive industry

PhD Thesis

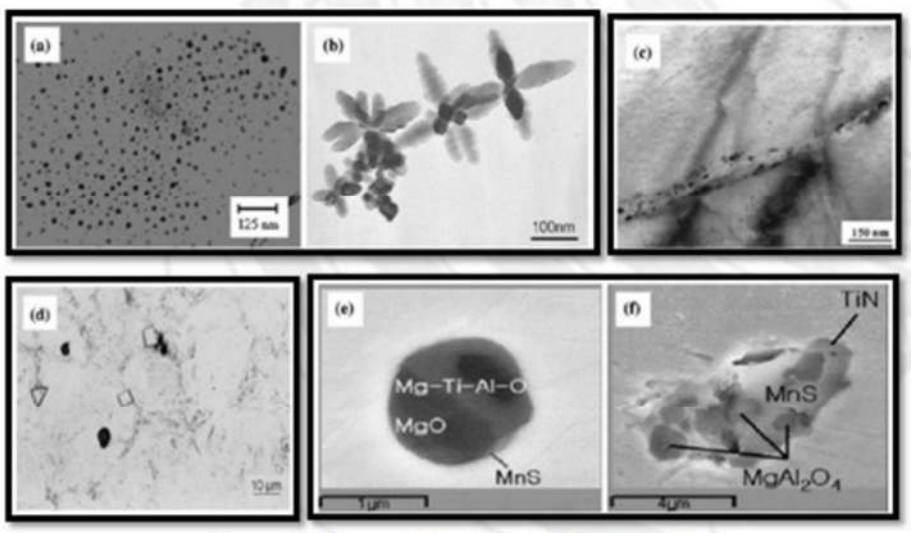
Authors: Poenaru Iulia Olivia, Popa Alina-Maria, Ana Virginia Socalici, Adina Budiul-Berghian, Corneliu Birtok Baneasa

Performantele deosebite în exploatare ale oțelurilor microaliate cu titan, vanadiu sau niobiu sunt determinate de compoziția chimică, puritate avansată si adaosuri mici de elemente de aliere în scopul finisării granulaţiei şi îmbunătăţirii proprietăţilor mecanice respectiv prin aplicarea unor tehnologii moderne de laminareşi tratamente termice.

În lucrare, se prezintă rezultatele cercetărilor industriale efectuate cu privire la microalierea cu titan a oțelurilor destinate fabricării țevilor cu pereți groși.



Analiza SEM a probelor experimentale, 280x
SEM analise of experimental tests, 280x



Exemple de precipitate în oțeluri microaliate
Examples of precipitates in microalloyed steels

a) precipitate de AlN sferice; b) nituri cruciforme de Ti sau V, apărute după recoacere la 1100°C; c) carburi de Tis au Nb precipitate pe limite de grăunte; d) nitrura cubică de Ti; e,f) precipitate multiple apărute prin nucleere eterogenă

Outstanding performance in development of microalloyed steels with titanium, vanadium or niobium are determinated by the chemical composition, advanced purity and small additions of alloying elements in order to finish the granulation and to improve the mechanical properties, but also by modern laminations technologies and heat treatments. In this scientific study, are presented the results of the industrial researches regarding the titanium microalloying of steels that are destinated to manufacturing of thick-walled pipes for the automotive industry .

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Experimental determination of filtration efficiency for porous ceramic cabin filter prototype

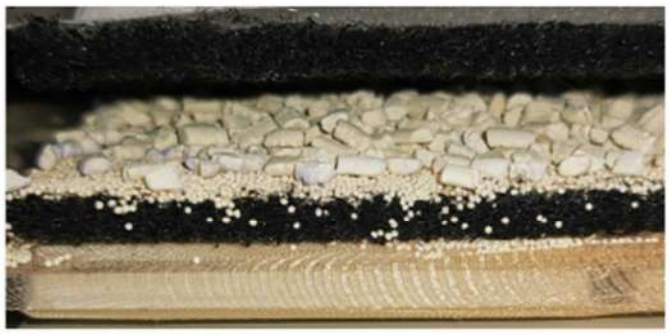
PhD thesis

Authors: Robert Bucevschi, Ana Virginia Socalici, Adina Budiul-Berghian, Corneliu Birtok Baneasa

This project presents the results obtained from the experimental analysis of the filtration efficiency for two prototypes of full ceramic cabin filters. The innovation presented by these concepts is the exclusive use as a filtration medium of a combination of porous ceramic materials. The project also presents the influence of the granulation of the ceramic filtration medium on the pressure drop and the filtration efficiency.

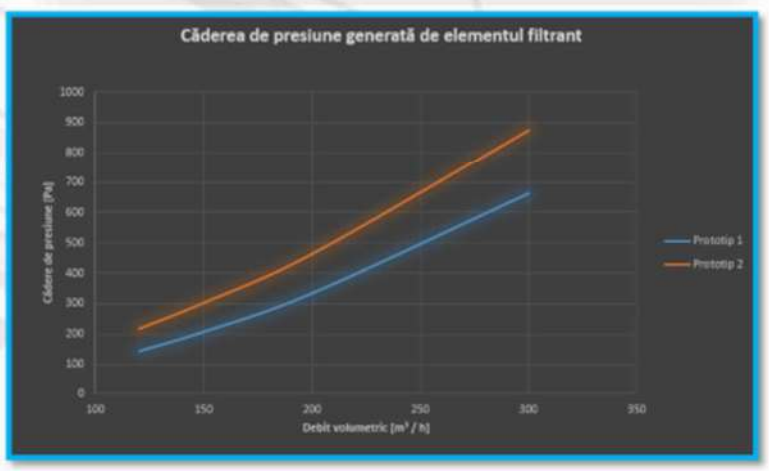
The analysis presented is part of the development process carried out within the doctoral research supported by the author.

Element de filtrare
Prototip nr. 1



Element de filtrare
Prototip nr. 2

Stand de testare Topas PAF113
Utilizat in determinare căderii de presiune și cuantificarea capacității de retinere a elementelor fintrante



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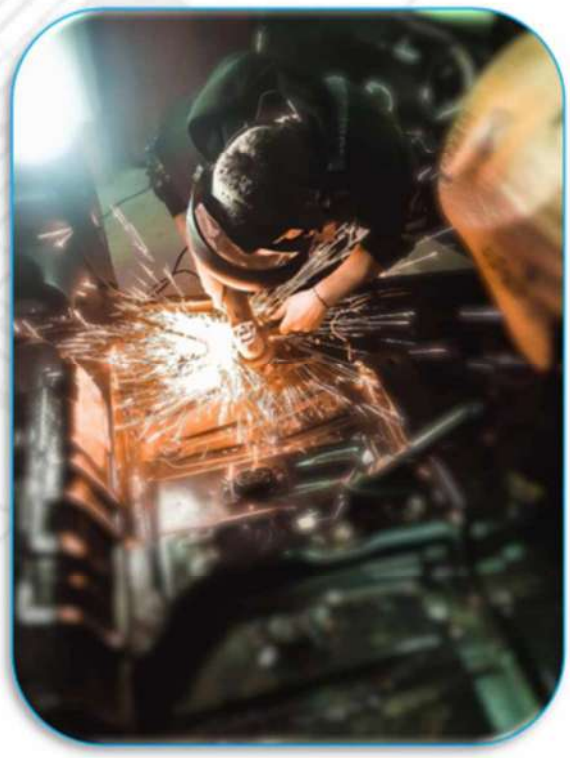
Puma AIR by CORNELIU

Educational program

Authors: Corneliu Birtok Baneasa, Adina Budiul Berghian, Diana Stoica, Oana Gaianu, Alin Stoianov

Puma AIR by CORNELIU is a project realized by the FIH-UPT students through the educational program Dexter's Laboratory.

The goal is to transform a street car into a sports car in order to participate at specific competitions.



The materialization of the project involves the design within the student diploma works by approaching the various necessary modifications: reducing weight, increasing body strength, implementing a roll cage, improving braking efficiency, increasing engine power etc.

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air power by corneliu

Increase of weld strength by micro alloying for HSLA steel

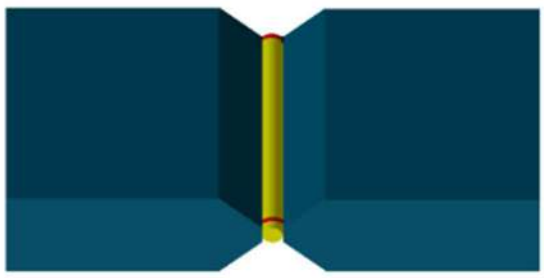
PhD Thesis

Author: Laurentiu Zgripcea, Teodor Heput

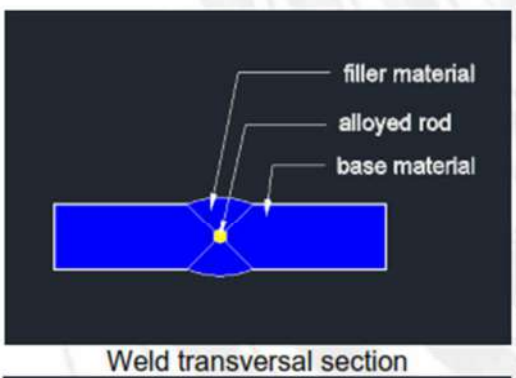
For special repairs of steel armors, standard welding cannot assure the strength required in normal exploitation. This is a safety requirement and cannot be minimized. As example repairs of armored vehicles, digging shovels for excavator or heavy machineries wearing plates.

The common elements of these steel grades are equivalent carbon which is much higher than ordinary steel grades. For this reason, special precaution must be taken during welding
and special techniques also.

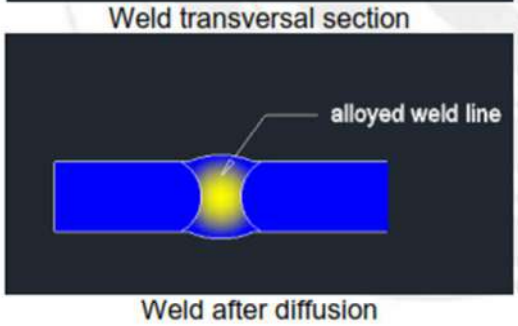
The new idea is to use a superalloyed cold wire, positioned in the welding center which will diffuse during the welding in the whole joint section.



Position of the superalloyed wire



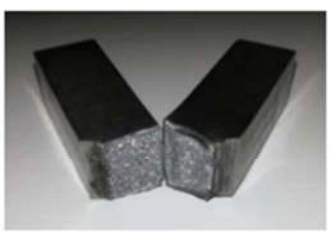
Weld transversal section



Weld after diffusion

Typical aplication of wearing plate repair

Aspect of high resilient weld



Aspect of non-conform fragile weld

Special welding using superalloyed wire and effect of weld microalloying is tested at impact, using Charpy machine. The sample must absorb higher energy and aspect of the breakage must be resilient, without fragility.

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A new dimension in the understanding of human perceptions using View Point System and Captiv L7000 Premier technology

PhD thesis

Authors: **Popa Mihaela, Mutu Robert Marian**

The heart of View point system is the VPS 16 glasses. These Eye Hyper-Tracking glasses with stereoscopic cameras in the nose bridge enable for the first time like spatial plane in which the user is looking to be precisely determined.

Added to this is the outstanding light immunity, which allows for reliable results even outdoors and under suddenly changing lighting conditions. The corrective power of the glasses can also be adapted to the wearer, and the eye tracking glasses can be comfortably worn with contact lenses. With the very short calibration time compared with other options, the glasses can be quickly adapted to the wearer and made ready for use. Once calibrated, the Eye Hyper-Tracking glasses can be used again and again for hours at a time – comfortably and unobtrusively.

CAPTIV-L7000 Premier is a flexible research software for the synchronization of video and measurements from sensors and interfaced third-party hardware and measurement devices, including advanced analysis and processing features.

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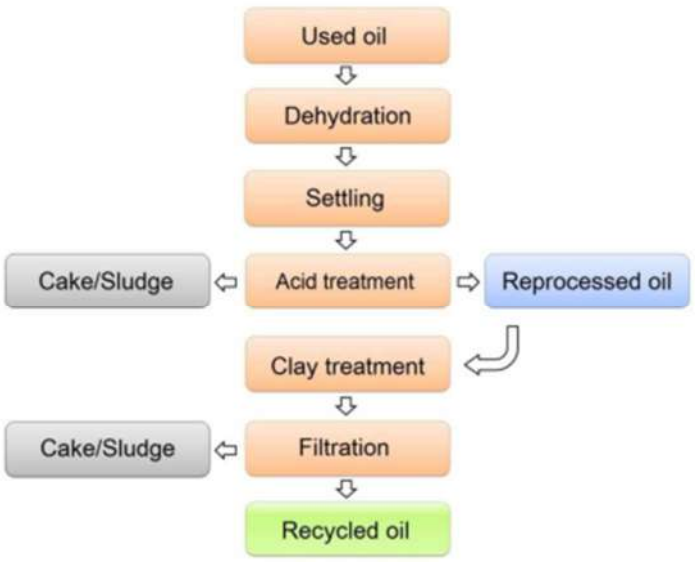
Study on the recycling methods of used engine oil

student project

Author: Diana Miruna Armioni

The study presents an overview of the main technologies for recycling used engine oil, as well as a comparative analysis of the impact of these technologies on the properties of recycled oil. The aim of this research is to highlight the importance of proper management of this type of hazardous waste.



Block diagram of the acid/clay recycling method

Overview of the used engine oil recycling process

The best known such methods are: acid/clay treatment, solvent extraction, vacuum distillation and clay treatment, vacuum distillation and hydrogenation process and membrane filtration technology. Each of these techniques has a number of advantages and disadvantages, from an economic point of view as well as environmentally, depending on its specifics. The acid/clay method is no longer encouraged globally because it generates toxic waste, but other technologies (solvent extraction and vacuum distillation) are developed industrially in different countries and are in a continuous process of improvement.

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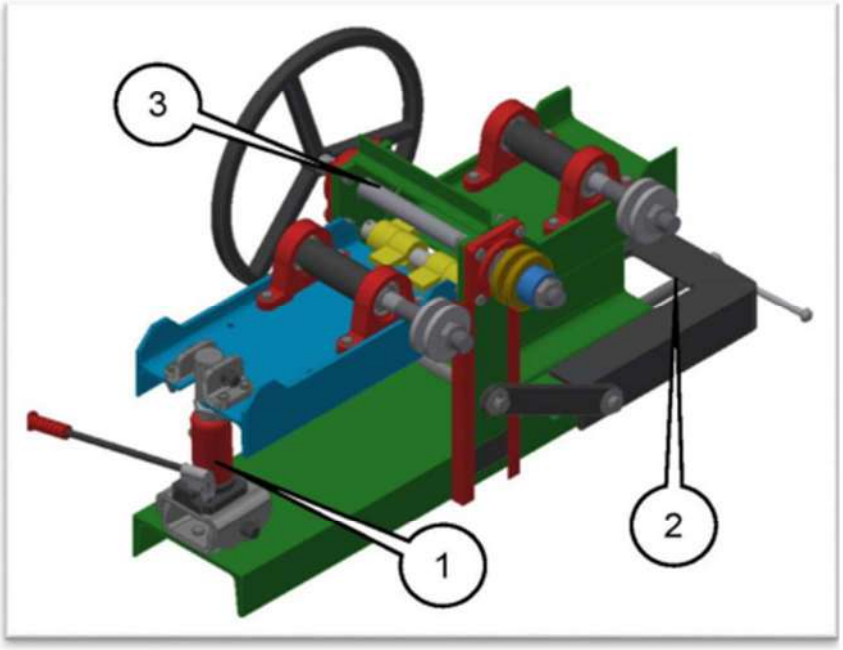
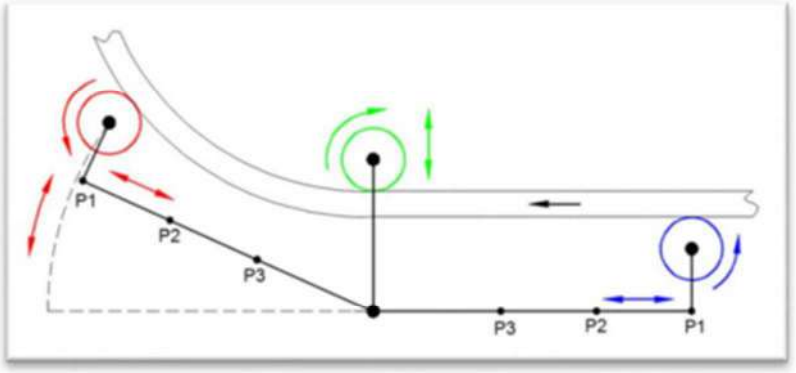
Dispozitiv de roluit bare

Bar rolling device

CIOROAGĂ Bogdan-Dorel, CIOATĂ Vasile George, ALEXA Vasile





Schema de funcționare / reglare

Componență:

(1) Mecanismul de reglare a gradului de deformare acționat prin intermediul cricului hidraulic;
(2) Mecanismul de reglare a poziției pe axa verticala a rolei motoare;
(3) Mecanismul de acționare a rolei motoare.

Caracteristici:

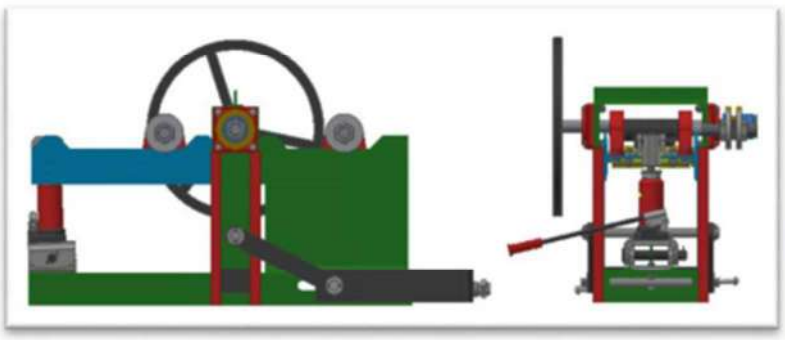
Dispozitivul de roluit bare este utilizat la curbarea controlată a barelor drepte, indiferent de profilul acestora.

Dimensiuni de gabarit: 1365 x 824 x 948 mm.

Acționarea este manuală.

Corp cu construcție rigidă, din profile laminate, îmbinate prin sudură.

Utilizabil în atelierele de confecții metalice.



Characteristics:

The bar rolling device is used for the controlled bending of straight bars, regardless of their profile.

Overall dimensions: 1365 x 824 x 948 mm.

The operation is manual.

Body with rigid construction, made of laminated profiles, joined by welding.

Usable in metal workshops.

The device has 3 main mechanisms:

(1) The mechanism for adjusting the degree of deformation operated by the hydraulic jack;
(2) The mechanism for adjusting the position on the vertical axis of the drive roller;
(3) The drive mechanism of the drive roller.

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Antik

"*Energy Tree*"

Student project

Authors: Sapta Doru Ioan, Marinut Gabriel Paul, Obrenovici Lavinia Ioana, Golcea Julia Daiana, Strugaru Dragos
Coordinator: Corneliu Birtok Baneasa

Stația de încărcare **Antik** "**Energy Tree**" este un dispozitiv multifuncțional bazat pe energie regenerabilă cu scopul de a remedia problema cetățeanului modern care de multe ori când este în spațiul public ajunge în situația de a fi nevoit să își încarce dispozitivul mobil, dar acesta nu are acces.

Acesta este construit din materiale rezistente indiferent de condițiile meteo, cu diferite tehnologii moderne pentru a oferii utilizatorului său o experiență cât mai plăcută.

Antik Energy Tree are ca scop să crească autonomia dispozitivelor mobile, să ofere ergonomie toate într-un design **Eco-Friendly**

The Antik "Energy Tree" charging station is a multi functional device. Based on renewable energy in order to fix the problem of the modern citizen who often when is in the public space ends up in the situation of having to charge his mobile device, but has no power source.

It is made of durable materials regardless of weather conditions, with various modern technologies to offer its user a pleasant experience. Antik Energy Tree aims to increase the autonomy of mobile devices, and to provide ergonomics in an **Eco-Friendly** design

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Antik

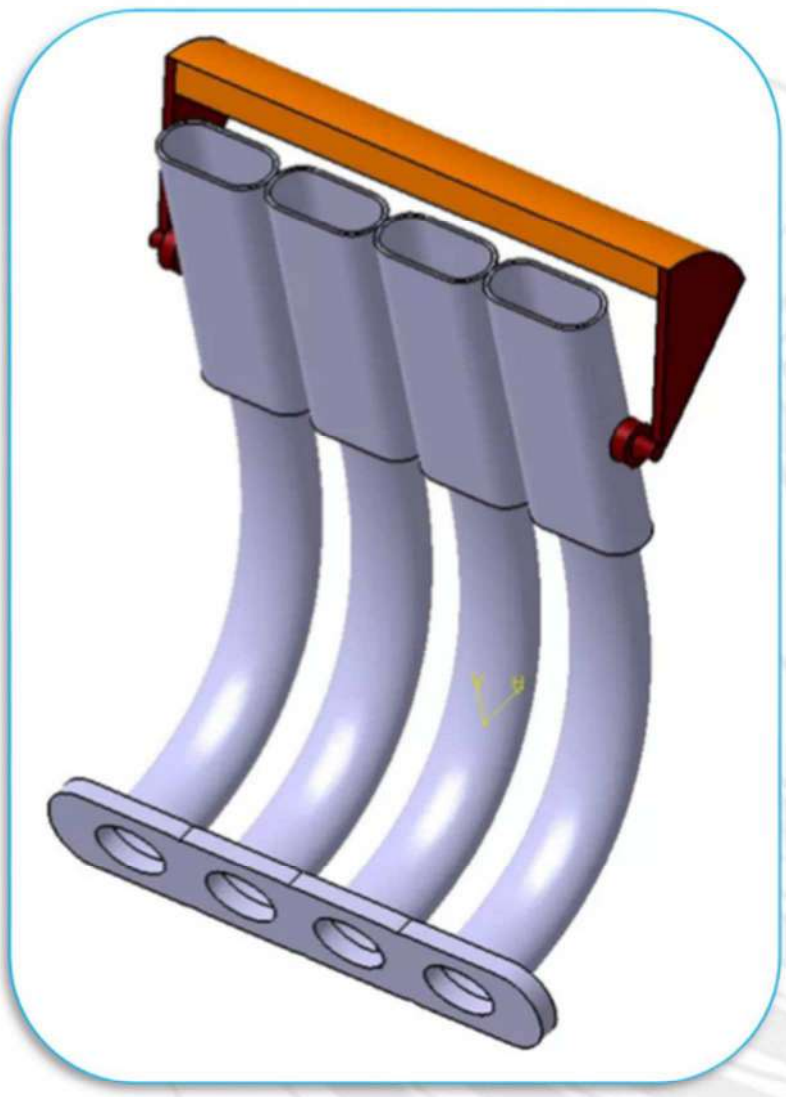
Adaptive exhaust cover Air by Corneliu

Authors: Marinut Gabriel Paul, Sapta Doru Ioan, Golcea Julia Daiana, Obrenovici Lavinia Ioana, Strugaru Dragos
Coordinators: Birtok Baneasa Corneliu, Budiul-Berghian Adina

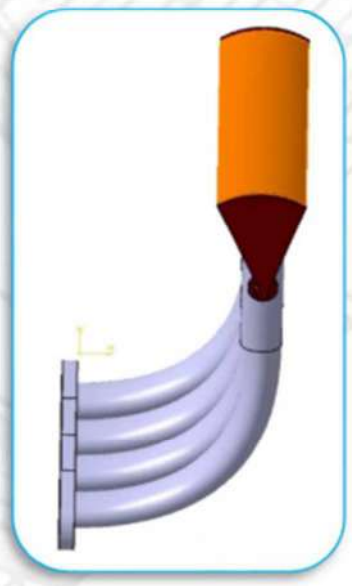
Adaptive exhaust cover (AEC) is a device for competition engines equipped with dynamic exhaust systems, especially the Air by Corneliu type.

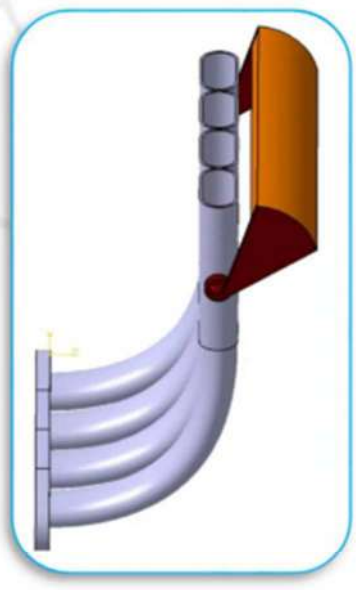
AEC este un dispozitiv destinat motoarelor de competiție echipate cu sisteme de evacuare dinamice, în special de tipul Air by Corneliu.

Implementarea AEC împiedică pătrunderea în sistemul de evacuare dinamic a particulelor solide (praf, nisip, frunze) sau apă când motorul este oprit.



The implementation of AEC prevents the entry into the dynamic exhaust system of solid particles (dust, sand, leaves) or water when the engine is stopped.





AEC has a smart control unit that allows it to operate according to the following parameters: temperature, humidity, wind speed, light intensity etc.

AEC are o unitate de control inteligentă care îi permite să funcționeze în funcție de următorii parametri: temperatura, umiditatea, viteza vântului, intensitatea luminii.

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Experiments on the wear of ball mill armor

PhD thesis

Author: **Teodor VASIU**

The study analyzes the wear behavior of armor execution materials in an experimental ball mill Ø700 × 700 depending on the parameters of the mechanical regime and also the wear of the metal lining of an industrial mill.

For experiments, a number of ten stages of experimental mill operating regimes were proposed. At each stage, the wear behavior of some armor materials was monitored, namely for: the supply and the exhaust cover - manganese steel, Relon P type polyamide (only for feeding), sormait, 5HNSV steel (GOST 5950/73) and Fc300 cast iron; body mill - OLC45 and sormait. The thickness of the layer lost by wear was measured with a Krautkramer Branson DME-DL ultrasonic device with a measuring accuracy of 0.01 mm.

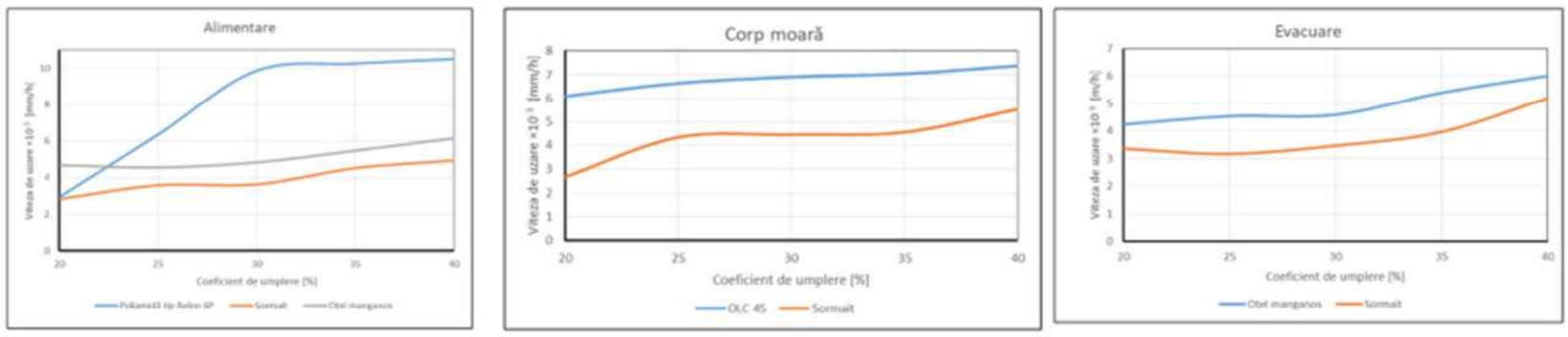

Figure 1. Variation of average linear wear rate as a function of filling coefficient at relative speed 33%

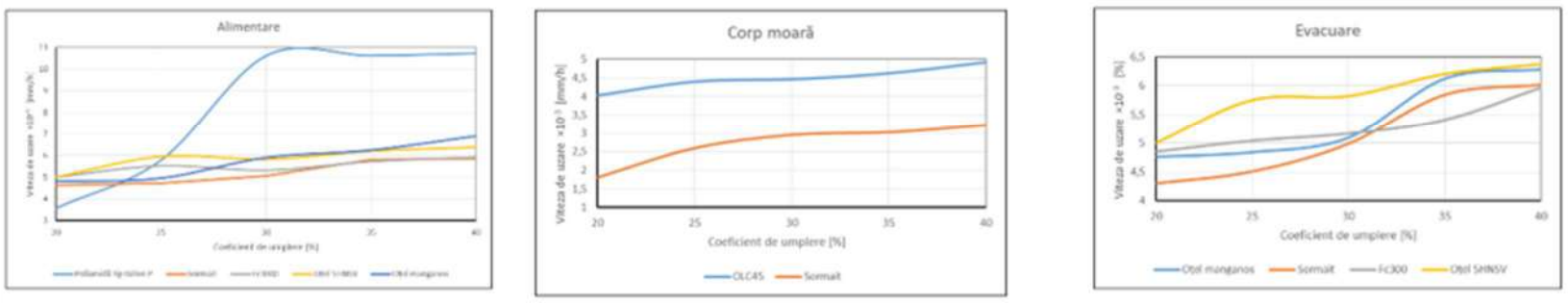

Figure 1. Variation of average linear wear rate as a function of filling coefficient at relative speed 80%

Graphical representations of the dependence of the average linear wear speed as a function of the mill filling coefficient, for the relative speeds of 33% and 80% respectively (Figures 1 and 2) show that the shields plated with sormait, both those at the ends and those at on the mill body, they have the lowest wear speeds. This finding led to the study of this material in a mill Ø2700 × 3000 in operation.

- Relon P type polyamide, with all the advantages of a low specific weight and low cost price compared to metallic materials, has low wear rates only at filling coefficients of approx. 20%, which is not recommended for the manufacture of shields on the supply side.
- The wear rates of the end shields are increased if the mill speed increases; this is because the relative sliding speeds in the points of contact between the armor and the load increase, which leads to the intensification of tribological processes in those areas.
- At high bars, their wear rates decrease as the mill speed increases, as the movement of the balls changes. If at the relative speed 33% is characteristic the rolling regime, at the relative speed 80% the ball regime is throwing, the relative sliding armor-load being lower.

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CLOS DRESS

Authors: Albescu Corina, Tîrnăvean Alexandru Adrian

Student project 2020001R/13.08.2020

Rochița în clos este o ținută versatilă, având croiul perfect pentru orice tip de siluetă și înălțime, ceea ce îți conferă o libertate de mișcare. Rochița în clos e realizată din materiale vaporoase, cum ar fi voalul, iar talia este pusă în evidență de o curelușă delicată. Această rochiță trei sfert se închide la spate cu un năsturel tip perlă, având un decolteu tip barcuță. Iar pentru că albul si negrul nu se demodează niciodată, poți miza oricând pe combinația acestor două culori.

The kirtle dress is a versatile fit with the club perfect for any form of silhouette and height, giving you freedom to move. The kirtle dress is made of ships, such as the veil, and the waist is exposed by a delicate strap. This three-quarter dress is closed behind with a pearl-type button, with a boat neck-neck. White and black never gets fashioned, you can always rely on the combination of these two colors.

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Mobile Pavilion for Rainwater Collection

Phd.eng. Pisleaga Mihaela[1], MAA Arch. Gabriel Aranda[2], Phd.eng. Cristina Capotescu[3]
Polytechnic University of Timisoara, [2] Glomad, [3]Aquatim
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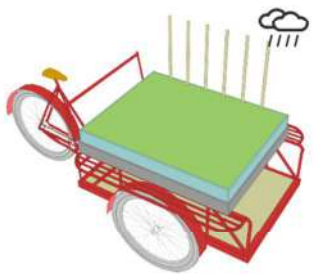
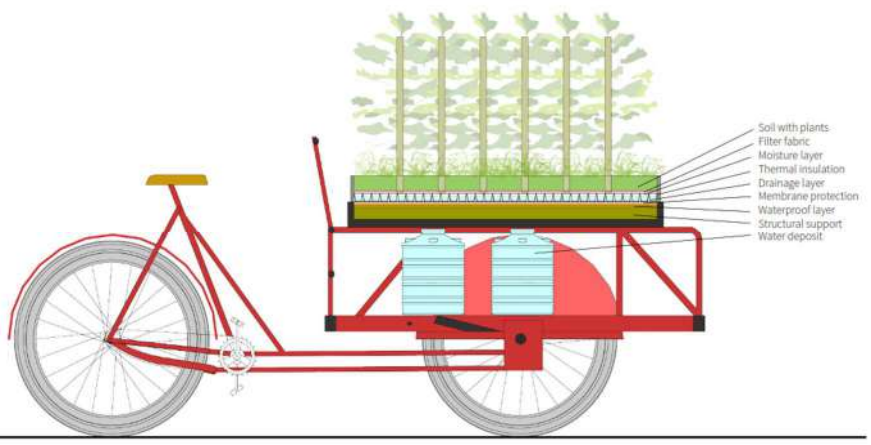
Novelty & Usefulness

In this period of population growth and in which we can observe the impact of climate change through extreme events, we must, more than ever, take care of natural resources that are not inexhaustible. Rainwater harvesting is used as a way to save money and as a way to take care of the environment. In this context, rainwater harvesting is the easiest way to educate the population about adapting to climate change. Thus, through this mobile rainwater collection stand we propose green solutions for residential buildings (roof, walls) that sensitize the population, understanding the importance of caring for resources, in this case water.

Low cost design

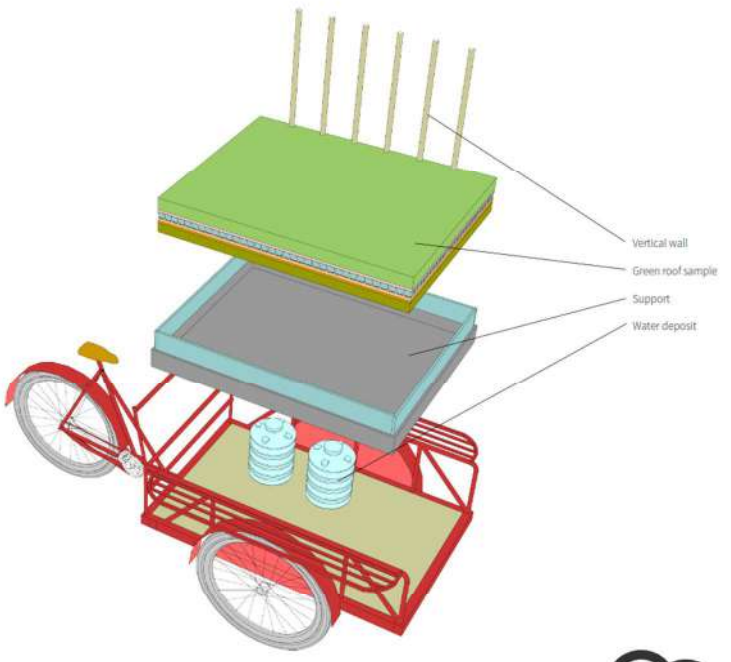
Green roof meets public. The main idea is to adapt a regular 2 wheels bicycle into a cargo bike, 3 wheels. After to adapt a 1 x 1 meter sample of a green roof, and 60 cm height green wall, including all the necessary pipes and water deposit(s), in order to show how all the elements works together. The installation will provide all the necessary information regarding the function of a green roof and wall. Will be an interactive experience between the city dweller and the buildings, promoting good praxis and awareness related with rainwater.





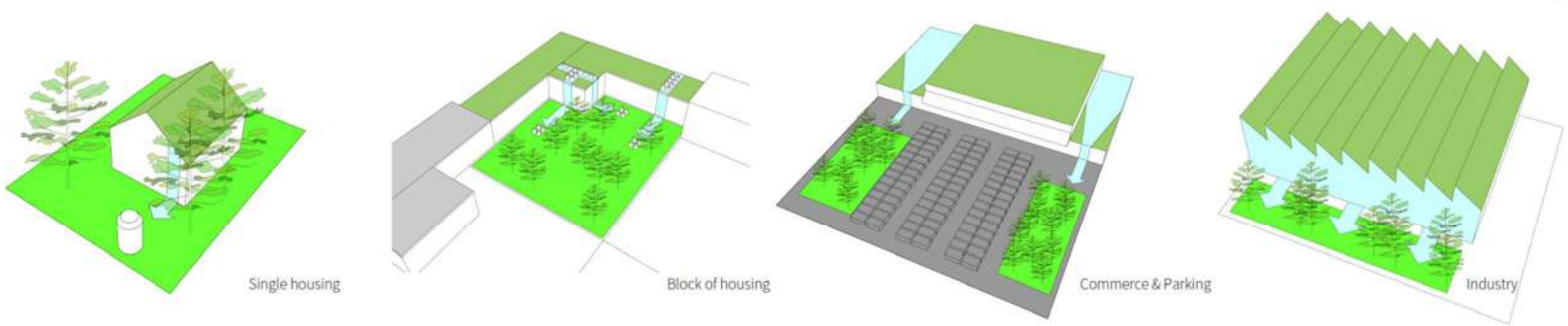
Social and economic impact

The mobile pavilion has a design that allows placement in public areas without the need for additional fees. In this case, the pavilion will be located in the space of the Faculty of Civil Engineering Timisoara, so that students understand what solutions exist for rainwater collection. In the future, as engineers they will have the ability to understand the importance of green roofs in buildings, especially since there are countries where the legislation imposes the obligation to build green roofs and it is possible that the legislation requires this in Romania.



Market opportunities

The construction of green roofs, for buildings, as a solution to adapt to climate change is a current issue, in some countries the legislation still does not clearly specify this aspect. But this is the future, we need green spaces in the urban area and green roofs, for buildings is a solution. The team includes two engineers and an architect, and the market opportunities part consists of consulting on the design and execution of green roofs for new and old buildings.



Universitatea Politehnica Timişoara

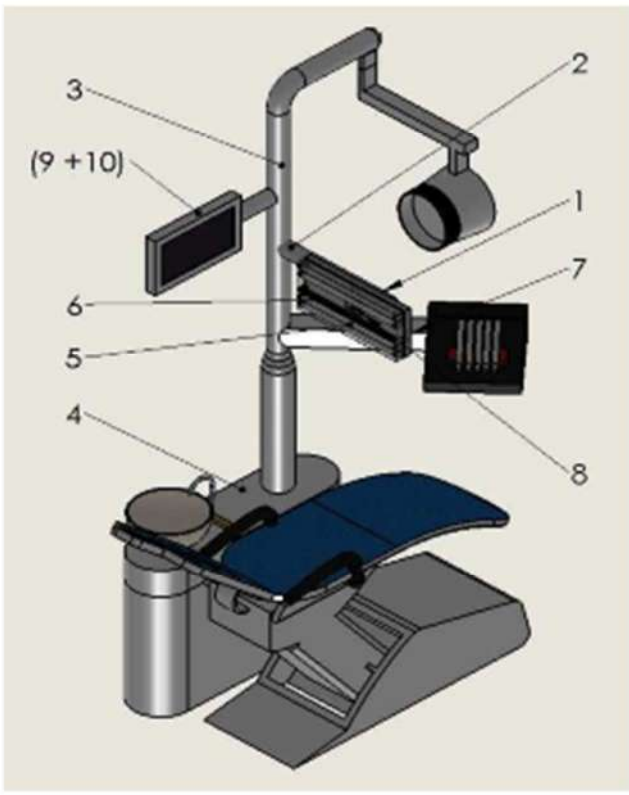
ELECTRICAL LIGHT INSTALLATION FOR DENTAL ESTHETICS

U/00018 28.04.2017

autori: Pavel Ştefan, Krems Cristina, Mocan Marian Liviu, Doboşi Ioan Silviu

DESCRIPTION

The invention relates to a fixed electrical lighting installation used in the dental cabinets which provides illumination to the dental area of the patient, illumination which is very close to the daylight parameters. The installation is made up of a mobile metal body made from a mirror coated inoxidable steel, attached to the dental pillar unit, in which 5 lamps with the true color rendering index are mounted, 97 Ra8 and the color temperature of 5300^{0}Kelvin, a black light type of lamp, and between the lamps is mounted a camera connected to a computer with the monitor fixed (optionally) on the dental pillar unit.



ADVANTAGES:

- **Ensures transparency in the incisal zone of the teeth;**
- **Ensures an illumination very close to the daylight parameters on the dental work area ;**
- **It ensures that the teeth are photographed with an illumination very close to the daylight parameters before and after the medical procedure of dental aesthetics;**
- **It ensures a better color setting in dental aesthetics.**

EUROINVENT
13th European Exhibition of Creativity and Innovation
Iasi, Romania, 20-21 May 2021

EURO INVENT

Universitatea Politehnica Timişoara

INSTALLATION FOR THE EVALUATION OF THE MAGNETIC FIELD EXPOSURE EFFECTS

A/ 00336/15.05.2018

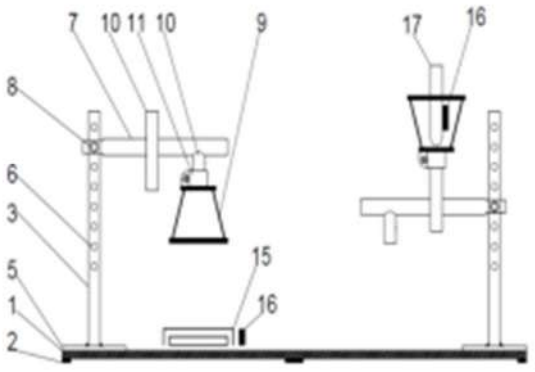
authors: Pavel Ştefan, Lupa Lavinia Afrodita, Mocan Marian Liviu, Ungureanu Daniel-Viorel, Doboşi Ioan Silviu, Moldovan Aurel, Simina Alina Georgiana, Bînzar Alexandru, Suciu Silviu Cristian

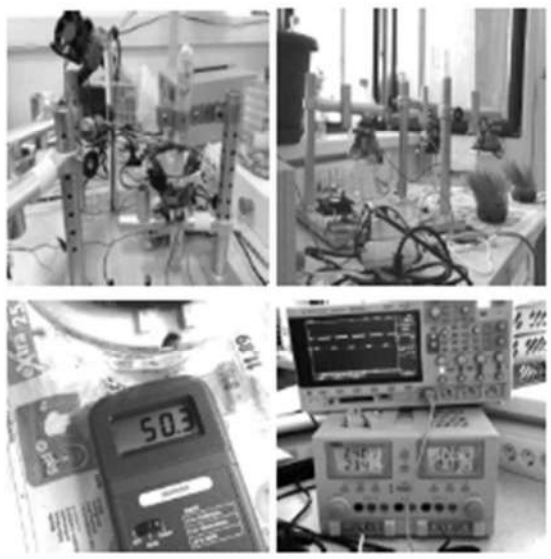
DESCRIPTION

The invention relates to an installation which can be used to evaluate the effects of a oscillating, pulsed, low frequency magnetic, 20÷70 Hz, and adjustable intensity on the cells of a biological sample: extracted tissue, organic fluid, living organism, seeds. The installation according to the invention consists of a support plate on which at least two perpendicular supports are positioned, depending on the number of workstations required to perform the study.On each arm attached to the support it is fixed an inductance, which can be positioned and fixed both in perpendicular plane for approach or distancing of the work sample so as to obtain the desired intensity of the magnetic field, as well as horizontally plane by sliding or (and) by rotation on the mounting support in front of the studied sample. The adjustable power source is controlled by a scheduler and connected to a variable frequency rectangular pulse generator.

ADVANTAGES:

- **Ensures the possibility of performing experiments under controlled exposure conditions;**
- **Allows evluation of the effects of a low frequency magnetic field, 20 ÷ 70 Hz, on the sample cells under specific exposure conditions;**
- **It is a compact, unitary, portable investigation tool and it doesn't require any auxillary measuring and recording equipment;**
- **It provides flexibility in configuration, depending on the investigation needs, simplicity and safety in operation.**





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13th European Exhibition of Creativity and Innovation
Iasi, Romania, 20-21 May 2021

Universitatea Politehnica Timişoara

EARTHING ELECTRODE WITH CORROSION RESISTANT CONNECTIONS

A/ 00757/28.09.2018

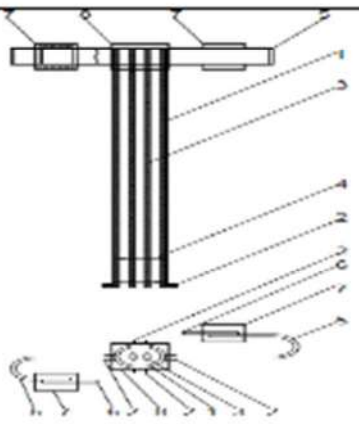
authors: Pavel Ştefan, Ungureanu Daniel-Viorel, Mocan Marian Liviu, Doboşi Ioan Silviu, Topală Florin-Ionel

DESCRIPTION

The electrode consists of some concentric tubes, an outer galvanized steel tube, and an inner galvanized steel tube joined to the bottom by welding with a plate, and at the top by a flattened metal plate in the shape of „S", so that the connections are made through the heads of the flattened metal plate through welding with the flattened horizontal metal plate of the earthing installation. The connection are covered with bitumen inside a plastic corrosion protection box and the top of the electrode assembly, the connection area between the electrode's flattened metal plate, and the horizontal earthing installation flattened metal plate has and access zone for periodic checks and measurements.The externally galvanized steel tube provides, at a limited length, at least 4 equidistant longitudinal grooves that allow the material of the tube so that on said tube some wings materialize, transversely on its axis, in the form of a rosette, which defines a larger contact surface of the galvanized steel tube with the soil.

ADVANTAGES

- ***Allows a better contact with the soil;***
- ***Provides through a lower electrical resistance, a better passage and dissipation of the lightning surge through the soil ;***
- ***Provides anticorrosive protection for the horizontal earthing flattened metal plate joining pieces***
- ***Ensures a simpler assembly work so that the possibility of friction with the soil is removed, implicitly the removal of the zinc coating.***



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Iasi, Romania, 20-21 May 2021

ELECTRICAL INSTALLATION FOR AIR AND SURFACE DISINFECTION FROM THE PUBLIC TRANSPORT

U/ 00024 24.06.2020

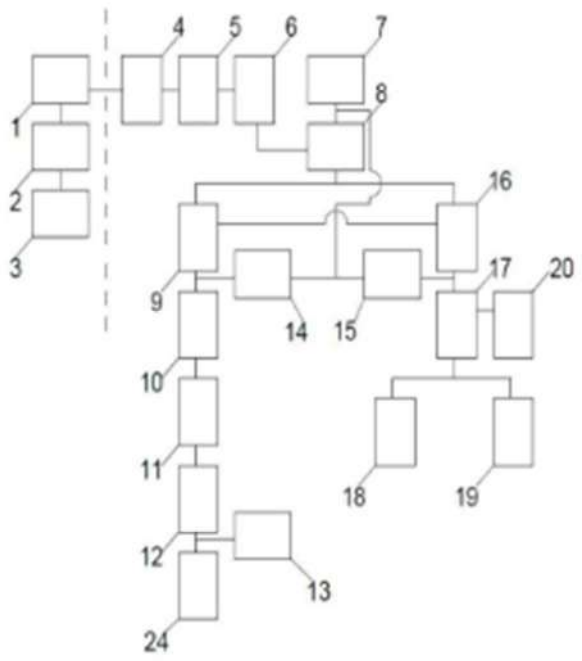
autori: Pavel Ştefan, Ungureanu Daniel-Viorel, Bînzar Alexandru, Tutelcă Ancuţa Letiţia, Suciu Silviu Cristian, Popoiu Călin Marius

DESCRIPTION

The technical problem which is solved by the invention, consists in realization of a fixed electrical installation which is used for surface and air disinfection with UVC ultraviolet radiation from the public transport, mounted on the ceiling of the transportation vehicle, powered by the electrical source of the public transport vehicle. The command of the disinfection installation can be executed manually or via Wi-Fi, from a predetermined distance

ADVANTAGES:

Being a fixed technical solution, located on the ceiling of the vehicle and powered by the electrical source of the public transport vehicle, compared to other types of similar solutions, for the same disinfection effect, it offers a lower manufacturing and operation costs. It uses three UVC germicidal lamps (26), two at the wavelength of 253.7 nm, and one at the wavenelgth of 183 nm [3], UVC radiation generators and ozone. The disinfection lamps are incorporated in an assembly protected by a slotted stainless steel with rhomboidal slots (perforations), expanded (successive "zig-zag" L-bends), with multiple reflection surfaces for the dispersion of the radiation into the device, for air disinfection, and into the exterior, onto the surfaces which necesits disinfection found inside the space of the public transport vehicle. The installation operates, disinfects the air and the surfaces, within 10 minutes, during the intended break of the tram driver or the bus driver, at the end of the public transportation vehicle route, place where the Wi-Fi transmitter is mounted and/or in the depot.



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INSTALLATION FOR REMOTE MONITORING OF CORROSION OF THE GROUND CONSTRUCTIONS COATED OR NOT WITH ZINC

U/ 00037 03.08.2020

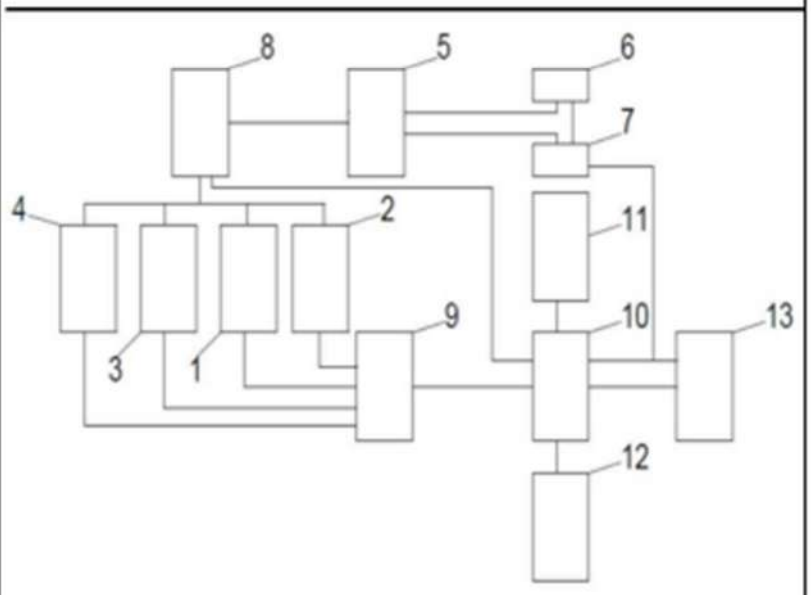
Authors: Pavel Ştefan, Ungureanu Daniel-Viorel, Bînzar Alexandru, Moldovan Aurel

DESCRIPTION

Installation for real-time remote monitoring of ground constructions coated or not with zinc. The technical issue solved by this invention, consists in making an installation for real – time remote monitoring of the coated or no coated ground metal constructions found at predetermined depths and data recording, transmission of the obtained data and archiving it.

ADVANTAGES:

- Ensures remote monitoring of the installation;
- Provides recording, saving, archiving and real-time data transmission;
- Provides remote control.



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EURO INVENT

ELECTRODE AND METHOD FOR FAST ELECTROCHEMICAL DETECTION OF ARSENIC(III) FROM AQUEOUS SOLUTIONS

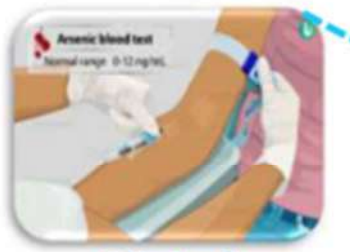
Florica MANEA*, Aniela POP, Anamaria BACIU, Adriana REMEȘ
Politehnica University of Timisoara, Romania, https://www.upt.ro
**e-mail: floricamanea@upt.ro*

Patent no RO 129026 B1, released on 30.10.2020

The invention refers to the elaboration of a n electrode and a method for the electrochemical detection of arsenic (III), known as a very toxic pollutant, from aqueous solutions. Also, the working electrode (WE) and the procedure can be applied both for the detection of other pollutants from water (*e.g.*, heavy metals, organic pollutants) and for other applications (*e.g.*, pharmaceutical analysis, food quality control and safety, clinical analysis).The problem solved throught this patent consists on the elaboration of a product and a process based on an electrochemical procedure for fast detection of arsenic (III) from aqueous solutions using an electrode made from relatively inexpensive materials, viable and exhibinting high electroanalytical performances as limit of detection, sensitivity, reproducibility, accuracy.

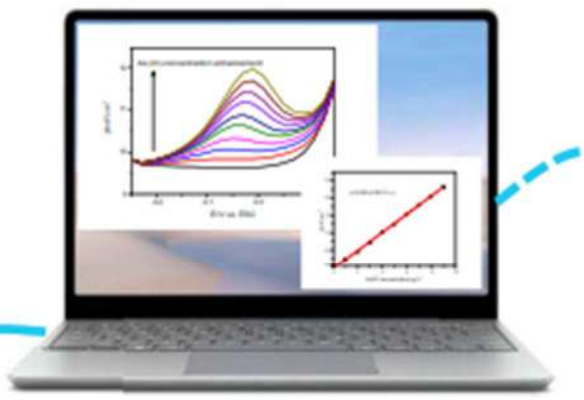

Environmental


Food

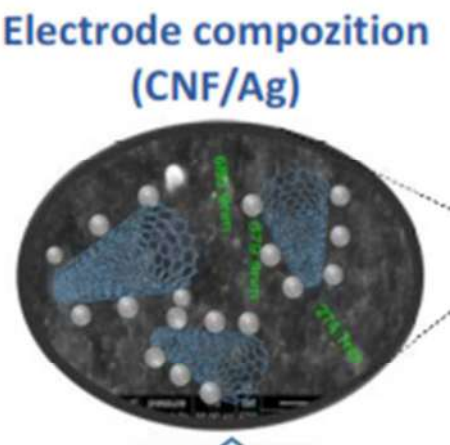


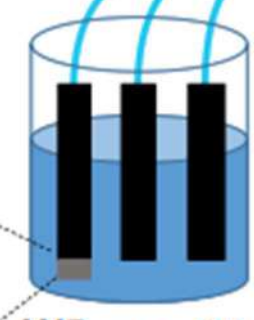
Clinical

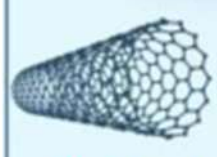
As (III)



Electrode compozition (CNF/Ag)






+ $Ag(NO_3)$

Electrochemical depozition

E = -0.4 V/SCE
t = 60 s

Square-wave voltammetry procedure

Step I. Cathodic reduction: $As^{3+}+3e^- \rightarrow As^0$
working conditions: - applied potential: -0.4 V/SCE
- time: 120 seconds

Step II. Anodic stripping: $As^0 \rightarrow As^{3+}+3e^-$
provides the electrochemical response corresponding to the detection of arsenic (III) at the potential of -0.01 V / ESC by square wave voltammetry application.

- The electrode and the procedure of fast arsenic (III) electrochemical detection from aqueous solutions according to the invention consists on using an electrode, called working electrode (WE), in an assembly together with a counter electrode (CE) and a reference electrode (RE), and based on the anodic stripping method and by applying the square wave voltammetry technique in the presence of a supporting electrolyte for the detection of arsenic (III) from a contaminated water through the electrochemical response of the working electrode in the presence of the target pollutant. The WE is a composite electrode obtained by carbon nanofibers dispersion in an epoxy matrix, followed by the electrochemical modification of the electrode surface with silver particles.
- The process and the electrode for rapid electrochemical detection of arsenic (III) in aqueous solutions according to the invention have the following advantages: very high electroanalytical performances (*i.e.*, limit of detection, sensitivity, reproducibility, accuracy), low costs of materials used for the working electrode construction, long life use (at least 1 year).
- This method allowed determining As(III) concentrations of 5 ppb, 45 ppb and 105 ppb in three groundwater sources form vest side of Romania.

3D Porous dimensionally stable anode–integrated particulate electrode-electrochemical filtering system for advanced treatment of cytostatics-containing water (3DSAPECYT)

Authors: Florica Manea, Corina Orha, Constantin Adrian Tudoran

Project no. PN-III-P2-2.1-PED-2019-4492, 441PED/2020

The development of improved innovative technology and process for water treatment represents a prerequisite condition within the context of the circular economy, considering its fundamental principles focus on reduce, reuse and recycle in order to close the loops of the water use cycle.

Objectives of the project consists of:

1. Synthesis and characterization of new porous dimensionally stable anodes through spin coating and hydrothermal techniques.

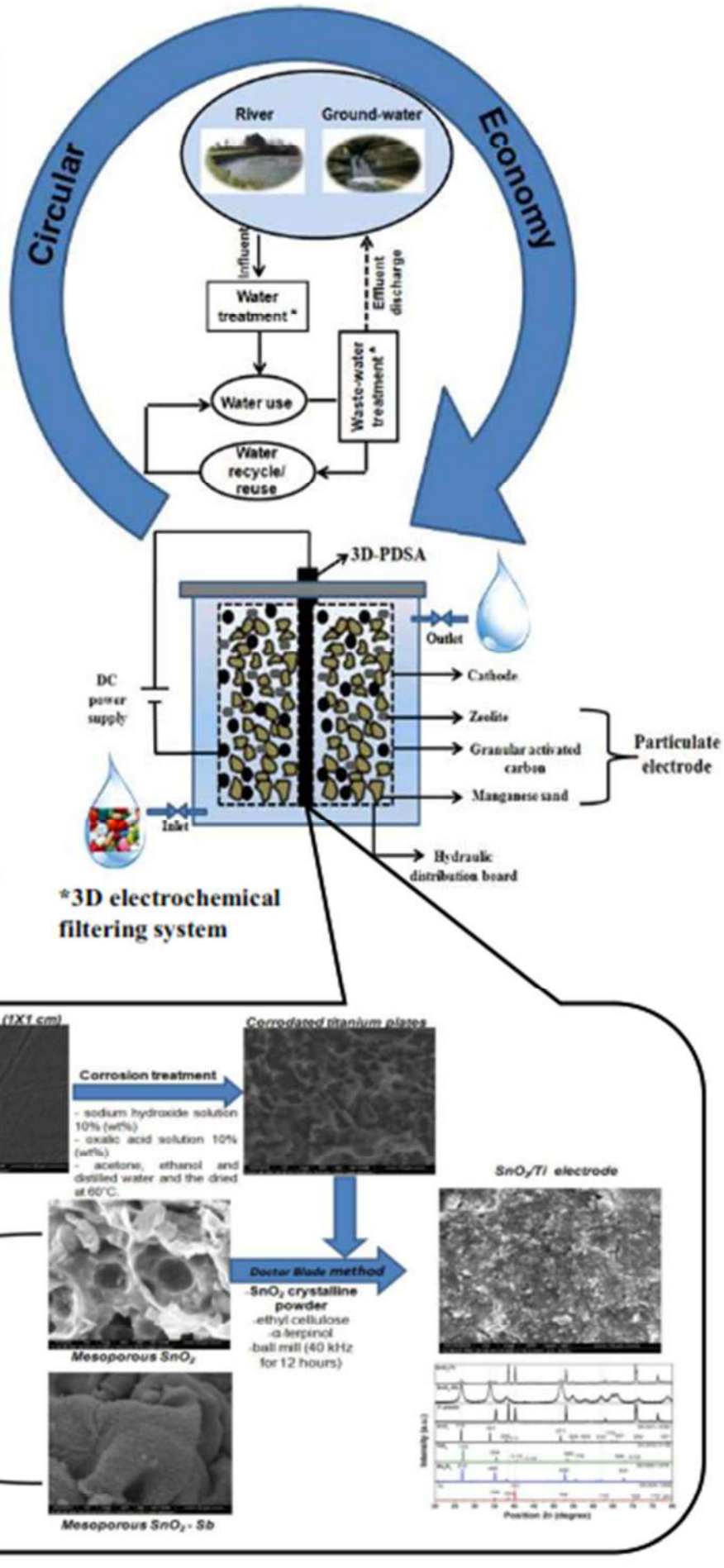
2. Development of new filtering composition within fluidized bed as particulate electrode based on activated carbon (mature technology) / Romanian zeolite (natural material) / manganese sand (depleted filtering waste generated in the drinking water treatment technology using manganese containing groundwater source).

3. Fabrication of an innovative ***three-dimensional (3D) Porous Dimensionally Stable Anode–integrated Particulate Electrode-Electrochemical Filtering System (3D-PDSA-PE-EFS)*** for advanced treatment of cytostatics containing water.

4. Validation and integration of ***3D-PDSA-PE-EFS*** system within advanced surface water treatment technology.

The ***scope*** of the present project is to develop an innovative three-dimensional (3D) Porous Dimensionally Stable Anode–integrated Particulate Electrode-Electrochemical Filtering System (***3D-PDSA-PE-EFS***) for advanced water treatment, which will be validated at the lab-scale for advanced treatment of cytostatics containing water, starting from ***TRL-2*** and reaching ***TRL-4*** in 24 months. The system (***3D-PDSA-PE-EFS***) will be flexible and enable for an advanced treatment of water/wastewater characterized by a wide range of contaminants (organics and inorganics) by combination of advanced electrooxidation process (AEOP) with adsorption/catalysis (A/C) process within one reactor.

Contact: floricamanea@upt.ro; orha.corina@gmail.com ; constantin.tudoran@datcomp.ro



Morpho-structural characterization of 3D-PDSA

MINISTRY OF EDUCATION AND RESEARCH

UNIVERSITATEA LUCIAN BLAGA DIN SIBIU

Sistem modular flexibil de fixare a semifabricatelor pentru procedeul de deformare incrementală

Flexible modular system for fixing workpieces for the incremental forming process

Patent Request a 2019 00712

Authors: RACZ Sever-Gabriel, BREAZ Radu-Eugen, OLEKSIK Valentin Ștefan, PASCU Adrian Marius, POPP Ilie Octavian, GÎRJOB Claudia Emilia, TERA Melania, CHICEA Anca Lucia, BIRIȘ Cristina Maria, CRENGANIȘ Mihai

DESCRIPTION

The incremental forming process is a flexible alternative to conventional cold metal forming processes. One of the main disadvantages of the process is that it allows the processing of a single type of workpiece size, because the working area and implicitly the size of the workpiece sheet that can be processed is fixed. To eliminate this disadvantage, a flexible modular system for fixing the workpiece is proposed.

The active plate 9 is characterized in that it is provided with five intermediate seating positions, both in the X-axis and in the Y-axis direction, in which modular active elements can be mounted, on both axes, 10, 11. Intermediate seating positions provided in the active plate, together with the modular active elements allow the user to adjust the size of the workspace and thus the size of the workpiece. The active plate is also provided with holes for mounting the clamping screws.

The figures on the right show the mounting of the modular active elements in the X-axis, 10, as well as a modular active element in the Y-axis, 11. It is also necessary to use a retaining plate to fix the sheet metal workpiece. For the proposed system, it is also characterized by a modular construction.

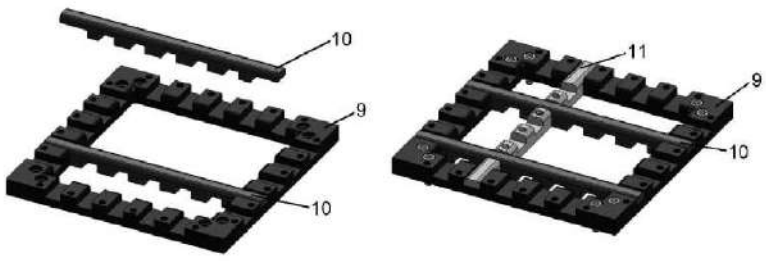
Thus, the retaining plate consists of two retaining elements in the shape of the letter I ,12, which can be mounted parallel to the X-axis direction and can occupy any of the six available positions above the active plate 9. The retaining elements in the shape of the letter I are provided with threaded holes, for the purpose of their removable connection with the active plate. In addition to the elements marked with 12, intermediate restraint elements, marked with 13, are also required.

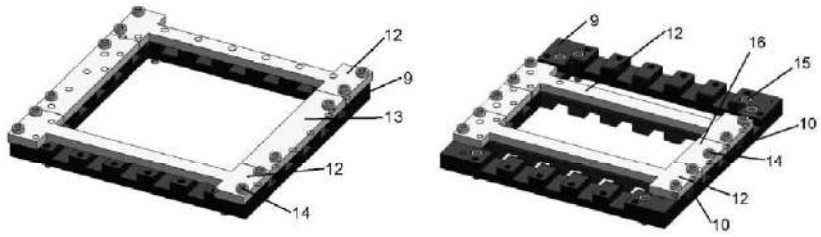
These elements have a simple construction, being made of plates of the same width and height, but of different lengths, allowing the modular fixation of the workpiece, between the active and the retaining elements. They are also fitted with threaded holes, for the purpose of their removable connection with the active plate, by means of fixing screws 14.

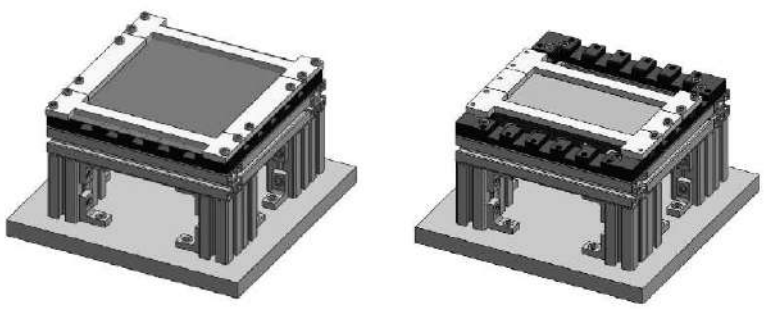
An example of the combination of the active plate 9 with retaining elements in the shape of letter I 12, with intermediate retaining elements 16 on the right side is shown on the right side. The screws used to assemble the assets and restraints 14, 15 are also shown.

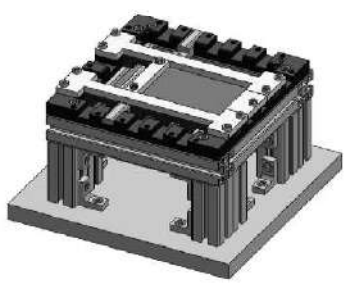
It can be seen how the adjustment of the working area and implicitly of the size of the workpiece can be done using both modular active elements and intermediate restraint elements mounted in the direction of the Y axis.

Finally, the modular fixing system of the workpiece is presented, including both the support structure and the active plate (together with the modular active elements) and the retaining plate (consisting of the I-shaped retaining elements and the intermediate retaining elements). In the figure one can also notice the sheet metal workpiece.









ADVANTAGES

The system allows the user to adjust the size of the workspace and implicitly the size of the workpiece. Consequently, the flexibility of the incremental forming process is significantly increased.

APPLICATIONS

The system can be used in the manufacturing, automotive and aeronautical industries to process complex shape sheet metal parts in a flexible and accurate manner.

CONTACT
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MINISTERUL EDUCAȚIEI NAȚIONALE ȘI CERCETĂRII ȘTIINȚIFICE

DESCRIPTIONS

The invention concern's new method and devices for rehabilitation of therapeutic properties of bathing water in lakes by stratified salt concentration. The method is to induce surface water with low salinity concentration under lower layers of water, with a higher salinity concentration in a gravitational continue water flow; water mix, water transportation and diffusion of rehabilitated water on the surface, in the upper layer under the direct osmosis. The method is based on the two principles:

1.principle of communicating vessels
2.principle of direct osmosis

Operation takes place automatically according to the gradient of concentration in the mixing chamber.

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METHOD AND DEVICES FOR REHABILITATION OF THERAPEUTIC PROPERTIES OF BATHING WATER IN LAKES BY STRATIFIED SALT CONCENTRATION

AUTHORS: NEDERIŢA Victor; OPREAN Constantin; OPREAN Letiţia; CIUDIN Rodica; TÎŢU Mihail

PATENT No: Patent 125497 - 30.12.2013

ADVANTAGES

Water mixing is done in laminar regime without causing any natural imbalance in the lake. The method is carried out based on exclusive use of natural phenomena without the involvement of artificial sources of energy. The method is environmentally friendly and they do not affect the natural balance of lakes. Other advantages are:

1. novel method for the rehabilitation of water treatment properties of bathing in salt lakes layer with stratified salt concentration.
2. introduction of gravitational water bathing the surface layer of brine flow in the substrate at any depth and rehabilitation of its therapeutic qualities of direct osmosis brine from underground.
3. summer use is organic method without artificial energy sources.

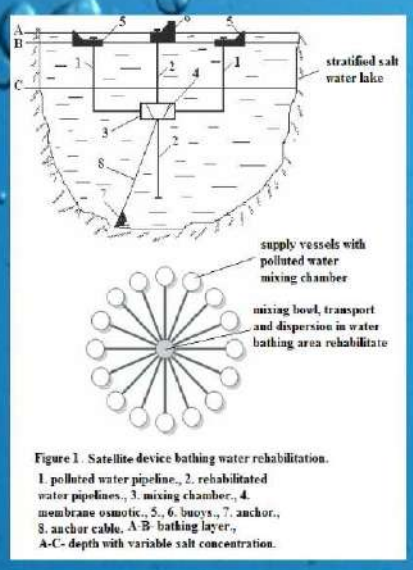


Figure 1. Satellite device bathing water rehabilitation.
1. polluted water pipeline., 2. rehabilitated water pipelines., 3. mixing chamber., 4. membrane osmotic., 5., 6. buoys., 7. anchor., 8. anchor cable, A-B- bathing layer., A-C- depth with variable salt concentration.

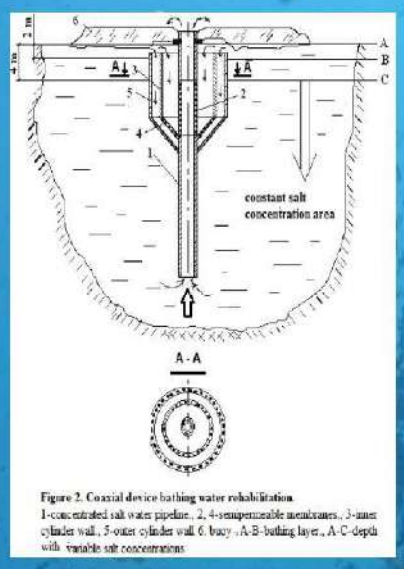
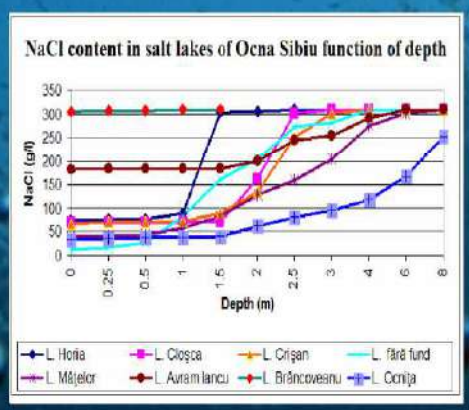
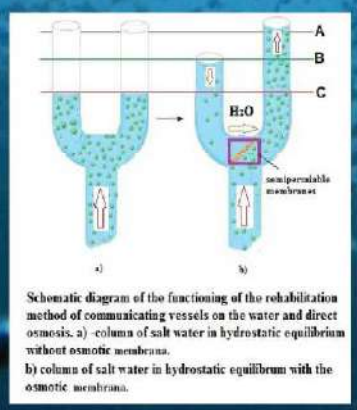


Figure 2. Coaxial device bathing water rehabilitation.
1-concentrated salt water pipeline., 2, 4-semipermeable membranes., 3-inner cylinder wall., 5-outer cylinder wall 6. buoy ,A-B-bathing layer., A-C-depth with variable salt concentrations





Schematic diagram of the functioning of the rehabilitation method of communicating vessels on the water and direct osmosis. a) -column of salt water in hydrostatic equilibrium without osmotic membrana.
b) column of salt water in hydrostatic equilibrum with the osmotic membrana.

APPLICATIONS

The invention is the result of research carried out under AGRAL / PNCDI the project on "Studies on the complex assessment and recovery solutions for lakes in Ocna Sibiu as a tourist and leisure spa healing" developed during 2004 - 2006 (Research Contract No. 8471. 2004) and one of the technological solutions proposed for the recovery of lakes within the project. Field of use is the water quality rehabilitation curative bathing in salt lakes layer is missing vertical movement of water through water stirring with high concentration by the deep and communicating vessels through direct osmosis.

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MINISTRY OF EDUCATION AND RESEARCH

DEVICE AND METHOD FOR DISPOSAL AND COLLECTION OF PATHOLOGICAL PRODUCTS

Authors: Sabău Dan, Sabău Alexandru Dan, Dumitra Anca Maria, Țîțu Aurel Mihail

Patent request: A 00004 2013 / 04.01.2013

DESCRIPTION

The invention refers to a method and a device of abdominal collection of some corpuscular/hydrous structures with a diameter smaller than 10 mm. The collecting methods are based on the existence of a closed, hyperbaric chamber (abdominal cavity) and of several gallstones fragments, coagulates, tissue dispersed or agglutinated, possibly hydrous, which require a relatively quick evacuation without any unnecessary movements of fragmentation and/or contamination.

The device, is made out of a tube with the interior diameter of circa 9-9.5-10 mm capable to evacuate the structures due to the difference in pressure between the interior and exterior of the abdomen, difference which can be emphasised by attaching an exterior aspirator.

On the path of the tube there is an eccentric collector which collects the structures or the evacuated liquid with the help of a deflector/ filter, which separates the air or liquid from the evacuated structures. The collector, is detachable and voidable when full. The filter can be quickly extracted and it can be cleaned. The device is kept airtight when pausing and decompressed intermittently after selecting and applying the intra-abdominal orifice of the suction unit on the solid or liquid structure that is aimed with the diameter smaller than the diameter of the tube which the abdominal decompression or the additional suction at the level of the external orifice could lead to the evacuation of the foreign matter.

Decompression is done manually (with the thumb) or instrumentally through a valve with flapper (rapid, sensitive, efficient) The efficiency of the evacuation can be increased by connecting with valve the evacuation ramification to a suction unit and connecting a rinsing system under the flapper which closes the system, it ensures the cleaning of the filter and device alternatively with the suction. The filter ensures the continuous functionality, without "plugs" of the external suction unit by creating a detour for the corpuscular structures and leaving the air or water pass through.

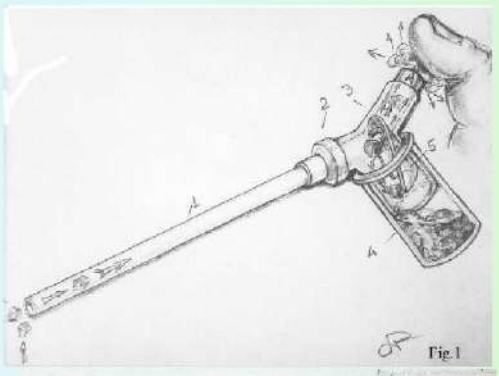
Fig.1

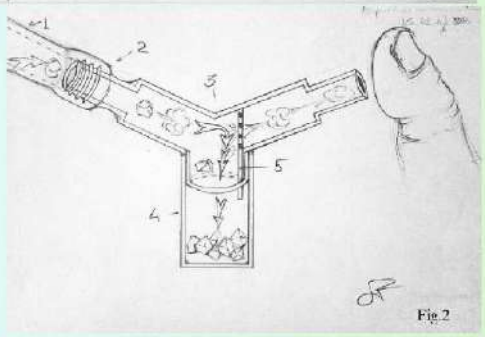
Fig.2

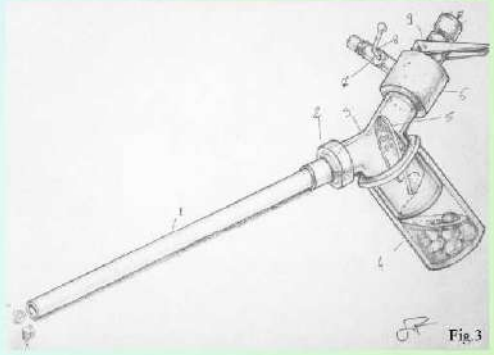
Fig.3

ADVANTAGES

-the extraction of the pathological products located or dispersed in the abdomen is done rapidly with storing for their intra-operatory analysis;
-the efficiency and the accessibility of the device in the entire abdomen, as well as in tight spaces, are remarkable;
-elimination of the contamination risk under the conditions of obtaining quick information;
-reduces the duration of the interventions;
-reduces the clogging of the suction unit by interposing the deflector filter;
-the capacity to quickly wash and clean the intra-operatory device which is modular with partial dismantling;
-the capacity to clean the intra-operatory filter through rinsing in backward flow without dismantling.

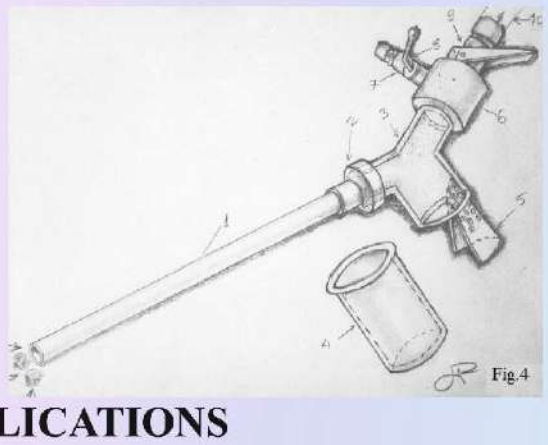
Fig.4

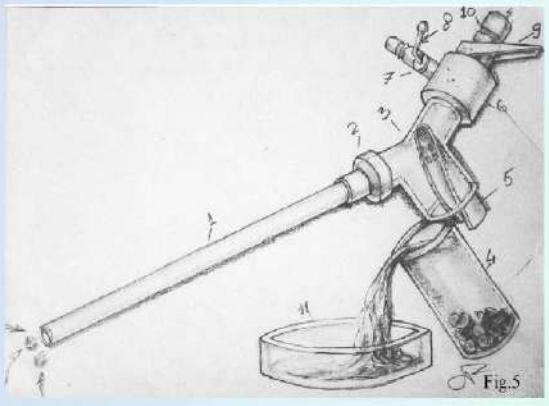
Fig.5

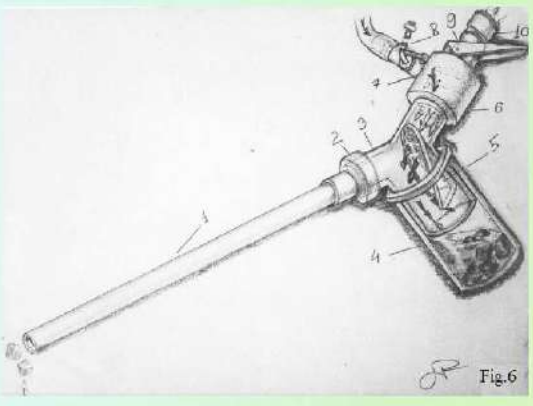
Fig.6

APPLICATIONS

- Destined for the minimal invasive surgery, especially laparoscopic, but also for open surgery;
- The method can be applied to gallstones up to 9-9.5 mm with container storage, quickly applying it to manoeuvres and protecting the tubular suction unit system from the cleaning/clearing manoeuvre by interposing a deflector filter which isolates the corpuscular elements from the liquid or gas ones.

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MINISTERUL EDUCAȚIEI ȘI CERCETĂRII
Ministry of Education and Research

STABLE SYNERGISTIC COMPOSITION WITH ANTIOXIDANT AND ANTI-INFLAMMATORY PROPERTIES BASED ON BIOACTIVE PHYTOEXTRACTS

Authors: Oancea Rodica Simona, Tecucianu Andreea Cristina, Dulf Francisc Vasile

Patent request no.: A 003932 / 09.07.2020

DESTINATION

The invention relates to a new synergistic composition, 100% natural, in the form of an emulsion, containing extracts of β-carotene from pumpkin, anthocyanins from red cabbage and inulin from parsnips, as well as the method of preparation and its bioactive properties. The invention is of practical importance both by valorization of local plants rich in bioactive compounds to obtain extracts with special biological properties, and by applying sustainable technologies for their preparation and for the final product.

PRINCIPLES USED

The process according to the invention consists in combining 50% and 25%, respectively, β-carotene oily extract from pumpkin, 25% and 15%, respectively, concentrated anthocyanin extract from red cabbage and 25% and 60%, respectively, aqueous fructan extract from parsnip, in the presence of 0.5% guar gum relative to the composition, resulting in a stable composition of phytoextracts with bioactive properties tested *in vitro*.

ADVANTAGES

- Obtaining synergistic natural compositions by combining 3 natural extracts of pumpkin rich in β-carotene, red cabbage rich in anthocyanins and parsnips rich in inulin, with beneficial effects on human health;
- The new compositions are advantageous in terms of costs, as it would reduce the costs of importing similar products;
- The new compositions allows creating a Romanian registered trademark product by exploiting the research in this area.

APPLICATIONS

- the invention is situated at the intersection of food science and health, useful for food supplements industry;
- the invention offers the possibility of combining phytoextracts with multifunctional properties;
- it is useful, in particular, for the development of nutraceutical products.

Bioactive content and antioxidant properties of the new synergistic developed compositions

Attributes	Composition 1	Composition 2
Saturated fatty acids	8.58	8.68
Monounsaturated fatty acids	23.11	27.71
Polyunsaturated fatty acids	68.30	63.61
Omega-3	0.04	0.05
Omega-6	68.26	63.56
FRAP (mg ascorbic acid/ 100 ml extract)	84.78	53.49
DPPH (% inhibition)	39.35	19.38

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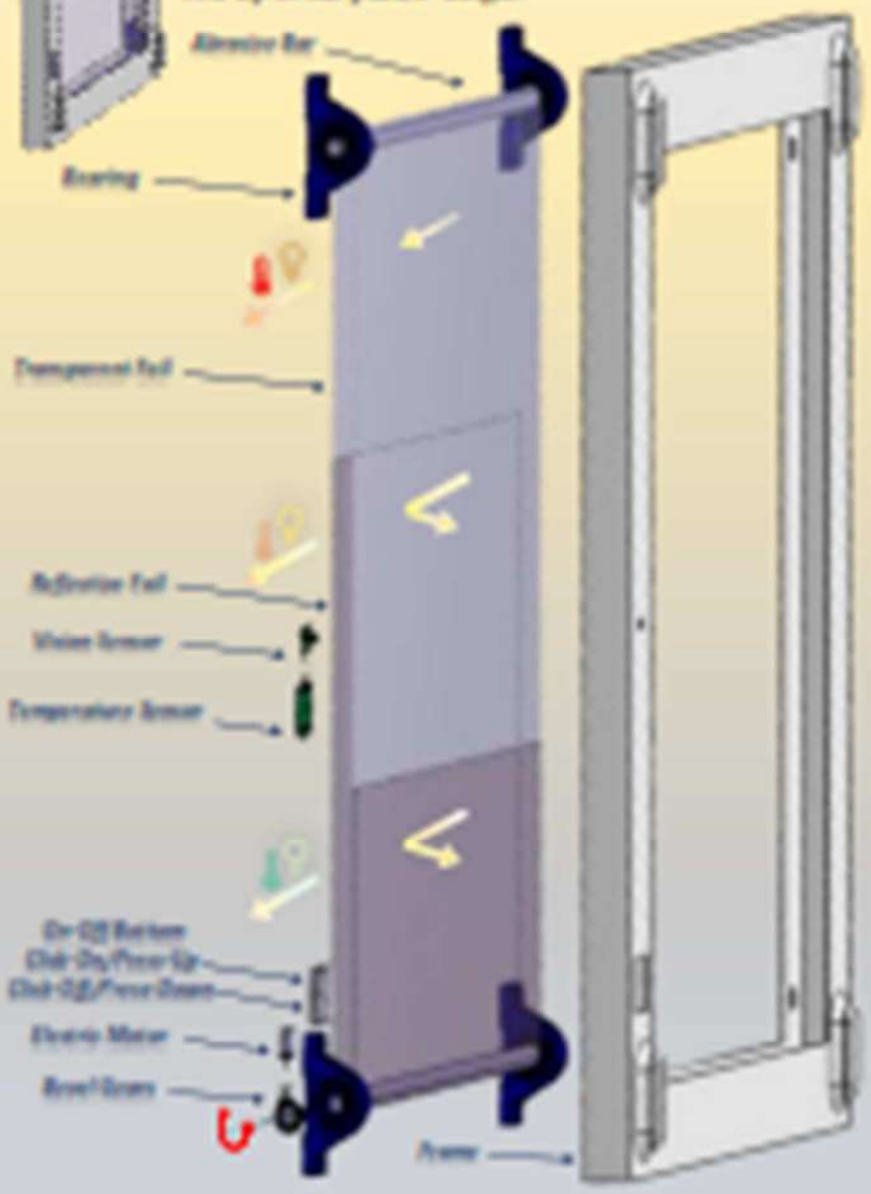
MINISTRY OF EDUCATION AND RESEARCH

Intelligent window solar protection system

Authors: DRAGOVAN Paula-Nicoleta, OLARIU Andreea-Melania

STUDENT SCIENTIFIC RESEARCH PROJECT

This project refers to a sun ray protection device for inside the home. A sun ray filtering mechanism is presented for when the penetrating rays become unbearable during the warm summer days when the temperatures are high. Depending on the set temperature for inside the room, this protection mechanism will control the quantity of sun rays that is allowed to enter the room through the window and the quantity which is going to be reflected. The solar filter can be maneuvered easily, it can be rolled up vertically, half way, one quarter of the window or any length that is desired, automatically using the sensors or manually by a push of the buttons placed on the exterior of the frame. This device is able to protect us very well from the blinding brightness of the sun throughout the day while we are at the desk and sensitive plants can benefit from protection against the strong rays especially by the ability of the device to roll up to the plants' height.



Applications:

- in the medical industry;
- in the HORECA industry;
- in the chemical industry;
- in laboratory;
- at home;
- at office;
- for the large industry of companies.

The device in the shape of a frame can be mounted very easily on the window frame and consists of construction and assembly elements, action, control and filter positioning components, the filter with a double structure, both transparent and reflective, a variety of incorporated sensors which operate the device when the necessary information is received, thus when a certain temperature is set and the sensors detect strong brightness as well as a rise in temperature, the rays begin to be reflected. When it is cloudy outside and the temperature stays the same or drops, such actions are not necessary. Besides all benefits described above, what makes the device unique is the existence of visual and thermal sensors which detect the presence of an individual in its action range when working at a desk situated near a window and protects them from the harmful UV rays while facilitating a low temperature working space without powerful, bright light.

Advantages:

- protects from the brightness of the sun;
- protects from the harmful UV rays;
- protects sensitive plants;
- protects materials exposed to sunlight;
- controls temperature;
- automatically and manually.

Contact:

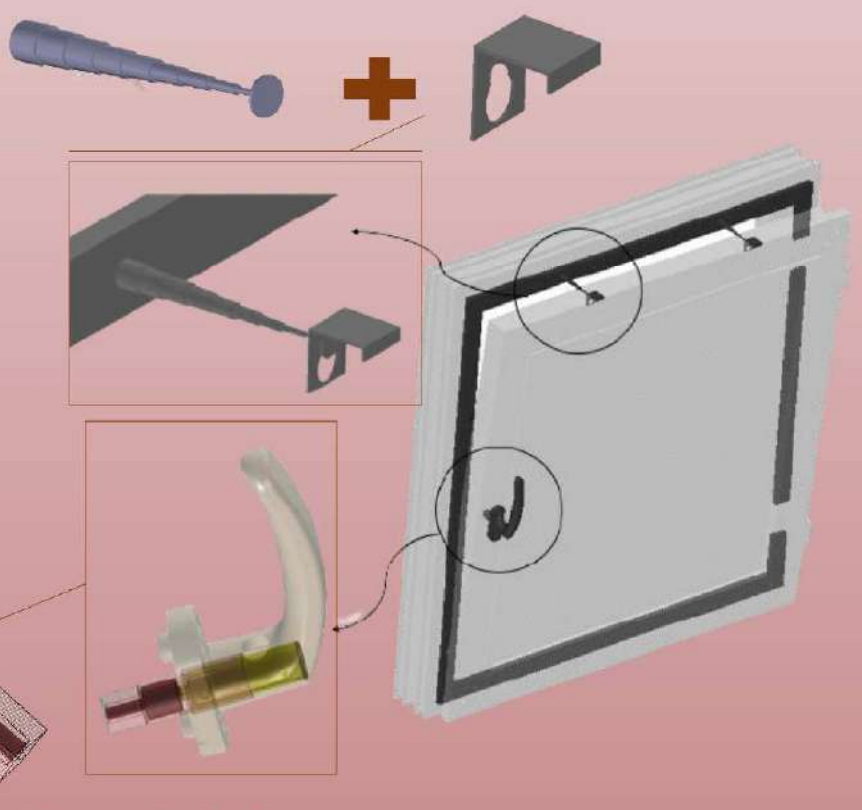
MINISTRY OF EDUCATION AND RESEARCH

UNIVERSITATEA LUCIAN BLAGA DIN SIBIU

INTELLIGENT SYSTEM FOR WINDOW AUTOMATIZATION

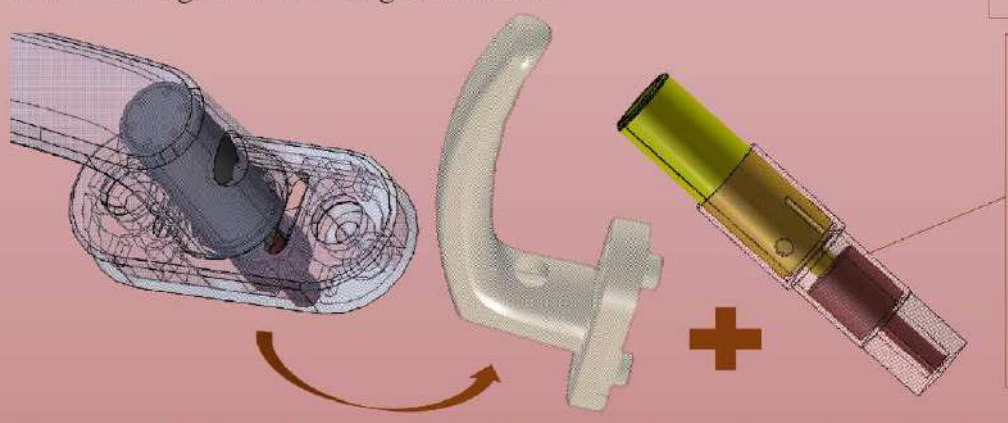
Authors: Andreea Melania OLARU, Paula Nicoleta DRAȘOVEAN

STUDENT SCIENTIFIC RESEARCH PROJECT



DESCRIPTION:

This project proposes the designing of an intelligent system for window automatization having in its composition a number of oxygen sensors. These sensors signal an electrical motor which acts upon the device to open, and ultimately close the window. The opening of the window consists in the folding of the window towards the inside of the room and can function on folding PVC doors with slight dimensioning modifications.



This device consists of a universal handle that can fit most, if not all, PVC windows and a slim frame (about 10 mm) which contains two telescopic rods. These function through the action of a reversible hydraulic system that has the capacity to extend and fold the rods through connection to the oxygen sensor. Attached to the end of each telescopic rod, two easily mountable and demountable parts can be found which connect the action device to the window frame at all times for an increased ease in function. The oxygen sensor functions on the wireless principle and is positioned inside of the handle which also has an end-to-end reaming for ventilating and proper functioning purposes.

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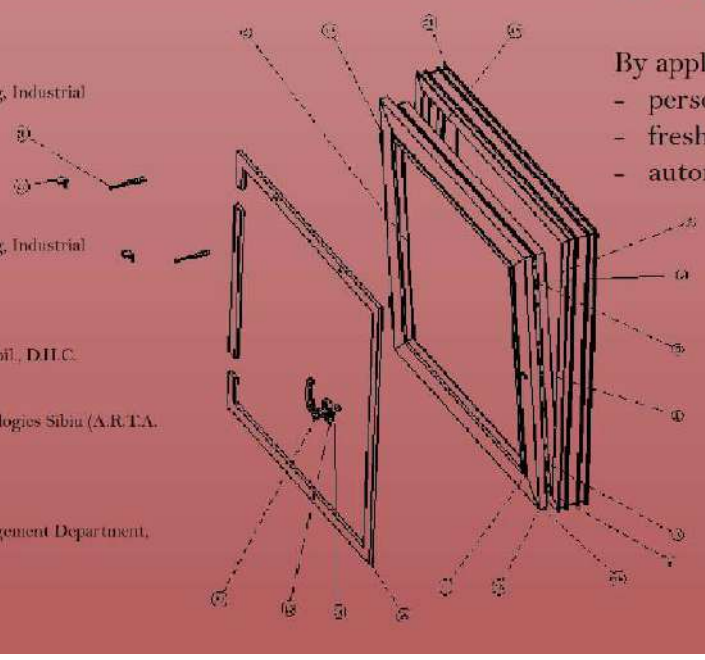

ADVANTAGES:

By applying this invention the following advantages are met:
- persoanl security of people and animal rises
- fresh air in the room upon returning home after a while
- automatization of window handling

APPLICATIONS:

- the medical industry
- the HORECA industry
- personal household use
- children orphanages
- retirement homes
- animal shelters

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IASI, ROMANIA, 20– 21 May 2021
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❖Title
Quality of flowers to daffodils based on vegetative and floral indices

❖**Authors & Contact**
Maria BĂLA, Florin SALA
Contact: Prof. Florin Sala, PhD, florin_sala@usab-tm.ro

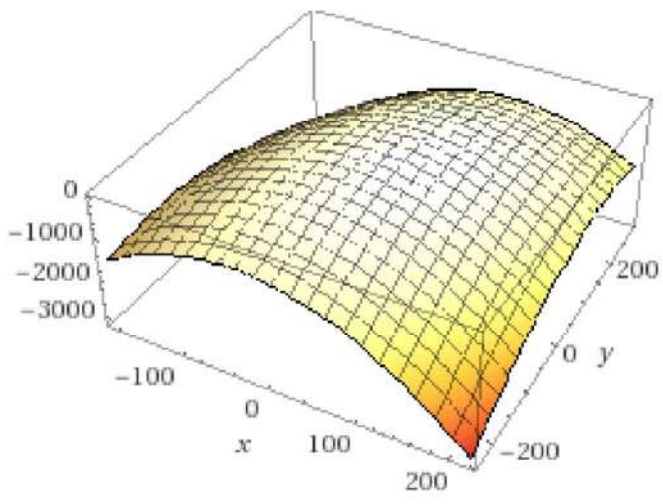
❖Short presentation

❑Research project aimed to evaluate the quality of flowers in daffodils (*Narcissus pseudonarcissus* L.) in relation to physiological and floral indices. The biological material was represented by five varieties of daffodils: 'Carlton', 'Ice Follies', 'St. Patrick', 'Dick Wilden' and 'Salome'.

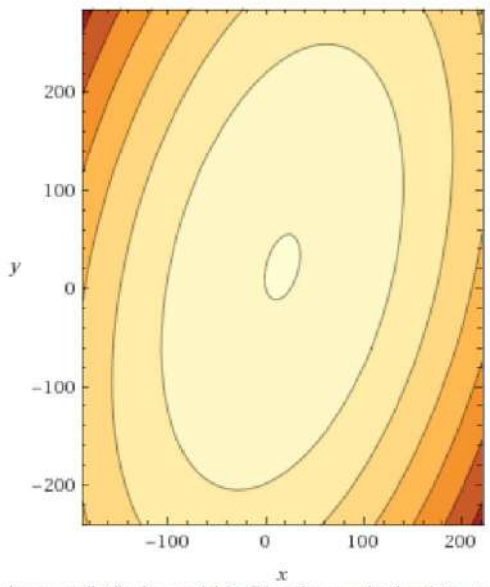
❑A series of physiological and floral indices were evaluated that described the status of plants (plant height - PH, number of leaves - LN, length of leaves - LL), vegetation period (VP), flowering period (FP), and flowers size (FS).

❑The flowering period (FP) expressed in days, recorded the values: FP = 13 days for 'Carlton', FP = 18 days for 'Ice Follies', FP = 9 days for 'St. Patrick', FP = 10 days for 'Dick Wilden', and respectively FP = 11 days for 'Salome'.

❑The variation of FS according to LN was described by a polynomial equation of degree 2, under conditions of $R^2 = 0.938$, $p << 0.001$. A 3D model of FS variation with respect to LN and FP was obtained, and a graphical representation in the form of isoquant, expressed a possible combination of LN and FP for optimum of FS.



3D graph for FS distribution in relation to LN and FP (x=LN; y=FP)



Isoquant distribution model for FS optimum value in relation to LN and FP (x=LN; y=FP)

Graphical distribution of FS values in relation to LN and FP;

➢PCA led to the distribution of the studied varieties in relation to the main quality parameters considered (VP, FP and FS).
➢Cluster analysis led to the grouping of daffodils varieties based on affinity with respect to flower quality indices (FP and FS) under statistical safety conditions, Coph.corr. = 0.924.

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❖Title

Optimization of some parameters for ornamental plants production in off-season

❖Authors & Contact

Maria BĂLA, Florin SALA
Contact: Prof. Florin Sala, PhD, florin_sala@usab-tm.ro

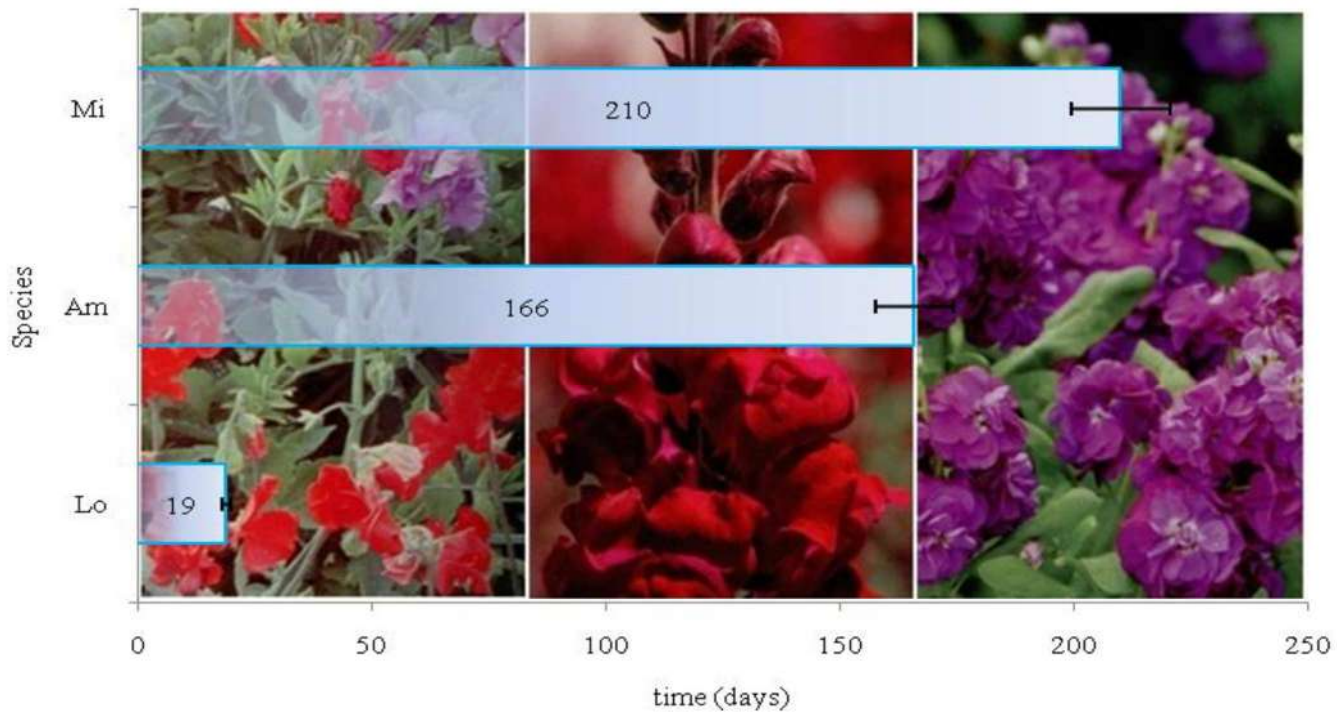
❖Short presentation

❑The present researcj project evaluated the behaviour of three ornamental species through flowers, in off-season cultivation conditions, in order to optimize production parameters. The total time of flowering (Ttf) was described, for each species, by mathematical models, in relation to the temperature and plants height.

❑The biological material was represented by the species: *Lathyrus odoratus* L.; *Antirrhinum majus* L., and *Matthiola incana* (L.) W.T. Aiton., respectively. The variation of the plant height, in the studied ornamental species, in relation to the temperature (T), was described by polynomial equations of degree 3, in safety statistical conditions (R^2=0.975 for *Lathyrus*; R^2=0.987 for *Antirrhinum*, and R^2=0.971 for *Matthiola*, respectively).

❑In relation to the biological specificity and the behavior in the off-season, the three species had different values for the total time of flowering (Ttf); Ttf = 19 days for *Lathyrus*; Ttf=166 days for *Antirrhinum*, and Ttf=210 days for *Matthiola*.

❑Multiple regression analysis led to the obtaining of Ttf estimation models, depending on the temperature (T, °C) and the height of the plants (H, cm), in statistical safety conditions.



Graphical representation of Ttf for the studied species; left - *Lathyrus odoratus* L.; middle - *Antirrhinum majus* L.; right - *Matthiola incana* (L.) W.T.Aiton

➢The Wolfram Alpha software facilitated the obtaining of 3D and isoquant graphic distribution models of Ttf, according to T (°C) and H (cm), for each species studied.
➢The optimal values for H and T were determined, in order to obtain the best total flowering time, in off-season conditions, values that can be ensured by the cultivation technology of the studied species.

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TENTAȚII CULINARE MARINE
BY AKADEMIKA FOODS

TRADEMARK
M2021/002405

Authors:
Raba Diana Nicoleta, Misca Corina-Dana, Bordean Despina Maria, Dumbrava Delia-Gabriela, Moldovan Camelia, Popa Viorica Mirela, Mariana-Atena Poiana, Pirvulescu Luminita, Radulov Isidora

BANAT'S UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE
"KING MICHAEL 1ST OF ROMANIA" FROM TIMIȘOARA

Marine culinary temptations include products from the category of meatballs and rolls, innovative by the facts that are prepared from seafood meat in varying proportions depending on the manufacturing recipe. The seafood used is: squid, mussels, shrimp, which can be used individually or combined. The products are both tasty and valuable from a nutritional point of view by the fact that they benefit both from the proteins with high biological value of seafood and from the vitamins, minerals and fiber from the vegetables used in the recipe: parsley leaves, peppers (only in rolls), green onions, green garlic and spices (salt, pepper, chili), both in rools and meatballs. The products are suitable for all categories of consumers over 3 years of age except those allergic to seafood.

Even if the seafood does not have a tradition of consumption in Romania, they have started to be more and more appreciated, and today they are also part of the diet of the consumer in our country.

Regardless of the species, seafood is highlighted by its high content of minerals (zinc, magnesium, phosphorus, calcium, iodine), vitamins (A, B, D, E) and protein. They are low in fat and are very rich in omega-3 and omega-6 fatty acids.

Compared to basic meat dishes, seafood dishes are characterized by:

- The diversified assortment determined by the variety of seafood, the technological processes applied for their preparation and the possibilities of association with different foods;
- Possibility of use in dietary nutrition;
- High nutritional value determined by complete protein, easily digestible fats, high content of vitamins A and B and minerals (fluorine, iodine);
- Special taste qualities and easy digestibility.

Mussels have the most impressive nutritional profile of all shellfish. They contain high levels of highly desirable long chain fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid). Mussels are also a brilliant source of vitamins. They give you a shot of important minerals, such as zinc, which helps build immunity. Mussels even contain levels of iron and folic acid to rival red meats.

Squid is a mollusk belonging to the shellfish family, and they come in four varieties: black, white, hard shell and red. It is high in protein, minerals and low in calories. This makes squid or calamari a highly nutritious meal.

Shrimp is one of the most commonly consumed types of shellfish. Shrimp is very nutritious. It is fairly low in calories and provides a high amount of protein and healthy fats, in addition to a variety of vitamins and minerals.

"Tentatii Culinare Marine" Assortments	Seafood meatballs	Seafood rolls
Proteins (g)	18.5	20.1
Total fat (g)	2.5	2.3
- Saturated fat (g)	1.9	1.8
Total carbohydrates (g)	7.3	7.5
- Dietary fiber (g)	0.5	2.4
- Sugar (g)	0.2	0.5
Sodium (mg)	320	325
Energy value (kcal)	102	110
(kJ)	426	460

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AperGoFree

by AKADEMIKAFOOD

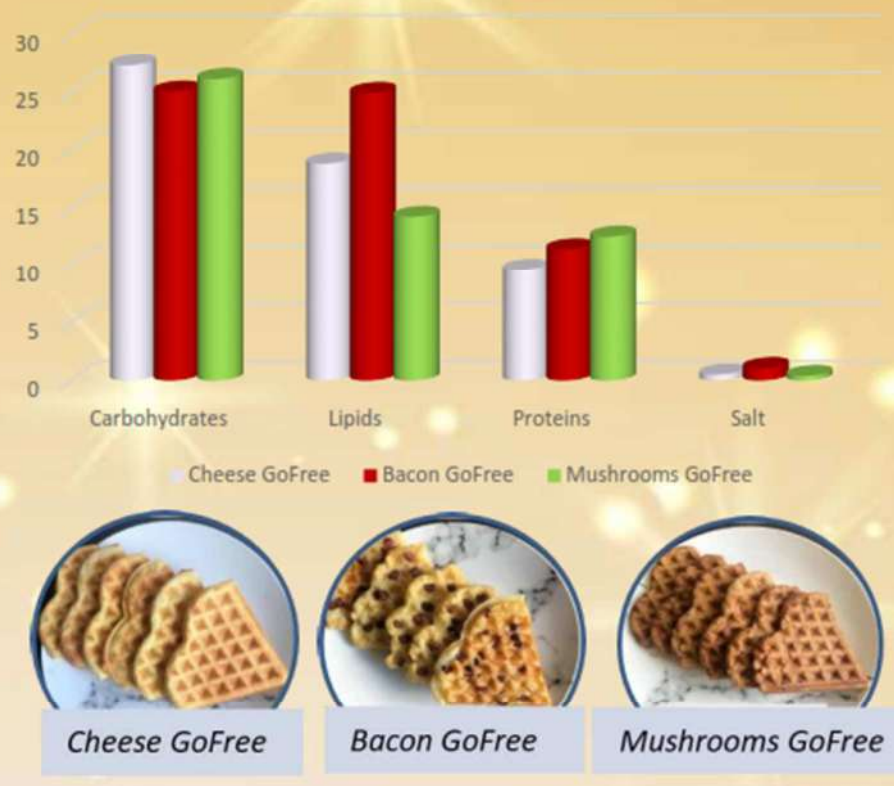
TRADEMARK M 2021/002463

Authors: Moldovan Camelia, Borozan Aurica-Breica, Botău Dorica, Drugă Mărioara, Dumbravă Delia-Gabriela, Mișcă Corina Dana, Negrea Monica Viorica, Poiană Mariana-Atena, Popa Viorica-Mirela, Raba Diana-Nicoleta, Rădoi Bogdan-Petru, Riviș Adrian

Banat`s University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara

The AperGoFree product range has an innovative character through the recipe and the increased nutritional value conferred by the addition of ingredients much appreciated by consumers. These products are a perfect alternative, as an appetizer or snack, for most categories of consumers.

PRODUCT NAME	AperGoFree
ORGANOLEPTIC PROPERTIES	Exterior appearance: pleasant, uniform, free of burn marks; shape dictated by the alveoli of the device; brown color; pieces of bacon can be seen in some places; soft, elastic texture. Interior appearance (per section): aerated interior, uniform pores, without flour agglomerations. Aroma, taste, smell: pleasant, specific to the additives used (bacon, cheese and mushrooms), without mineral impurities or foreign odors.
BENEFICIARY	The product is intended for the general population, except for people with gluten intolerance, or people allergic to lactose or fungi.
USE	ready-to-eat product
STORAGE	dark, dry, cool place
TERMS OF VALIDITY	72 hours
PACKING	polyethylene (PE) + cardboard



These products can also be recommended to diabetics, being considered "low carbs" products.

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LensSpread
by AKADEMIKAFOOD

TRADEMARK
M2021/00222

Authors:
Dumbravă Delia-Gabriela, Alexa Ersilia-Călina, Bordean Despina Maria, Botău Dorica, Cocan Ileana, Dogaru Diana-Veronica, Mișcă Corina Dana, Moldovan Camelia, Popa Viorica-Mirela, Raba Diana-Nicoleta, Radulov Isidora, Riviș Adrian, Ștef Ducu Sandu

BANAT'S UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE
"KING MICHAEL 1ST OF ROMANIA" FROM TIMIȘOARA

A range of innovative, spreadable, lentil-based vegan appetizer creams with the addition of different vegetables depending on the manufacturing recipe The products are both healthy and tasty, suitable for consumers of all ages, rich in polyphenols, chlorophylls, carotenoids, unsaturated fatty acids, with a remarkable antioxidant activity - which can include them in the category of protective foods.

In the last years we have witnessed an accelerated increase, at the world level, in the number of people adopting a vegetarian or even vegan diet. Thus, the need for new food products that meet the nutritional requirements of vegetarians and vegans has been increasing.

The green lentil (*Lens culinaris L.*) with the grain covered with a soft coating, requires a short cooking time (23-26 min) and thus the losses of nutrients are smaller than in the case of cooking the grains with a strong coating. Lentil is rich in protein and carbohydrates, but is poor in lipids, having a low energy value

Spinach (*Spinacia oleracea*) is one of the most important and nutritious vegetables consumed raw or cooked, offering a very good amount of vitamins B6, riboflavin, folate, niacin, soluble dietary fiber, omega 3 fatty acids and minerals. Spinach is also rich in iron, vitamin K, flavonoids, carotenoids, chlorophylls, vitamin C.

Broccoli (*Brassica oleracea var. Italica*) is a member of the *Brassicaceae* family and is very close to cauliflower. This delicious vegetable contains several nutrients such as vitamins A, C, D, carotenoids, chlorophylls, calcium, dietary fiber, iron and antioxidants.

Avocado (*Persea Americana*) is considered one of the main tropical fruits because it contains fat-soluble vitamins that are less common in other fruits, in addition to high levels of protein, potassium and unsaturated fatty acids. This fruit has been recognized for its health benefits, especially due to the compounds present in the lipid fraction, such as omega fatty acids, phytosterols, tocopherols, carotenoids.

LensSpread	Green lentil with broccoli and spinach	Green lentil with broccoli and avocado
Proteins (g)	8.18	8.28
Total fat (g)	9.06	9.20
- Saturated fat (g)	1.26	1.32
Total carbohydrates (g)	20.47	23
- Dietary fiber (g)	9.65	11.35
- Sugar (g)	0.67	0.77
Sodium (mg)	380	374
Energy value (kcal)	159	168
Total polyphenols (mg gallic acid/g)	3.56±0.12	2.83±0.04
Total chlorophylls (µg/g)	302.78±1.43	68.33±0.35
Total carotenoids (µg/g)	55.46±0.42	21.72±0.20
Antioxidant activity (mg Trolox/g)	5.13±0.20	4.87±0.14

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ASSESSMENT OF THE ANTIBACTERIAL POTENTIAL OF A MIXTURE OF PROPOLIS AND PROPOLIS COMPOUNDS

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INTRODUCTION

Propolis is known today as one of the most surprising natural products due to its biological action and therapeutic effects. Even if the studies on propolis are innumerable, it is recommended to continue the research and discover all the component fractions and their application possibilities, especially since differences were observed in antibacterial activity and in the chemical composition of propolis in different geographical areas.

The antimicrobial, antiviral, antioxidant, analgesic, antitumor properties of propolis extracts continue to attract the interest of researchers in the medical, food and pharmaceutical fields.

Studies on propolis in western Romania are limited, which is why the main objective of our research is the selection of propolis extracts and propolis compounds that have antibacterial activity against species commonly found in the medical and food fields.

MATERIAL AND METHODS

The extracts from the propolis mixture and the dilutions of catechin, quercitin and gallic acid were microbiologically tested compared to the control, represented by Dimethyl-Sulfoxide (DMSO), using the Kirby Bauer method (with minor modifications). The bacterial species tested were: *Escherichia coli* (A), *Staphylococcus aureus* (B) şi *Salmonella flexneri* (C). The data were statistically analyzed using an MVSP 3.1 statistical package.

RESULTS AND DISCUSIONS

The results of the microbial analyzes were reported to CLSI and are represented in graphs 1-3.

Of all the compounds tested, the maximum antimicrobial activity is given by the propolis mixture (Fig. 1).

Inhibitory effect on *Escherichia coli*, has guercitin and propolis, compared to other bacterial species. Resistance to catechin and gallic acid is observed in the bacterial species *Stapaylococcus aureus* and *Salmonella flexneri* (Fig. 2).

Similarity was observed between the mixture of crude propolis and quercitin, and between catechin and gallic acid (Fig. 3).

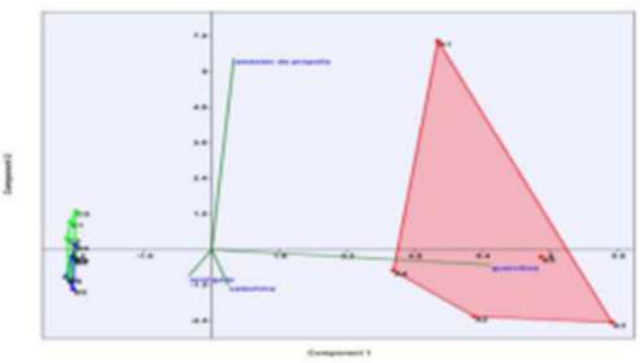

Fig. 2. PCA – on microbial species

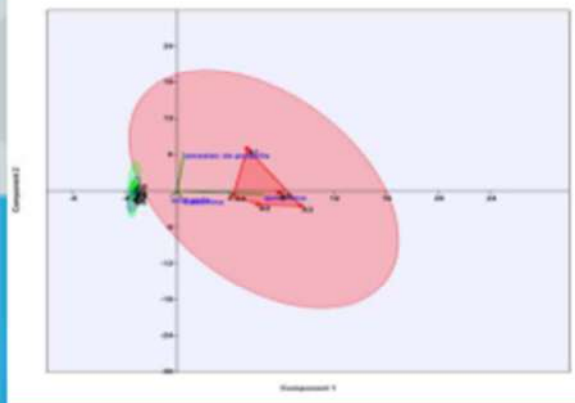

Fig. 1. PCA – maximum biological activity

Fig. 3. Cluster - Ward method in two ways, using Euclidean distances

CONCLUSIONS

Of the three bacterial cultures tested, *Escherichia coli* was the most sensitive to the highest concentration of propolis. Of the four extracts used, sensitivity was noted at some concentrations of the mixture of propolis and guercitin.

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OBTAINING AND NUTRITIONAL CHARACTERIZATION OF SOME INNOVATIVE SHRIMP PRODUCTS

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Abstract: The first objective of this paper was to obtain an innovative ready-to-eat food product, using shrimp as a basic raw material, namely: appetizer cream, in two variants: one with baked red peppers and the second with green olives, using raw and auxiliary materials from the Romanian market. Second objective was to characterize the finished products obtained from the point of view of the total polyphenols and certain mineral elements content (K, Ca, Mg, Fe, P, Mn, Cu, Cd, Zn, Pb, Cr, Ni), as well as in terms of antioxidant activity, compared to the raw materials used. The third objective was to determine the proximate composition and energy value of the two variants of shrimp appetizer cream. From the raw and auxiliary materials used to obtain the two varieties of shrimp appetizer cream, the richest content of total polyphenols was found in black pepper, followed by roasted red pepper and green olives. Regarding the finished products, the highest content of total polyphenols was recorded for the appetizer cream variant with shrimp and baked red peppers, which also had the strongest antioxidant activity. Among the heavy metals analyzed, Cd was not identified in either the raw materials or the finished products. Pb was present in shrimp in a higher concentration than the maximum limit provided by law. All other raw materials and finished products had concentrations of heavy metals below the maximum limits provided by law. The two varieties of appetizer with shrimp cream were very similar both in terms of proximate composition and energy value. The appetizer cream version with shrimp and backed red peppers had a slightly lower energy value than the green olive variant.

• Introduction

The aim of this paper was, first of all, to obtain an innovative food product that meets several conditions: to be ready-to-eat, to use shrimp as a basic raw material, to be tasty, nutritious and with high protective qualities on the human body. Thus, we chose to obtain a shrimp-based appetizer cream, in two variants: one with baked red peppers and the second with green olives. Another aim of the paper was to determine the total polyphenol content, antioxidant activity and content of certain mineral elements of the two products, compared to the raw and auxiliary materials, as well as to calculate the proximate composition and energy value of the two finished products.

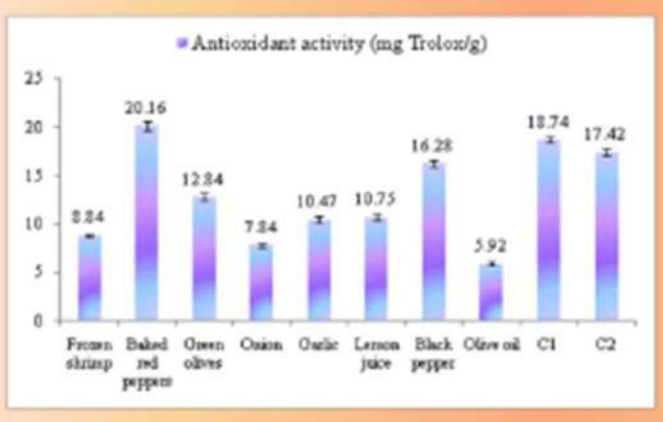
• Material and method

- Total polyphenol content determination - by Folin-Ciocâlteu method
- Atioxidant activity analysis - by CUPRAC assay
- Mineral elements determination - by atomic absorbtion spectrometry
- Proximate composition and energetic value - by calculation, using "USDA Food Compozition Databases"

• Results and discussions

Sample / Mineral element	Raw materials			Finished products	
	Baked red peppers	Green olives	Shrimp	C1	C2
Cu	3.689±0,156	2,598±0,067	6,630±0,215	3,103±0,095	0,520±0,024
Cd	-	-	-	-	-
Cr	0.650±0,028	0.587±0.026	0.713±0,024	0.604±0,014	0.372±0,007
Ni	0.289±0,008	0.739±0,010	1.445±0,068	0.488±0,012	0.971±0,021
Pb	0.435±0,100	0.144±0,005	0.833±0,029	0.471±0,011	0.355±0,012
Zn	10.766±0,484	1.491±0,036	14.510±0,500	5.342±0,218	2.252±0,053
Fe	15.628±0,348	8.098±0,218	41.648±1,323	6.737±0,229	3.432±0,053
Mn	-	-	3.392±0.102	-	-
Ca	309±5,292	1669±36.346	545±6.245	612±8.000	674±17.436
Mg	48±1.732	111±2..340	181±2.645	106±3.605	142±2.645
K	765±14.106	501±8,888	1317±13,228	809±14,731	646±13,114
P	1559±23.643	458±15.874	692±12.124	732±20.297	201±6.082

C1	C2
Proximate composition	**Proximate composition**
Proteins (g): 9.52	Proteins (g): 9.59
Total lipids (g): 20.63	Total lipids (g): 21.23
- saturated fatty acids (g): 1.95	- saturated fatty acids (g): 2.05
Cholesterol (mg): 73.01	Cholesterol (mg): 73.52
Total carbohydrates (g): 3.17	Total carbohydrates (g): 2.74
-sugars (g): 1.38	-sugars (g): 0.75
- dietary fiber (g): 0.66	- dietary fiber (g): 0.91
Salt (mg): 322.00	Salt (mg): 321.46
Energy value: 229.70 kcal	**Energy value:** 233.33 kcal



• Conclusions

- An innovative, ready-to-eat shrimp-based food product was obtained: 'shrimp appetizer cream', in two variants: one with baked red peppers (C1) and the second with green olives (C2) , using raw and auxiliary materials from the Romanian market and a simple obtaining technology.
- Among the raw and auxiliary materials, the highest content of total polyphenols was in black pepper, followed by baked red peppers and green olives. Shrimp had a fairly high content of total polyphenols, being higher than that of onions and garlic. The experimental results obtained were within the limits found in the literature data. Of the two finished products obtained, the version C1 had a higher concentration of total polyphenols than the version C2
- The highest antioxidant activity had the baked red peppers, followed by black pepper and green olives, and the finished product variant C1 presented the best antioxidant activity.
- The determination of a number of 12 mineral elements (Cu, Cd, Cr, Ni, Pb, Zn, Fe, Mn, Ca, Mg, K, P) from the raw materials and finished products showed that all the heavy metals determined were below the limits provided by law, with one exception: shrimp lead that has exceeded the legal limit. Also, among the raw materials analyzed, shrimps were the richest in the following mineral elements: Cu, Cr, Ni, Zn, Fe, Mg, and the fint product variant C1 was the most concentrated in: Cu, Cr, Pb , Zn, Fe, K and P of the two products obtained, while the C2 variant was richer in Ni, Ca and Mg

Appetizer cream with shrimp and baked red pepper (C1)

Appetizer cream with shrimp and green olives (C2)

SPACE AND TIME ANALYSIS OF GRASSLAND SURFACES BY REMOTE SENSING METHODS AND MEANS

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Dr.geograf Loredana COPĂCEAN[1]
Drd.ing. Mihai SIMON[1]

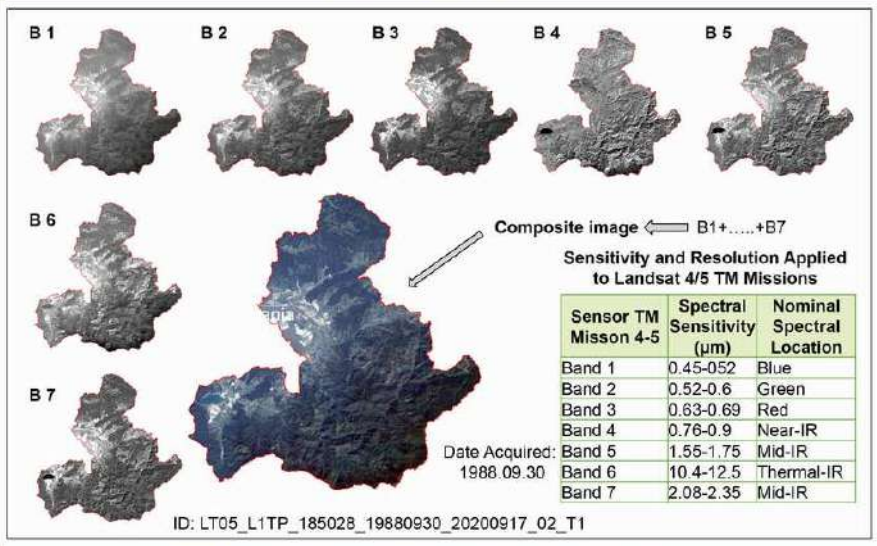
A THE MOTIVATION OF DESIGNING THE WORK ALGORITHM

Over time, a series of factors and / or processes of different origins and intensities act on the grasslands, which leads to the modification of the useful, agriculturally exploitable surfaces. In this context, the analysis of changes through the processing of satellite images (Landsat 4-5 and 8) and GIS technology is an interdisciplinary method, with minimal consumption of material and human resources, to assess the dynamics of pastoral space, with implications for the rural economy, at the zonal level.

B MATERIALS AND WORKFLOW

B.1. Satellite image processing

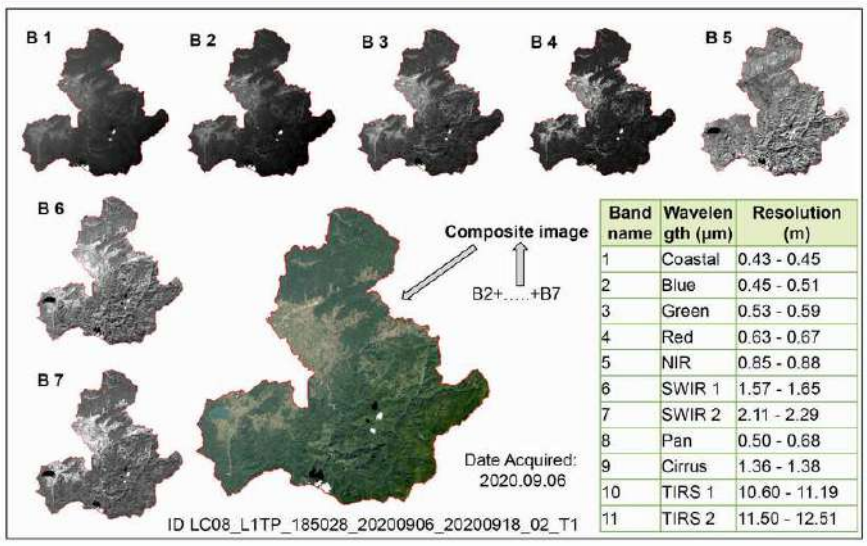
Landsat 4-5 TM - 1988



Sensitivity and Resolution Applied to Landsat 4/5 TM Missions

Sensor TM Misson 4-5	Spectral Sensitivity (µm)	Nominal Spectral Location
Band 1	0.45-052	Blue
Band 2	0.52-0.6	Green
Band 3	0.63-0.69	Red
Band 4	0.76-0.9	Near-IR
Band 5	1.55-1.75	Mid-IR
Band 6	10.4-12.5	Thermal-IR
Band 7	2.08-2.35	Mid-IR

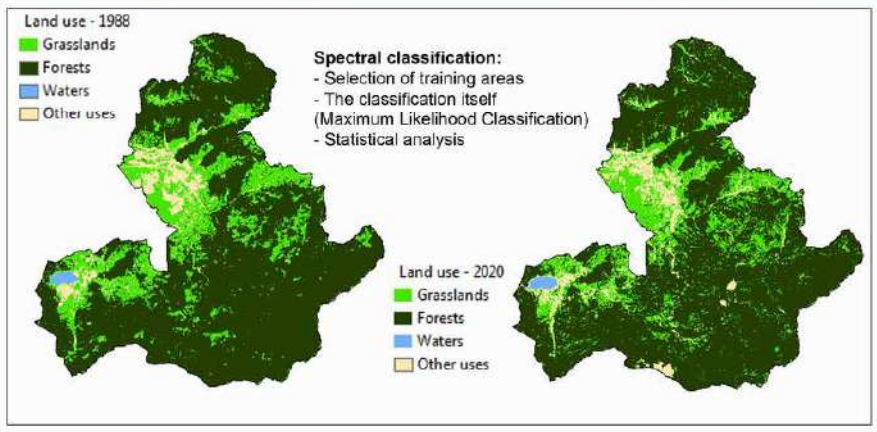
Landsat 8 LC08 - 2020



Band name	Wavelength (µm)	Resolution (m)
1	Coastal	0.43 - 0.45
2	Blue	0.45 - 0.51
3	Green	0.53 - 0.59
4	Red	0.63 - 0.67
5	NIR	0.85 - 0.88
6	SWIR 1	1.57 - 1.65
7	SWIR 2	2.11 - 2.29
8	Pan	0.50 - 0.68
9	Cirrus	1.36 - 1.38
10	TIRS 1	10.60 - 11.19
11	TIRS 2	11.50 - 12.51

B.2. Spectral classification of satellite images

Landsat 4-5 TM - 1988 **Landsat 8 LC08 - 2020**



B.3. Validation of spectral classification results

ACCURACY ASSESEMENT

Extract values to points – Frequency – Pivot Table – Error Matrix

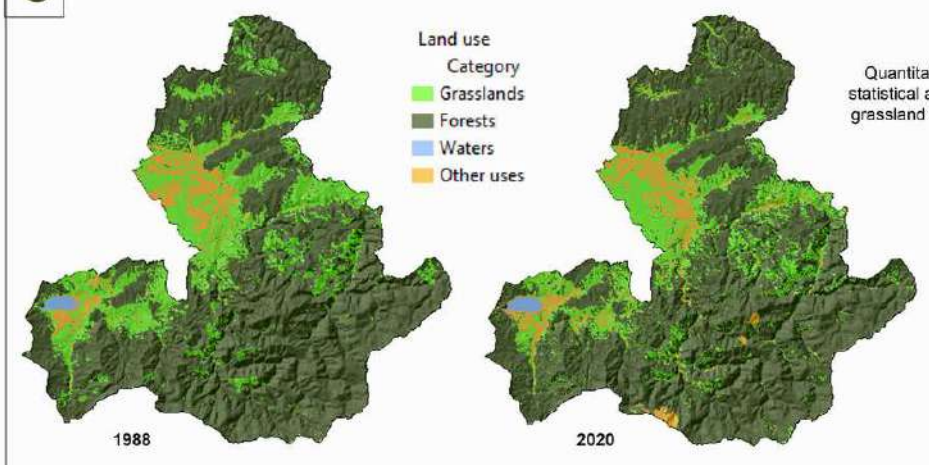
1988
Comparing results with:
- cadastral maps
- Aerial images

Class name	Predict	Truth 1	Truth 2	Truth 3	Percent	Predictions
Grasslands	1	**57**	11	3	80,3%	71
Other categories	2	9	**102**	3	89,5%	114
Waters	3	4	6	**23**	69,7%	33
	Percent	81,4%	85,7%	79,3%	**83,5%**	
	Count truth	70	119	29		Total points 218

2020
Comparing results with:
- cadastral maps
- Orthophotomaps
- Specialized platforms (Google Earth)
- GPS points

Class name	Predict	Truth 1	Truth 2	Truth 3	Percent	Predictions
Grasslands	1	**52**	11	3	80,3%	66
Other categories	2	9	**107**	6	90,5%	122
Waters	3	4	6	**20**	67,7%	30
	Percent	78,3%	89,1%	79,3%	**81,7%**	
	Count truth	65	124	29		Total points 218

C TERRITORIAL DIFFERENCES AND SURFACE CALCULATION

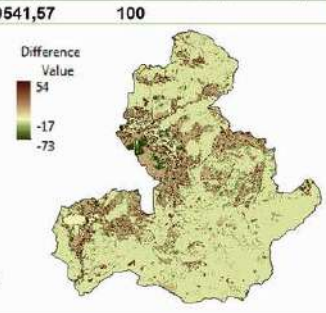


Quantitative and statistical analysis of grassland dynamics

Land use	Year 1988 Surface (ha)	Year 1988 % of total area	Year 2020 Surface (ha)	Year 2020 % of total area	Variation (ha)	Relative variation (%)
Grasslands	13230,44	21,85	11689,89	19,31	-1540,55	-11,64
Forests	43765,44	72,29	44445,65	73,41	680,21	1,55
Surduc Lake	271,78	0,45	288,41	0,48	16,63	6,12
Other uses	3273,91	5,41	4118,66	6,80	844,75	25,80
Total	**60541,57**	**100**	**60541,57**	**100**		

For the calculation of the surfaces were applied:
- Reclassification of images with land use resulting from spectral classification;
- Raster - vector conversion;
- Statistical processing

Cartographic representation of changes in land use



D ADVANTAGES OF USING THE WORKFLOW

In Romania, the cadastral record of the grasslands is in many cases unclear and "mobile", the systematic cadastral procedure being in progress. Under these conditions, the idea of developing an algorithm (workflow) for processing satellite images to obtain the identification and spatial delimitation of grassland surfaces is a precision "automated" alternative that can be easily applied over large areas.

A major advantage is the possibility of using satellite images from different time periods being possible for comparative analysis in the GIS environment. Thus, it is possible to:

- highlighting the dynamics of grassland areas, in time and space, over large areas, without the need to move in the field;
- performing spatial analyzes on variable time intervals, depending on needs, given that satellite images have a time resolution of 26 days (in the case of Landsat missions) or even higher;
- existence of satellite data over a long period of time (approx. 40 years in the case of the Landsat archive);
- the analysis of the grasslands in relation to other components of the geographical space, which allows the formulation and application of objective management measures, with special importance for the local communities.

Banat's University of Agricultural Sciences and Veterinary Medicine "King Mihai I of Romania" from Timisoara

Agricultural Research and Development Station - Lovrin

SENTINEL 2 SATELLITE IMAGE PROCESSING TECHNIQUES FOR GEOSPATIAL ANALYSIS OF GRASSLAND AREAS

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Prof.dr.ing. Luminiţa COJOCARIU[1,2]
Drd.ing. Mihai SIMON[1]
Prof.dr.ing. Cosmin POPESCU[1]

A THE MOTIVATION OF DESIGNING THE WORK ALGORITHM

With the technical possibilities of investigating the pastoral space through satellite images and GIS technology, the pratological research has passed into a new dimension, with perspectives of "extension" and with a strong multidisciplinary character. In this context, through the present researches were "experimented" spectral classification techniques applied on Sentinel 2 satellite images, in order to identify, territorial representation and complex analysis of grasslands in hilly and mountainous areas from southwestern Romania.

B MATERIALS AND WORKFLOW

For the acquisition, preprocessing and processing of Sentinel 2 images, the Semi-Automatic Classification v. 7.8.0.1 Plugin implemented by Luca Congedo in the QGIS software was used.

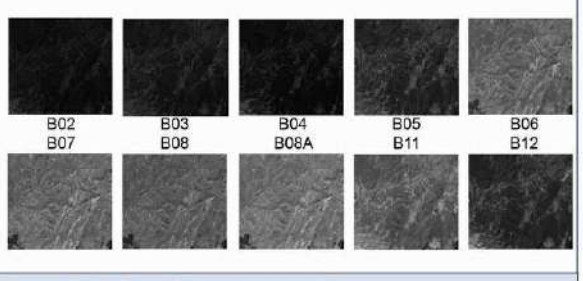
1. Technical data relating to the Sentinel 2 satellite image

Product ID:
L2A_T34TER_A027303_20200913T093346
Acquisition Date
2020-09-13T09:30:41.024Z
Cloud Cover: 4,84137; **Zone Path** 34TER;
Colection/Image
S2A_MSIL2A_20200913T093041_N0214_R136_T34TER_20200913T122841

Study area:
WGS coordinates
Top left
45.246047337626
21.630413090890
Bottom right
45.089203365688
21.911225262096

Spectral bands used

	Band name	Center wavelength
1	T34TER_A027303_20200913T093346_B02	0.49
2	T34TER_A027303_20200913T093346_B03	0.56
3	T34TER_A027303_20200913T093346_B04	0.665
4	T34TER_A027303_20200913T093346_B05	0.705
5	T34TER_A027303_20200913T093346_B06	0.74
6	T34TER_A027303_20200913T093346_B07	0.783
7	T34TER_A027303_20200913T093346_B08	0.842
8	T34TER_A027303_20200913T093346_B8A	0.865
9	T34TER_A027303_20200913T093346_B11	1.61
10	T34TER_A027303_20200913T093346_B12	2.19



2. Sentinel 2 spectral band preprocessing

Conversion from DN to reflectance values
Initial - DN

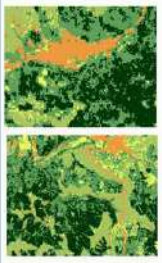
	Band	Quantification value	Solar irradiance
1	clip_T34TER_A027303_20200913T093346_B02.tif	10000	1941.63
2	clip_T34TER_A027303_20200913T093346_B03.tif	10000	1822.61
3	clip_T34TER_A027303_20200913T093346_B04.tif	10000	1512.79
4	clip_T34TER_A027303_20200913T093346_B05.tif	10000	1425.56
5	clip_T34TER_A027303_20200913T093346_B06.tif	10000	1288.32
6	clip_T34TER_A027303_20200913T093346_B07.tif	10000	1163.19
7	clip_T34TER_A027303_20200913T093346_B08.tif	10000	1036.39
8	clip_T34TER_A027303_20200913T093346_B11.tif	10000	245.59
9	clip_T34TER_A027303_20200913T093346_B12.tif	10000	85.25
10	clip_T34TER_A027303_20200913T093346_B8A.tif	10000	955.19

After conversion

Reflectance values

Band	Ref. min	Ref. max.
02	0,0033	0,3226
03	0,0101	0,3820
04	0,0046	0,4352
05	0,0183	0,4157
06	0,0593	0,5278
07	0,0742	0,6191
08	0,0605	0,7204
08A	0,0733	0,6598
11	0,0256	0,4834
12	0,0117	0,4194

3. Creation of training areas for spectral classification



Land use

MC ID	C ID	Name	Type	Color
1		**Forest areas**		
✓ 1	1	Forests	R&S	
2		**Agricultural areas**		
✓ 2	2	Grasslands	R&S	
3		**Built spaces**		
✓ 3	3	Settlements	R&S	
4		**Bare ground**		
✓ 4	4	Uncovered soil	R&S	
5		**Cultivated land**		
✓ 5	5	Permanent crops	R&S	
6		**Shrubs**		
✓ 6	6	Trees and shrubs	R&S	

Spectral band combinations

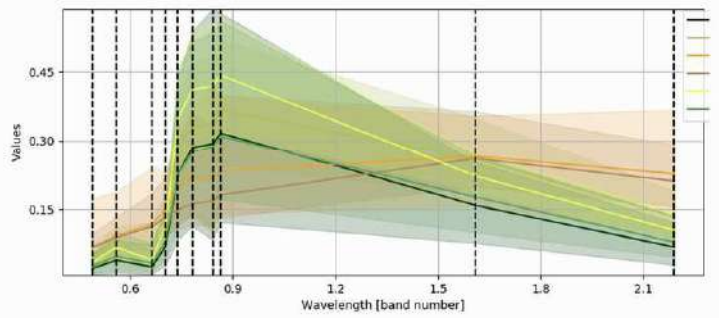
4-3-2 Natural Colors | 8-4-3 False color Infrared | 11-8-2 Agriculture

4. Evaluation of spectral signatures and accuracy of results

1	✓	1	Forest areas	1	Forests
2	✓	2	Agricultural areas	2	Grasslands
3	✓	3	Built spaces	3	Setlements
4	✓	4	Bare ground	4	Uncovered soil
5	✓	5	Cultivated land	5	Permanent crops
6	✓	6	Shrubs	6	Trees and shrubs

Macroclasses and land use classes

Variation of spectral signatures in relation to wavelength



Details of spectral signatures

Band	02	03	04	05	06	07	08	08A	11	12
Wavelength [E-6m]	0,49	0,56	0,665	0,705	0,74	0,783	0,842	0,865	1,61	2,19
MC_ID = 1 – Forest areas; C_ID = 1 - Forests										
Values	0,02077	0,03652	0,02432	0,06945	0,22542	0,26439	0,29307	0,31655	0,15801	0,06731
Standard deviation	0,00426	0,0074	0,00503	0,01115	0,03428	0,0432	0,04813	0,04527	0,01987	0,00883
MC_ID = 2 – Agricultural areas; C_ID = 2 - Grasslands										
Values	0,04404	0,08106	0,06899	0,14319	0,28827	0,33053	0,33968	0,36682	0,26017	0,13367
Standard deviation	0,0066	0,00918	0,01456	0,01368	0,03462	0,04177	0,04227	0,04385	0,02859	0,02026
MC_ID = 3 – Built spaces; C_ID = 3 - Settlements										
Values	0,0665	0,09132	0,11715	0,14916	0,19905	0,21817	0,21702	0,23516	0,2658	0,22671
Standard deviation	0,02001	0,02276	0,03098	0,023	0,02873	0,03325	0,04249	0,03653	0,03748	0,04433
MC_ID = 4 – Bare ground; C_ID = 4 – Uncovered soil										
Values	0,06542	0,08812	0,11171	0,13333	0,14837	0,16116	0,16763	0,1606	0,26049	0,21102
Standard deviation	0,00641	0,00884	0,01399	0,01597	0,02462	0,02855	0,03091	0,03274	0,02592	0,0204
MC_ID = 5 – Cultivated land; C_ID = 5 – Permanent crops										
Values	0,03274	0,06706	0,03874	0,11667	0,34923	0,4117	0,41931	0,44329	0,22216	0,104
Standard deviation	0,00296	0,00572	0,00561	0,00839	0,0445	0,03497	0,05553	0,05241	0,01468	0,01063
MC_ID = 6 – Shrubs; C_ID = 6 – Trees and shrubs										
Values	0,02574	0,04714	0,03215	0,08002	0,22601	0,27495	0,28626	0,30915	0,1759	0,07813
Standard deviation	0,00501	0,01055	0,00799	0,01647	0,03596	0,04141	0,05135	0,04424	0,0238	0,01333

Accuracy evaluation - spectral distance

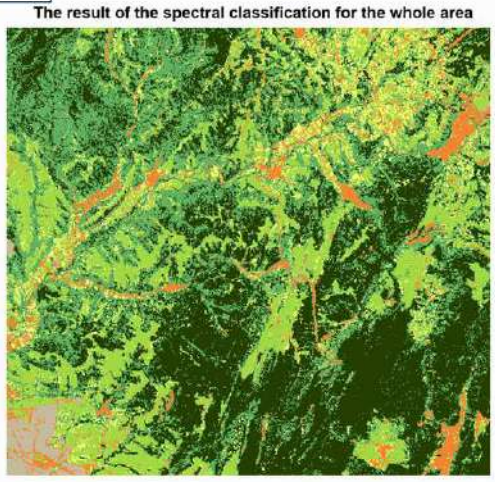
Land use - Class ID	1 - 2	1 - 3	1 - 4	1 - 5	1 - 6	2 - 3	2 - 4	2 - 5	2 - 6	3 - 4	3 - 5	3 - 6	4 - 5	4 - 6	5 - 6
Jeffries-Matusita distance	1.9971	1.9994	1.9999	1.9991	1.9954	1.9980	1.9996	1.9999	1.9575	1.9785	1.9994	1.9975	1.9999	1.9999	1.8121
Spectral angle	9.3197	26.4379	32.5299	2.9834	2.8816	17.7021	23.7247	8.4286	6.5068	6.6436	25.6046	23.7585	31.8305	29.7973	2.9137
Euclidean distance	0.1883	0.2733	0.3264	0.2899	0.0299	0.2549	0.3475	0.1638	0.1738	0.1076	0.4134	0.2455	0.5054	0.2946	0.2724
Bray-Curtis similarity [%]	84.26	75.91	68.49	80.99	97.20	83.28	76.98	89.46	85.47	92.26	72.63	78.71	66.39	71.61	82.10

MC_ID = 1 – Forest areas; C_ID = 1 – Forests; MC_ID = 2 – Agricultural areas; C_ID = 2 – Grasslands; MC_ID = 3 – Built spaces; C_ID = 3 – Settlements;
MC_ID = 4 – Bare ground; C_ID = 4 – Uncovered soil; MC_ID = 5 – Cultivated land; C_ID = 5 – Permanent crops; MC_ID = 6 – Shrubs; C_ID = 6 – Trees and shrubs

C RESULTS OF SPECTRAL CLASSIFICATION

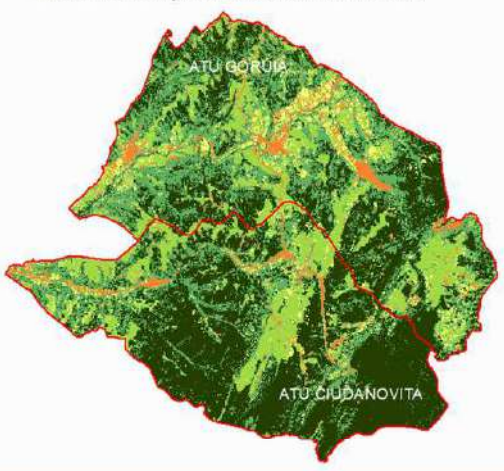
ArcGIS 10.2.1 software was used to extract the area of interest and calculate the surfaces by land use categories.

The result of the spectral classification for the whole area



Legend
- Forests
- Grasslands
- Built spaces
- Uncovered soil
- Permanent crops
- Trees and shrubs

The result of the spectral classification at ATU level



Calculation of areas by land use categories

MC/ C ID	Land use	Surface Ha	%
1	Forests	5136,64	43,46
2	Grasslands	1772,62	15,00
3	Built spaces	509,80	4,31
4	Uncovered soil	18,96	0,16
5	Permanent crops	666,72	5,64
6	Trees and shrubs	3714,12	31,43
	Total	**11818,87**	**100,00**

Image structure

MC/ C ID	Land use	Count
1	Forests	511020
2	Grasslands	176180
3	Built spaces	51604
4	Uncovered soil	1970
5	Permanent crops	69279
6	Trees and shrubs	371979
	Total	**1182032**

D ADVANTAGES OF USING THE WORKFLOW

The use of spectral classification techniques in grassland analysis has as major advantages:

- limiting field trips; "Field visits" are required to mark checkpoints in certain areas, based on which the accuracy and precision of the classification is validated;
- the possibility of conducting research on large areas, given the global "coverage" of scenes; on the other hand, the evolution over time of specific phenomena and processes can be analyzed;
- obtaining a very large volume of information, of different categories, which offers the opportunity to "combine" the results in multilayer analyzes of great complexity, but also the possibility of generating forecasts, under different theoretical or practical aspects.

Banat's University of Agricultural Sciences and Veterinary Medicine "King Mihai I of Romania" from Timisoara

Agricultural Research and Development Station - Lovrin

EUROINVENT
13th European Exhibition of Creativity and Innovation
IASI, ROMANIA, 20– 22 May 2021

EVALUATION OF URBAN AREAS BY REMOTE SENSING METHODS IN RELATION TO CLIMATIC CONDITIONS

Authors:
Assoc. Prof. Herbei Mihai Valentin, PhD; **Prof. Florin Sala, PhD**

Overview

The study used methods based on remote sensing to evaluate the urban area of Timisoara City in relation to the climatic conditions. Satellite images were taken from the Landsat 8 system. The study interval was between August 9, 2013 and August 7, 2018. The images were taken in August, an expressive month in thermal aspect for the studied area. The spectral information from the satellite images was analyzed in the light of specific indices, such as: Land Surface Temp - LST, Normalized Difference Built-Up Index – NDBI, and Normalized Difference Vegetation Index – NDVI, respectively. For the interpretation of the values of the indices, the climatic data were taken into account for the period January - July of each analyzed year (P1 - P7, precipitation in January-July; T1-T7, average monthly temperature in January-July). There was registered very strong, negative and positive correlations (NDVI with NDBI, r = -0.998; LST with P7, r =-0.976; LST with T4, r =-0.984; NDVI with P7, r =0.900). Also, strong negative or positive correlations were recorded (LST with P6, r=-0.891; LST with T5, r =-0.889; NDVI with LST, r=0.824; NDVI with T4, r =0.883). Depending on the time factor (T), the variation of indices was described by smoothing spline model (LST vs. T), or by the models on type of polynomial equations of degree 2 (NDBI vs T, R^2 =0.965, p <0.05; NDVI vs. T, R^2 =0.986, p <0.01). Multiple regression analysis led to obtaining 3D and isoquant variation models of NDVI and LST indices depending on T7 and P6.

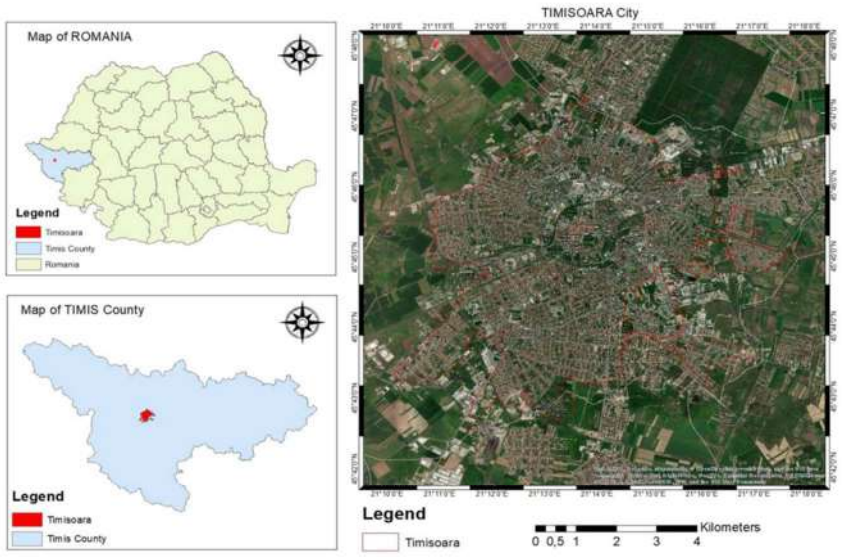
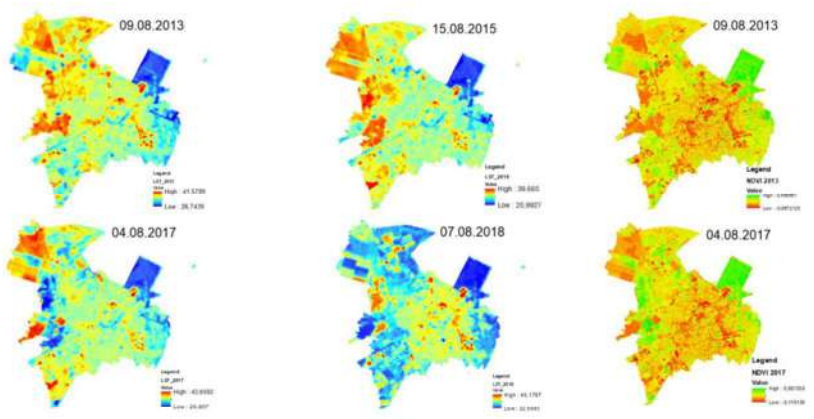
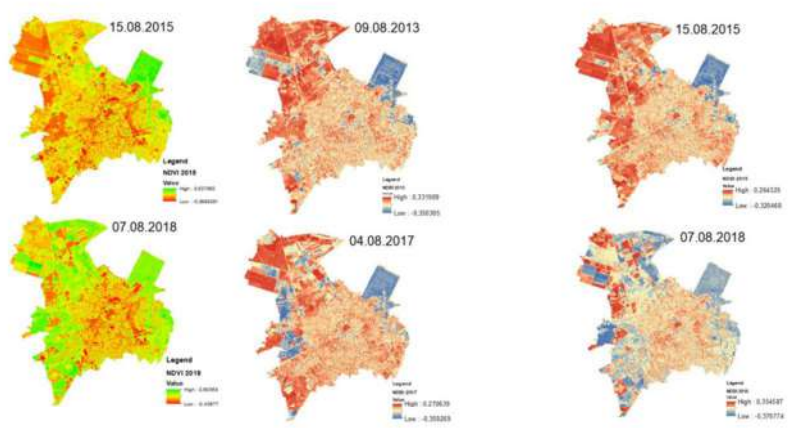


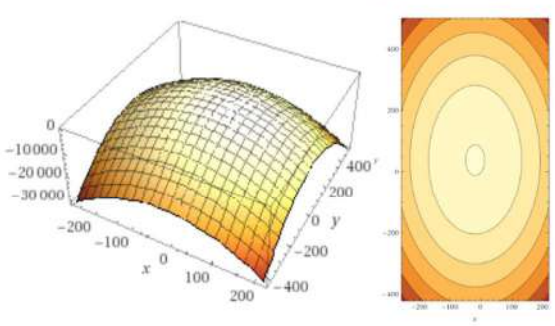
Table 1. Data of LST, NDVI and NDBI indices and climatic conditions for City of Timisoara, 2013 - 2018

Year	Indices			Precipitation (P, mm)							Temperatures (T, ºC)						
	LST	NDBI	NDVI	P1	P2	P3	P4	P5	P6	P7	T1	T2	T3	T4	T5	T6	T7
2013	33.15686	-0.05473	0.242145	54.3	37	104.2	34.1	97.3	47.5	24.9	-1.5	0.6	5.7	11.3	16.3	19.4	21.5
2015	32.0458	-0.0335	0.214432	51.4	37.4	33.3	28.1	46.9	61.8	25	2.1	2.9	7.1	11.6	17.7	21.2	24.9
2017	33.94456	-0.05782	0.250366	8.7	19.4	26	55.9	53.8	58.8	19.4	-4.7	3.3	9.4	10.8	17.6	22.5	24.2
2018	27.98844	-0.11605	0.314672	58.4	44.8	67.3	28.1	51.6	80.3	72.5	3	2	4.6	16.4	20	21.3	22.6

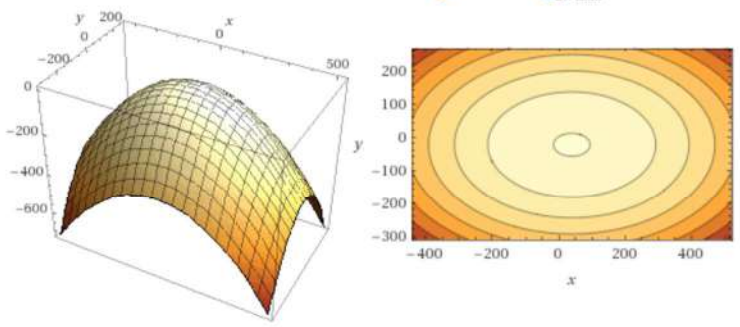
P – Precipitation (mm); T – Temperatures (ºC); 1 - January, 2 - February, 3 - March, 4 - April, 5 - May, 6 - June, 7 – July.







3D graph for LST variation according to T (ºC) in June, and P (mm) in June and Graphical representation in the form of isoquant for optimal LST according to the optimum values of T (ºC) in July and P (mm) in June



3D graph for NDVI variation according to T (ºC) in June, and P (mm) in June and Graphical representation in the form of isoquant for optimal NDVI according to the optimum values of T (ºC) in July and P (mm) in June

The study of urban areas through satellite images, specific indices and imaging analysis is of interest and also a necessity for assessing the specific environmental conditions of urban ecosystems. The specific indices LST, NDVI and NDBI were useful tools in the present study to evaluate the temporal variation over a period of five years of the environmental conditions in the city of Timisoara, in close relation with the climatic conditions of temperature and precipitation. The study may be the basis for the development of a model for monitoring and management of the urban ecosystem in the city of Timisoara in order to monitor environmental conditions, especially in the summer season, and water supply interventions for green spaces, reflected in values of NDVI and LST indices, correlated with climatic conditions.

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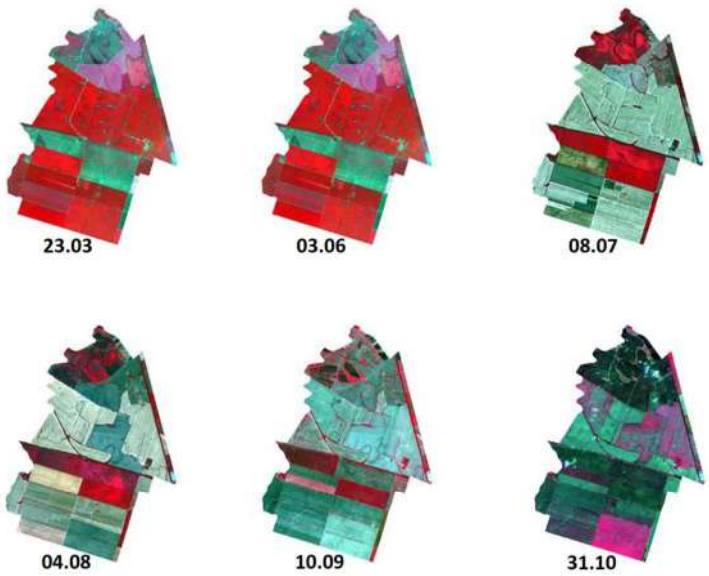
❖Title

Assessment of temporal variability for agricultural land by fractal analysis of satellite imagery

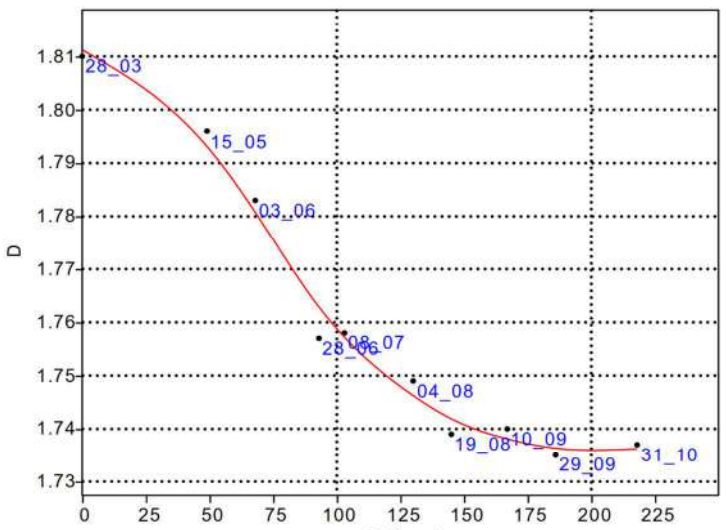
❖Authors & Contact
Florin SALA , Cosmin Alin POPESCU, Mihai Valentin HERBEI
Contact: Prof. Florin Sala, PhD, florin_sala@usab-tm.ro

❖Short presentation

The study used fractal analysis and remote sensing technique to analyze and describe the temporal variation of an agricultural area. The fractal analysis was performed on the binarized images, using the box-counting method. Fractal dimensions (D) were obtained in conditions of statistical accuracy (R^2 for D=0.999). Fractal dimensions had values ranging between D=1.735 (trial 9, data 29.09) and D=1.810 (trial 1, data 28.03). There were identified very high negative correlations between D and T (r=-0.942). The variation of the fractal dimension (D) with respect to T has been accurately described by a polynomial model of degree 2, under conditions of R=0.951, p<<0.001, and by a model of smoothing spline, under conditions of statistical certainty ( ). In the framework of PCA analysis, PC1 has explained 87.845% of variance, and PC2 has explained 10.688% of variance. Cluster analysis, based on fractal dimensions (D), led to the grouping of the studied cases, associated with the ten moments of time, according to the Euclidean distances, under statistical accuracy conditions (Coph.corr=0.895). Variants were found to be grouped into two distinct clusters. Estimating a moment in time T depending on the values of the fractal dimensions (D) was possible on the basis of a model expressed by a polynomial equation of 3rd degree, under conditions of statistical accuracy R^2=0.947, p=0.00031.



Images in false colors during the study period, SD Timisoara



Graphic distribution of values D in relation to T, according to spline model

❖Applicability

Fractal analysis based on satellite imagery can be used for:

- ➢General analysis of territory
- ➢Temporal variability assessment of agricultural lands
- ➢Generating analysis and forecasting models
- ➢Agricultural land management

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❖Ali A., Martelli R., Lupia F., Barbanti L. 2019 – Assessing multiple years' spatial variability of crop yields using satellite vegetation indices. Remote Sensing, 11: 2384.
❖Herbei M.V., Sala F. 2015 – Use landsat image to evaluate vegetation stage in sunflower crops. AgroLife Scientific Journal, 4(1): 79-86.
❖Rio-Mena T., Willemen L., Vrieling A., Nelson A. 2020 – Understanding intra-annual dynamics of ecosystem services using satellite image time series. Remote Sensing, 12(4): 710.
❖Xu X., He P., Pampolino M.F., Qiu S., Zhao S., Zhou W. 2019 – Spatial variation of yield response and fertilizer requirements on regional scale for irrigated rice in China. Scientific Reports, 9: 3589.

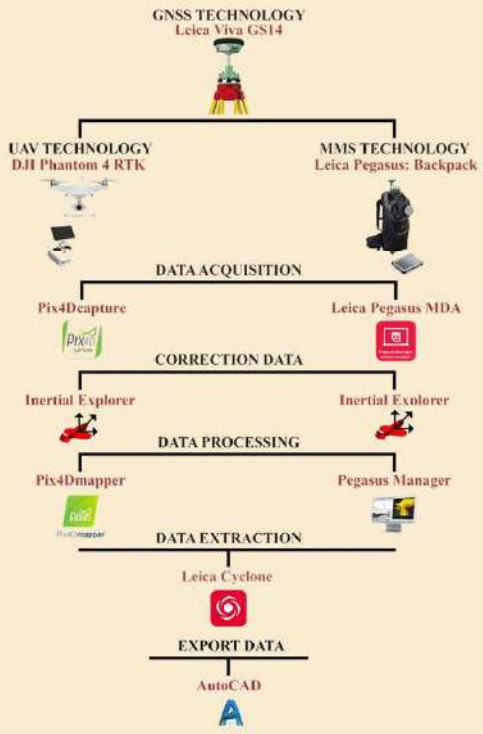
BANAT'S UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE
"KING MICHAEL I OF ROMANIA" FROM TIMISOARA

PHOTOGRAMMETRIC TECHNIQUES AND LIDAR SYSTEMS (UAV AND MMS) ADAPTED FOR THE DETAILED INVESTIGATION OF THE RURAL AREA

01 PURPOSE OF THE STUDY

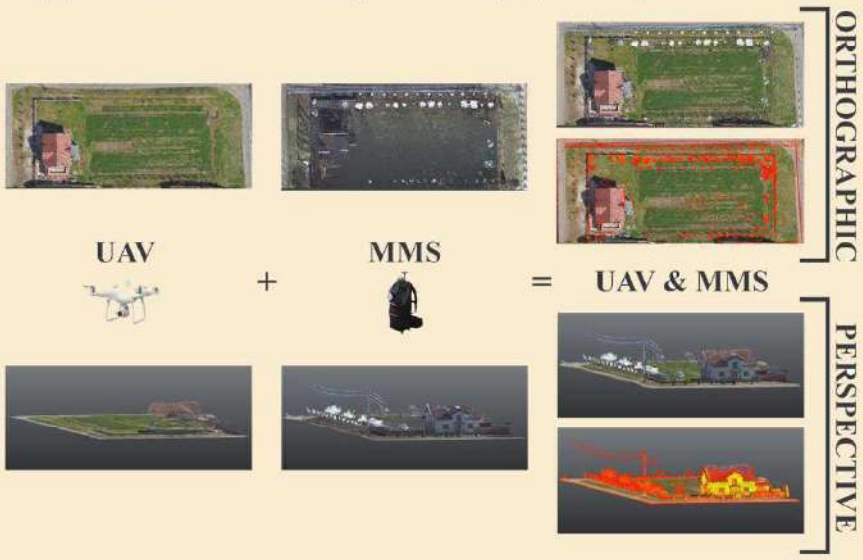
The aim of this study was to demonstrate the applicability and opportunity of the means and methods of remote sensing (MMS) and photogrammetry (UAS) in rendering faithfully, with very high accuracy and precision, the components of geographical space, "remotely", without a direct contact with the investigated objective.

02 WORK METHODOLOGY



03 DATA ACQUISITION

In the images below you can see the contribution of each piece of equipment used in the investigation of the proposed objective



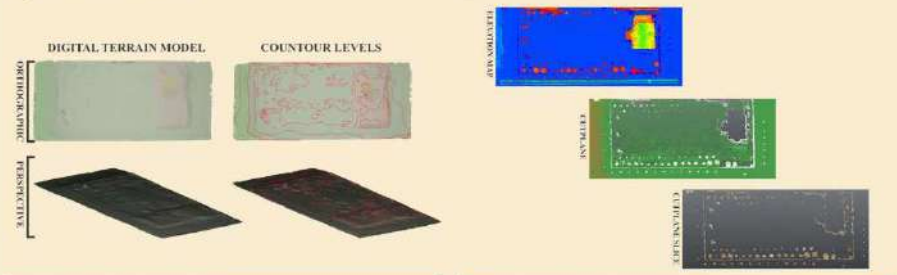
04 RESULTS AND DISCUSSIONS

A.THE FIRST STAGE

The first stage of the study was the analysis of the terrain, both for the built space and for the related agricultural land.

B.THE SECOND STAGE

The second stage involved the preparation of the study area, respectively the sectionig to capture all the details.

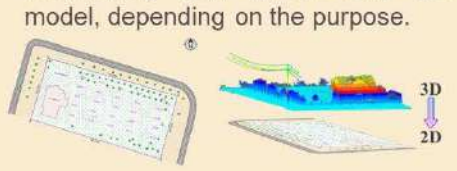


C.THE THIRD STAGE

In the third stage of the study, point clouds obtained by the two techologies, UAS and MMS, were superimposed.

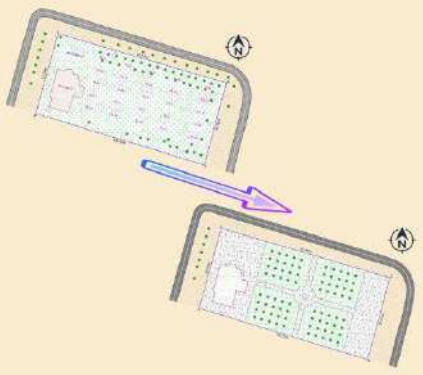
C.THE FOURTH STAGE

The last stage of the study is the processing and extaction of information, both in 2D and 3D model, depending on the purpose.



05 THE FINAL RESULT

The objective of the study, achievable by combining the two technologies, UAS and MMS, is to create a situation plan of the studied perimeter, detailed topographic plan, witch contains information in the Stereographic 1970 reference system.
The proposed arrangement example can be materialized in the future and aims at planting fruit trees, but also a space for vegetable growing, given the location of the building in the rural area.



06 PRACTICAL APPLICABILITY

As both the drone and the scanner have incorporated GNSS and INS technology, the data obtained are "in coordinates" and therefore the use of control points and the georeferencing operation is excluded. By combining these "remote" measurements, the detailed topographic survey (with GPS and total station) is replaced and by 3D analysis all the details from the outside, but also from inside the plot are captured. By creating the orthophotoplan, the way of land use, aspects related to vegetation or the way of arrangement can be analyzed. The equipment used and the working methodology "experienced" in this study can be applied in any type of space or for any purpose.

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20-22 MAY 2021
13th Edition of
EURO INVENT

Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara

MIRUNA F1 – Authentic Taste of Romanian Tomatoes

Şumălan Radu, Ciulca Sorin, Bodnărescu Florin, Ciulca Adriana

4018/20.05.2019- certificate regarding the registration of the USAB 29 tomato hybrid, issued from "The State Institute for Testing and Registrating of Varieties" from Romania.

CERTIFICAT

privind înregistrarea hibridului de tomate

Miruna,

DIRECTOR GENERAL,

Tomato hybrid **MIRUNA** - is the result of the breeding work for improvement of romanian tomatoes old varieties and heirlooms. The main qualities following the breeding of this hybrid were related to the nutritional value, and the tolerance to biotic and abiotic stressors. The tomato plants have undetermined growth with good adaptability to different cultivation conditions (field or greenhouses). with strong stem and anthocyanin coloring in the upper third. Leaves of medium size, bipenate, coloured intense green. The fruits have large size, flattened shape, intense red color, glossy, with medium pericarp and firmness. The flowering and ripening period is medium. The hybrid was created especially for intensive cultivation in field and greenhouse conditions, for fresh consumption or processed, having very good nutraceutical qualities (ascorbic acid, lycopene, beta-carotene and phenols).

MIRUNA F$_1$ (Cruceni ♀ x Livezile ♂ - old romanian tomatoes landraces)

Hybrid with indetermined growth, with vigorous plants and good adaptability to different cultivation conditions. In greenhouse conditions it has a very good pollination, binds 4-7 fruits per floor with an average weight between 100-180 g, the production on the first floor was around 1.5 kg and on four floor around 3.5 kg. In the cross section, the fruit has pericarp with a thickness of 5.6-7.5 mm and a number of 4-6 seminal logs, with attractive commercial appearance, pleasant taste, balanced. Ripe fruits contain 5-5.5% sugar (BRIX).

EUROINVENT

Iasi, Romania, 21-23 May 2021

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Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara

Tomato Hybrid BANATO – Romanian Tomatoes for Traditional Farmers

Bodnărescu Florin, Şumălan Radu, Ciulca Sorin, Popescu Sorina, Gaşpar Sorin

4020/20.05.2019- certificate regarding the registration of the Sorada tomato hybrid, issued from "The State Institute for Testing and Registrating of Varieties" from Romania.

Banato is a tomatoes hybrid obtained by crossing some old local populations from Banat. He has inherited from the parental forms the tolerance to diseases and pests, the high adaptability to the specific conditions of climate and soil, the taste, the aroma and the special flavor, specific to the old tomatoes varieties. The plants of this hybrid have unndetermined growth, with medium stem and anthocyanin coloring in the upper third. Leaves of medium size, bipenate, coloured intense green. The fruits have medium size, intense red color, glossy, with thin pericarp and low firmness. The flowering and ripening period is medium.

The **Banato** hybrid was created especially for growing in family and small vegetable farms, with traditional technologies, organic fertilizers and minimal pesticide treatments. It ensures good and quality productions, both by cultivating in protected areas (greenhouses) as well as in the field. Tomatoes that respect the concept - "from the household directly to the plate …"

Banato F$_1$ (Gradinari ♀ x Dudesti ♂ - old tomato landraces)

♀

♂

EURO INVENT

Iasi, Romania, 20-22 May 2021

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Tomato hybrid with vigorous plants, undetermined growth, with rich foliage that provides good protection of fruit, medium precocity at flowering and fruits maturation. good adaptability to different cultivation conditions. The plants show a good adaptability to different growing conditions. The fruits are large, with a flattened shape, large seminal cavity, and medium thickness of the pericarp, glossy red color, pleasant taste and aroma, and attractive commercial appearance. The fruits are appreciated considering the increasing interest of the consumers for traditional and healthy products. It has 4-7 fruits per floor with an average weight of between 80-110 g and the production on first four floors was 2.5 kg. In the cross-section the fruits has a pericarp with a thickness of 5.5-6.5 mm and a number 5-8 seminal lodges. Fruits taste pleasant, balanced, the amount of sugars between 5-6 % (Brix).

The use of essential oils as antifungal agents in cereals protection

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INTRODUCTION

Cereals are subject of fungal attack both in vegetation and in warehouses when storage conditions are not appropriate. Fungal control of cereals involves the use of synthetic fungicides with a negative impact on health. The use of essential oils as antifungal agents is a healthy alternative to chemicals. Thyme (TEO), coriander (CE0) and oregano (OEO) essential oils have been tested to demonstrate the ability to inhibit the *Fusarium graminaerum* fungal growth and mycotoxins (deoxynivalenol) developed on cereals using in vivo studies. Also, the phytotoxic effect of essential oils on the germination capacity of wheat seeds was studied.

MATERIALS AND METHOD

The experimental part involved following steps:

A. Establishing the minimum concentration with impact on mycelial growth of fungi using the poisoned environment technique [1,2].

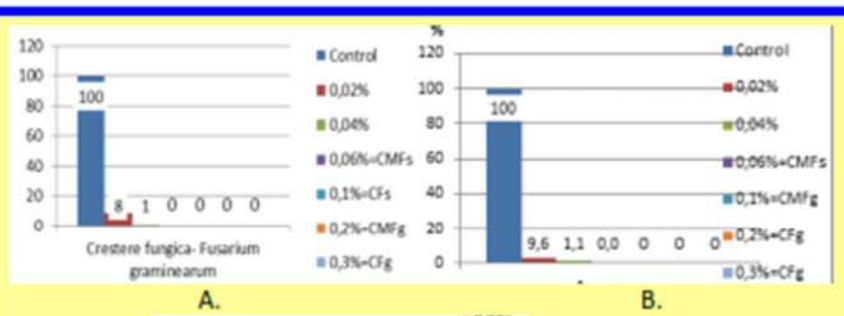
B. The treatment of wheat grains with essential oils in concentrations determined in in vitro studies to ensure the fungicidal effect;

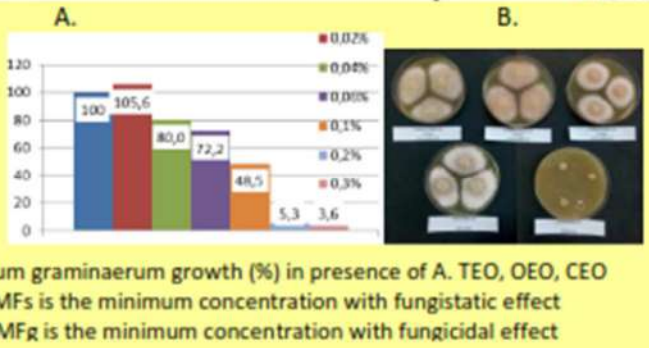
C. Determination of antifungal potential of EOs against *Fusarium graminaerum* in vivo under controlled conditions;

D. Determination of phytotoxic effects of essential oils on seed germination.

E. The effect of EOs against mycotoxins (DON) development.

RESULTS AND DISCUSSIONS

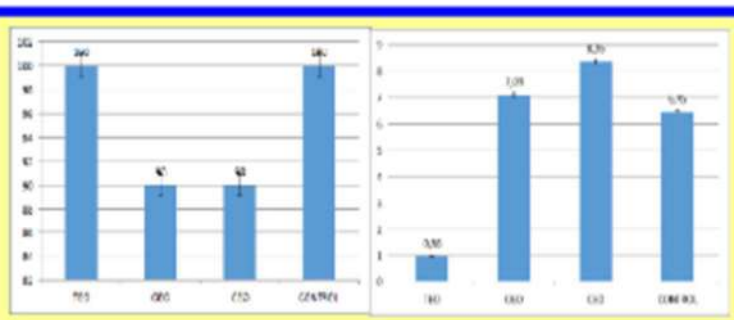




Fusarium graminaerum growth (%) in presence of A. TEO, OEO, CEO
CMFs is the minimum concentration with fungistatic effect
CMFg is the minimum concentration with fungicidal effect

TEO and OEO have a strong antifungal effect; at 0.06% the value of CMFs is reached, which is maintained at 0.1%. Starting with 0.2%, CMFg is reached, the fungicidal effect being maintained at the concentration of 0.3% TEO culture medium. OEO has the same CMFs (0,06%), but the CMFg is lower (0.1%).

CEO stimulates the growth of fungal mycelium at low concentrations; at 0.02% the mycelial area of *Fusarium graminearum* exceeds the control value by 5.6%. Above this concentration the growth of the fungus is inhibited. There is a progressive decrease of the mycelial surface simultaneously with the increase of the oil concentration added to the growth medium, thus at 0.3% oil the percentage increase is only 3.6% compared to the control.



Seed germination index DON content

The antifungal effect on *Fusarium graminaerum* in vivo is maximum and comparatively similar when applying OEO and TEO treatment at concentrations with fungicidal effect, but lower when applying CEO to wheat seed.

The antimycotoxigenic effect of EOs against DON is maximal in the case of TEO (inhibition rate of 85.2%), while OEO and CEO do not prove to have antifungal potential compared to the control.

Seed germination is not affected by treatment with essential oils (Germination index 90-100%), recommended their use as antifungal agents.

CONCLUSIONS

Due to high bioactivity and the absence of toxicity essential oils (EOs) of *Thymus vulgaris and Oregano vulgaris* can be used as natural antifungal and antymicotoxignic agent in protection of cereals.

13th edition of EUROINVENT - European Exhibition of Cretivity and Innovation - Iași, România, 20-22 May 2021

REVERSE OSMOSIS OF WHEY – A VALUABLE BIOCOMPONENT OF FEED AND FOOD

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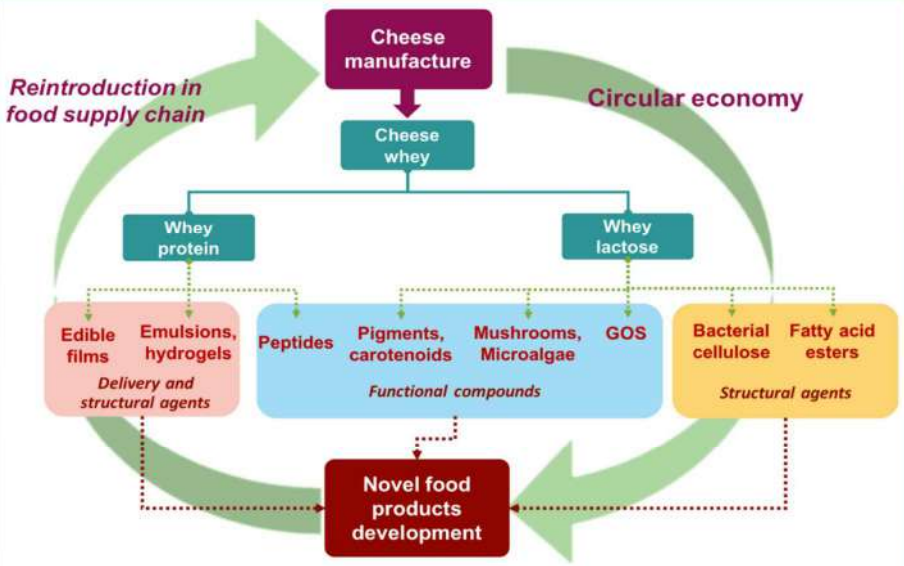
Why and from where whey?

- ✓ *is a high-quality dairy by-product from cheese industry*
- ✓ *is produce in very high quantity in the diary products industry, in all seasons, especially in summer time*
- ✓ *factories have a real problem regarding the big quantity of whey produced every day*
  - ♦ *From 4 L milk => 0.5-0.7 Kg Mozzarella or Feta => ~ 3 Kg whey*
  - ♦ *From 2 L milk => 0.5 Kg cream cheese => ~ 1.5 Kg whey*
  - ♦ *From 10 L milk => 1 Kg hard cheese => 9 Kg whey*
- ✓ *whey is a perishable product*
- ✓ *is an important source of valuable proteins in human & animal nutrition due to its content in enzymes, hormones, vitamins, minerals, and antioxidant*
- ✓ *it has low lactose content, has very little or free of lipids*
- ✓ *the dehydration (drying) technique must be very well chosen to preserve the quantity and quality of components*

Whey – a valuable by-product

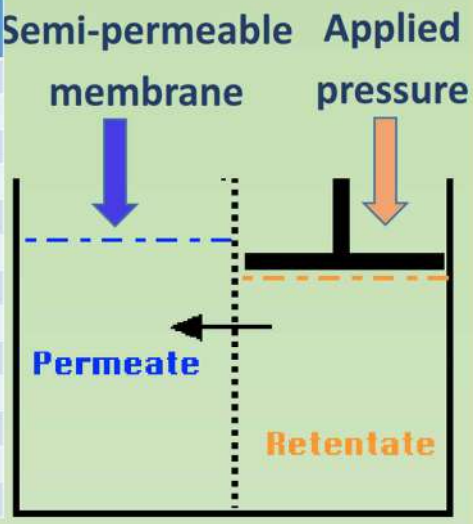


Experimental part

- ➢ *our research = carried out in a private milk processing plant from Timis County – Romania*
- ➢ *whey processing plan => necessary because in the summer time, whey quantity is ↑ and producers needed to find a way to process and capitalize it.*
- ➢ *for a very good whey quality (especially whey protein), after different tests, the degreasing (maximum 0.1% fat) followed by reverse osmosis for concentration the whey, was the best applicable solution.*
- ➢ *total lipids, protein, pH we measured on raw sweet ovine whey (resulting after cheese production), skimmed whey (after whey degreasing by centrifugation), and concentrated skimmed whey (after reverse osmosis).*
- ➢ *Whey acidity, pH, total fat, protein conc., humidity, dry matter were evaluated.*
- ➢ *27 whey samples were collected – as raw whey, skimmed whey and concentrated skimmed whey.*

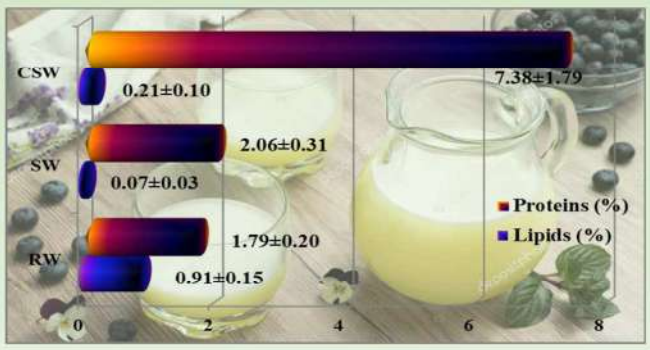
Whey reverse osmosis (Membrane processing)

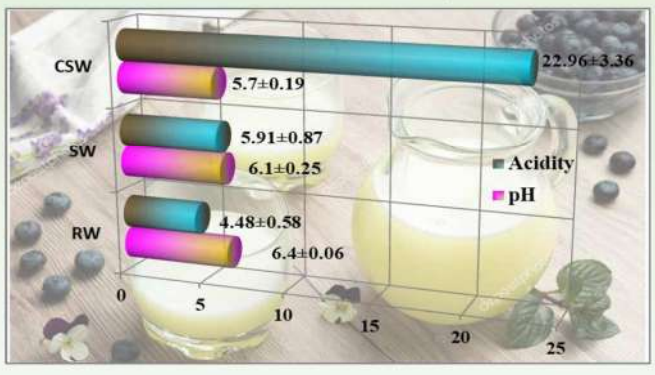
Fresh whey composition	Measure unit	Value
Protein	% (mass)	0.7
Lactose	%	4.5
Lipids	%	0.1
Ash	%	0.5
Dry content	%	6.0
Calcium	mg/L	350
Magnesium	mg/L	90
Sodium	mg/L	450
Potassium	mg/L	1400
Phosphorus	mg/L	450
Chloride	mg/L	1000
Lactic acid	mg/L	900
Citric acid	mg/L	1400



Results and disscutions

CSW – concentrated skimmed whey; SW – skimmed whey; RW – raw whey





Conclusions – whey

- ❖ *valuable natural proteins and lactose resource, being considered a waste product in dairy technology.*
- ❖ *are easily digestible, have good emulsification and solubilization properties.*
- ❖ *Reverse osmosis = a good technological approach for concentrating the cheese whey, but before osmosis concentration, the whey is mandatory to be degreased to a very low lipid concentration or even lipid free whey.*
- ❖ *Whey could become a valuable nutritional product and concentration of whey by reverse osmosis could be a good method of recovering the by-product from the cheese plants for a good purpose and thus, whey would not be classified as an environmental pollutant.*

THE AGRICULTURAL SYSTEM IN THE DOROBANȚI COMUNE, ARAD COUNTY

Ungureanu Alexandra, Berecici Miodrag, Okros Adalbert, Mihuț Casiana, Manea Dan

Abstract: The agriculture has been a vital area of human activity from 9 thousand year. It is the only source of food even the most recent development of artificial substrates. It is also a major supplier of raw materials for different industries. Mankind evolution leads to the development of the agricultural sector. Agricultural development is the main result of the changes determined by demographic pressure, increasing agricultural production, for making the basic food needs for larger population than the one currently existing. The Dorobanți locality is in the Western Romanian Plain, namely in its central part. The perimeter presented in this paperwork, although located in a plain, has various differences, which has led into three geomorphological subunits. These subunits are represented by the Comlăuș Plain, the Macea Plain and the Turnul Iratoș Plain. The Dorobanți Plain is a small area located east from and at about 1.5 km from the territory of Curtici and south from the Curtici-Sântana county road, that mean is in west of Arad county. The Macea Plain: is about 2.5 km wide oriented towards NW – SE. The Turnul Iratoș Plain: over the sands existing at the end of the Quaternary, there were loessoid deposits of relatively small thicknesses of 2.0 m similar to those of Banat. From a geological point of view, nature is showing the physical and chemical properties of the parental materials in the Comlăuș Plain, Macea-Curtici Plain, Zimand plain. The texture of soils formed in some interdunes is medium and fine sandy clay. To the west of the area occupied by the Macea-Curtici Plain, Zimand-Cîcir, the loessoid materials were deposited. Their thickness does not exceed 1.5 to 3.0 m. The territory under investigation is characterized by a continental temperate climate with milder winters , or seasonal thermal action centres.

• Introduction

• The field dealing with the production of animal and vegetable food, fibre and various useful materials is called agriculture. This area concerns the systematic cultivation of certain plants and the rearing of animals. [6,7]

• Since ancient times, agriculture has been a vital area of human activity. It is the only source of food, but also a major supplier of raw materials, both for industry and market.

• Agriculture is a main branch of the national economy, both in less developed and developed countries. Experience in recent years shows that agriculture contributes to the growth of the world economy. Agriculture in Romania is a basic field compared to the natural resources of the country (oil, coal, ores, etc.) that are exhausted as they are exploited.

• Natural factors including climate, humidity and light play a very important role in this area, as they provide optimal conditions for the growth and development of crops. Technical factors play an important role in increasing production through mechanization, chemistry, irrigation, etc. Social and economic factors increase the capacity and readiness of the workforce to develop this branch of the economy. [8,9]

• Agricultural development is the result of the changes stimulated by demographic pressure aimed at increasing agricultural production to ensure the basic food needs for a much larger population than the one currently existing. The perimeter of Dorobanți is located in the relief unit called the Western Plain, namely in its central part. This plain formed over the crystalline foundation of the Pannonia Depression. The clogging of the Pannonia Lake caused the waters to withdraw.

• The process was carried out gradually: the proof is the relief steps resulting from these phenomena. Based on field study, office study, and soil map processing, with the information we have collected, the map and the legend of soils and land comprising a number of 6 types and 11 soil subtypes was developed as follows: [10,11]

1. Dark soils-typical (ti), calcium (ka), cambic (cb), salinic (sc), salsodic (ss), gleic (gc), calcium-salinic (ka-sc), calcium-gleic (ka-gc), cambic-gleic (cb-gc), cambic-vertic (cb-vs), green (vs-gc), vertic-gleic-salinic (vs-gc-sc), gleic-stagnic (gc-st), gleic-salinic (gc-sc), gleic-salinic-alkalic (gc-sc-ac), salinic-alkalic (sc-ac). This type of soil covers an area of 4,548.67 ha.
2. Phaeozioms-cambic (cb), gleic(gc), cambic-gleic (cb-gc). This type of soil covers an area of 192.92 ha.
3. Eutricambosols-typical (ti), molic (mo), limey (ca), molic-gleic (mo-gc), vertic-gleic (vs-gc). This type of soil covers an area of 578.58 ha.
4. Vertosols-gleic (gc), stagnic-gleic (st-gc), gleic-salinic-alkalic (gc-sc-ac). This type of soil covers an area of 239.12 ha.
5. Pelosols-gleic (gc), salinic (sc), vertic-gleic-salinic (vs-gc-sc), gleic-salinic (gc-sc), salinic-alkalic (gc-sc-ac), gleic-stagnic-salinic (gc-st-sc). This type of soil covers an area of 868.78 ha.
6. Antrosols-aric (ad). This type of soil covers an area of 6.92 ha.

• Material and method

• For the elaboration of this paper, data resulting from own observations were used, data from the Romanian Statistical Directory, from M.A.D.R. and I.N.S.S.E and from the Secusigiu locality mayor hall. The agricultural production manifested very diverse specific dynamics, from a sector point of view (vegetal and animal), as well as from a regional point of view, depending on the diversity of agri-climatic usability conditions, as well as the production factor usage degree. [2,3]

• Results and discussions

• In Table 1, it can be seen that the area cultivated with wheat is 55.4 ha, decreasing in 2019 by 5.08 ha, compared to the area cultivated with maize in 2017, when an area of 105.3 ha was recorded, while in 2019, the area expanded to 125.29 ha.

• Table 1.

• Cultivated area (ha) of wheat and maize crops in 2018-2019

Crops	Area (ha)	
	2018	2019
Wheat	55.4	50.32
Maize	105.3	125.29
TOTAL	160.7	175.61

• Table 2 shows the production of wheat and maize in 2018-2019. Wheat yield was 3,614 t/ha in 2018, falling by 0,832 t in 2019 to a production of 2,782 t/ha. Maize yielded 9,129 t/ha in 2018, compared to 2019, when production increased by 3,212 t, reaching 12,341 t/ha.

• Table 2.

• Productions (t) in wheat and maize in 2018-2019

Crops	Cultivated area (ha)	
	2018	2019
Sunflower	31.42	16.59
Barley	-	-
Soy	-	-
TOTAL	31.42	16.59

• Table 3 shows the areas cultivated in 2018-2019 with sunflower, barley, and soybean, when sunflower was the only crop grown, with an area of 31.42 ha in 2018, falling considerably in 2019 by 14.83 ha, thus reaching an area of 16.59 ha.

• Table 3.

• Areas (ha) cultivated in 2018-2019 with sunflower

Crops	Mean yield (t/ha)	
	2018	2019
Sunflower	3.35	3.55
Barley	-	-
Soy	-	-
TOTAL	3.35	3.55

• The above table shows the production situation in sunflower, barley and soybean crops. As the sunflower was the only plant grown, there were productions of 3.35 t/ha in 2018, compared to 2019 where production increased by 0.2 t, reaching a production of 3.55 t/ha.

• Table 4.

• Yields obtained (t) in sunflower cultivation in 2018-2019

Crops	Mean yields (t)	
	2018	2019
Wheat	3.614	2.782
Maize	9.129	12.341
TOTAL	12,743	15,123

• Conclusions

- Cultivated areas oscillate from year to year, decreasing in some crops and increasing in others.
- Production is very low in relation to the area under cultivation, with the highest production being recorded in maize.
- It is necessary to monitor the evolution of crops and replace them with crops that are suitable for the area.

Currently, considerable quantities of fruit kernels resulting from food processing from both the world and Romania are wasted this year. Studies in recent decades have highlighted the favorable effects of some constituents of vegeta

Banat`s University of Agricultural Sciences and Veterinary Medicine „King Michael I of Romania" from Timişoara

HPLC DETERMINATION OF AMYGDALIN CONTENT IN KERNEL OILS CULTIVARS FROM ROMANIA

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Abstract

In the present paper, the amygdalin content of oil samples extracted from the kernels of some fruits belonging to the *Rosacae* family was studied and identified.
The determinations were performed using the HPLC chromatographic method on a C18 Supelcosil 250 x 4.5 x 5µm column with methanol/water (15/85) as the mobile phase at (1 ml/min) flow rate and detection at the length wavelength of 215 nm. The experimental results showed the linearity range of 0 - 0.6 mg/ml amygdaline with a correlation coefficient of 0.9949. Retention time speciffic for amygdalin is tR = 12.45 min. The amygdalin content detected in the oil samples analyzed ranged from 51.61-398.45 µg / ml of oil.

• Introduction

Currently, considerable quantities of fruit kernels resulting from food processing from both the world and Romania are wasted this year.
Studies in recent decades have highlighted the favorable effects of some constituents of vegetable oils derived from various oily materials on the health of consumers, especially in terms of protection against cardiovascular disease.
Scientific research has shown the presence of amygdalin in the kernel oils of apricots, plums and peaches.

• Material and method

- ***Amygdalin extraction from oil***

Sample preparation
The analyzed samples are presented in table 1.

Table 1. Apricot and plum kernel oil samples from Banat, Muntenia, Maramures, Transilvania, Oltenia and Moldova

Sample number	Oil samples
1	Apricot kernel oils Banat
2	Plum kernel oils Banat
3	Apricot kernel oils Muntenia
4	Plum kernel oils Muntenia
5	Apricot kernel oils Maramureş
6	Plum kernel oils Maramureş
7	Apricot kernel oils Transilvania
8	Plum kernel oils Transilvania
9	Apricot kernel oils Oltenia
10	Plum kernel oils Oltenia
11	Apricot kernel oils Moldova
12	Plum kernel oils Moldova
13	Peach kernel oils Banat
14	Plum boiled kernel oils Banat

Determination of the amigdaline calibration curve

A series of 7 solutions of amigdaline: 0.6 mg/ml, 0.5 mg/ml, 0.4 mg/ml, 0,3 mg/ml, 02 mg/ml, 0.1 mg/ml, 0.05 mg/ml.
Each solution was injected into the HPLC system Agilent 1200 model equipped with a UV-VIS detector on a C18 Supelcosil column 250 x 4.5 x 5 µm. It was used as eluent methanol/water 15/85 in isocratic system at a flow rate of 1 ml/min for 26 minutes. Chromatogram was recorded at wavelength 215 nm.

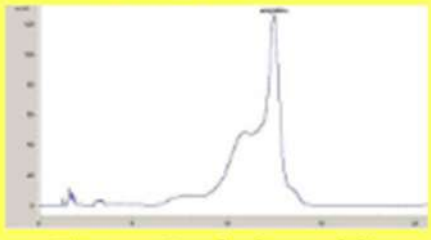

Figure 1. Standard amygdalin chromatrogram

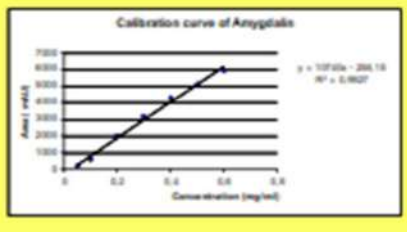

Figure 2. Calibration curve of amygdalin

• Results and discussions

- Of the fourteen samples of apricot kernel and plum oil samples in only five samples identified small amounts of amigdaline, namely:
- sample 1 apricot kernel oils Banat
- sample 3 apricot kernel oils Muntenia
- sample 7 apricot kernel oils Transilvania
- sample 12 plum kernel oils Moldova
- sample 14 plum boiled kernel oils Banat

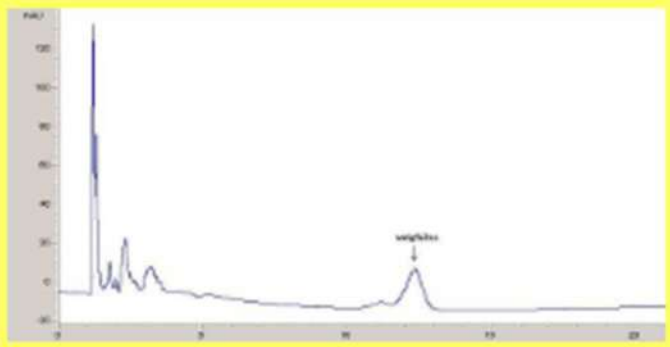

Figure 3. The HPLC chromatogram of amygdalin in the sample 12 (plum kernel oils Moldova)

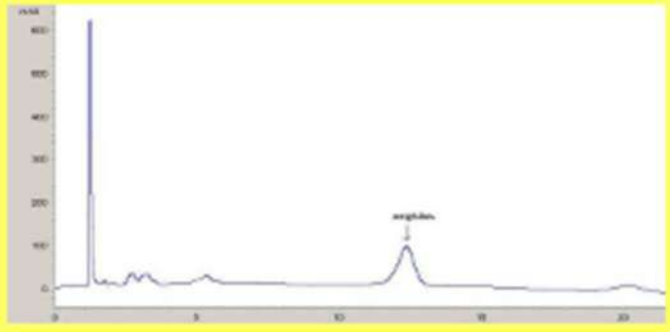

Figure 4. The HPLC chromatogram of amygdalin in the sample 14 (plum boiled kernel oils Banat)

• Conclusions

- Following the studies conducted in this paper, new food safety regulations and applications need to be developed for apricot kernels, peaches and plums, but also for oils extracted from them.
- Therefore, new and effective regulations are needed in this respect, and consumers should be informed about the characteristics of these types of kernels and oils.

APPLICATIONS OF GENE SEQUENCING METHOD (BARCODING) FOR PLANT PATHOGENS IDENTIFICATION

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INTRODUCTION

One of the most important problems of geranium growers is the infection of plants with bacteria, considered *Xantomonas* which cause huge losses due to the lack of control possibilities. Thus, identification and prevention methods are particularly important.

The classic identification of bacteria consists in analyzing their morphological traits, followed by microscopic ones as the shape and appearance of developed bacterial colonies, the type of cell membrane system, cell shape and size, presence or absence of a flagellum. Since these methods do not allow the precise identification of bacterial species, it is necessary to supplement them with DNA sequencing analyzes.

It is known that the sequencing of the 16 S RNA gene and its comparison with databases allows the identification of the bacterial species with high precision.

The AIM of this project was to identify the pathogen which produce the leaf spots and the necrosis on geranium plants cultivated in greenhouses.

MATERIAL AND METHODS

The microorganisms were isolated from infected leaves of geranium plants cultivated in a greenhouse and from soil samples.

For the DNA isolation the Bioline, ISOLATE II Genomic DNA Kit was used.

Amplifying the 16S rRNA gene from the DNA samples was carried out with the following primers:

F27: AGAGTT TGATCMTGGCT and

F485: CAGCAGCCGGGGTAA using Green Taq master mix (Promega) in accordance with the manufacture indications.

The amplified products were separated in 1.8% agarose gel electrophoresis and the DNA fragments with the expected size of 1500 bp were excised and purify with the PureLink, Quick Gel Extraction & PCR Purification Combo Kit.

For sequencing the Sanger method was used starting from the primers which generated the interest fragment. The obtained sequences were compared with the international databases (https://blast.ncbi.nlm.nih.gov/), therefore the accurate identification of the bacterial species being possible.

CONCLUSIONS

The results of 16S rRNA gene sequencing showed that none of the isolated strains belonged to the genus *Xanthomonas*, as inferred from morphological observations.

Pseudomonas species were identified in four of the six soil samples, which were not surprising, considering that *Pseudomonas* species are widespread in the soil and also represent a pathogen of geraniums. In other soil samples *Erwinia* and *Lelliottia* species were identified which are both genera present in the soil. For samples isolated from plants, only *Pseudomonas* strains were identified, which represent a pathogen of geraniums.

The importance of molecular analyzes is obvious, considering that *Xanthomonas* has morphology similar to *Pseudomonas* and *Erwinia*, and their differentiation would not have been possible exclusively through microscopic observations.

RESULTS AND DISCUSIONS

Bacterial isolation

Bacteria isolated from both plants and soil were inoculated on liquid and solid culture media and incubated at 28 °C. After the development of bacterial cultures on the initial media, 3-4 subcultures took place, successively on solid and liquid culture media, in order to purify the bacterial strains to obtain single colonies.

Identification of bacterial strains based on morphological methods

The morphological characterization of the ten isolated bacterial strains revealed widespread bacterial colonies, mucilaginous, with a round shape and a white-yellow color, which could be specific to bacteria of the genus *Xanthomonas*.

Microscopic analysis, based on Gram staining, revealed some Gram-negative microorganisms, which had a bacillary form, consistent features, among others, with the features of bacteria of the genus Xanthomonas, but this information was not enough to definitively identify a microorganism.

Xanthomonas has similar morphology to *Pseudomonas* and *Erwinia*, therefore molecular analyzes should complement classical microbiological determinations.

Molecular analysis

The DNA extracted from all the ten isolated samples was amplified with the primers specific for 16S RNA gene. The amplified fragments were purified from gel and send for sequencing.

The bacterial species were identified by comparison with sequencing databases.

12th Edition of EUROINVENT – European Exhibition of Creativity and Innovation
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Inventions and Research Exhibition

Microfluidic Plasmonic Device based on Gold Bipyramidal Nanoparticles

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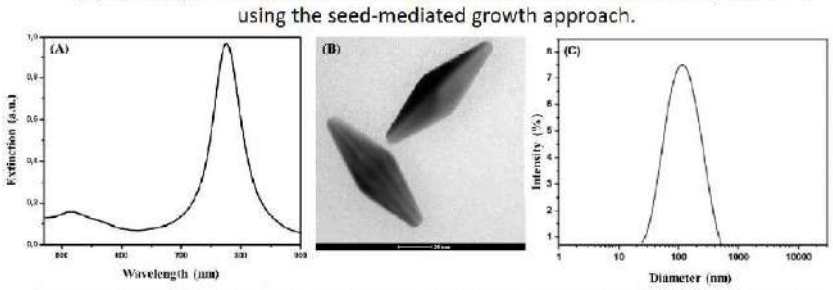
The invention entitled "Microfluidic Plasmonic Device based on Gold Bipyramidal Nanoparticles" proposes a innovative microfluidic plasmonic device based on gold nanobipyramids (AuBPs) which allows the implementation of two detection methods in the microfluidic polydimethylsiloxane (PDMS) network, specifically the Localized surface Plasmon Resonance (LSPR) and Surface Enhanced Raman Spectroscopy (SERS). The fabrication method of the device implies the integration of a nanoparticulate film obtained by a self-assembling process of AuBPs available in solution onto a silanized glass substrate inside of a microfluidic channel. The AuBPs present themselves as promising due to their controllable optical properties and, implicitly, detection capabilities. The validation of the developed low-cost, miniaturized and portable microfluidic device was realized by the real-time detection of active analytes in laminar flow.

Step 1: Colloidal Gold nano-bipyramids: Optical and Morphological Characterisation

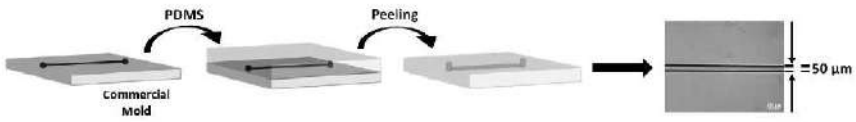
Bipyramidal gold nanoparticles in solution with LSPR at 776 nm were synthesised using the seed-mediated growth approach.



(A) Extinction spectrum, (B) Representative TEM microscopic image and (C) Dynamic Hydrodynamic diameter of the as-synthesised AuBPs .

Step 2: Fabrication of the Microfluidic Channel in PDMS

The microfluidic channel was obtained by a replica moulding technique using commercially available microfluidic channel mould over which a mixture of polydimethylsiloxane (PDMS) elastomer and curing agent was poured. The microfluidic replica was then peeled off the mould, fabricating thus a microfluidic channel of 50 µm diameter.



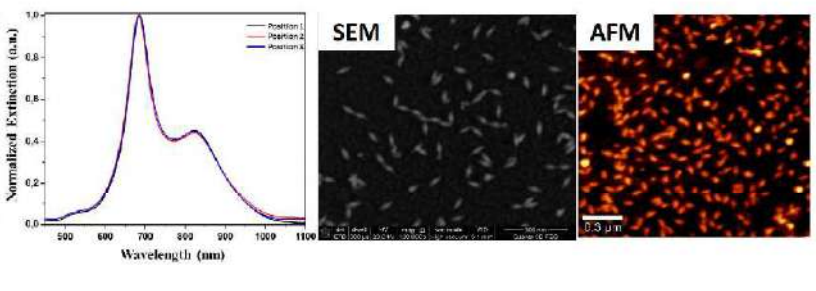
Schematic illustration of the fabrication of microfluidic channel.

Microscopic Image of the microfluidic channel.

Step 3: Preparation of the Plasmonic Substrate: Optical and Morphological Characterisation

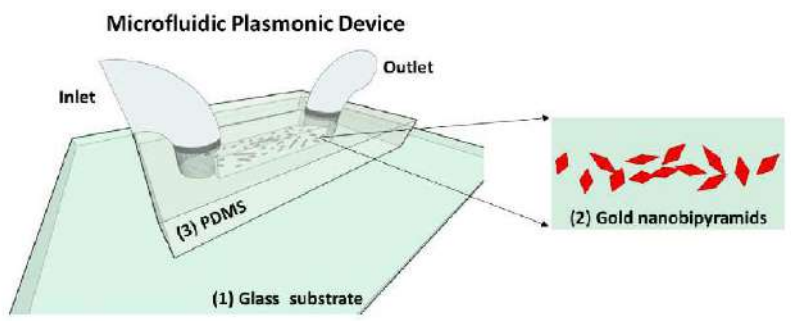
After the controlled deposition of the AuBPs, the plasmonic substrate exhibits the preserved optical properties of the colloidal gold nanoparticles along with the appearance of a new near-infrared band assigned to self-assembled AuBPs chains, confirmed by Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM) observations.

Schematic illustration of the deposition process of the AuBPs onto the silanized glass substrate.



Step 4: Assembly of the Final Microfluidic Plasmonic Device

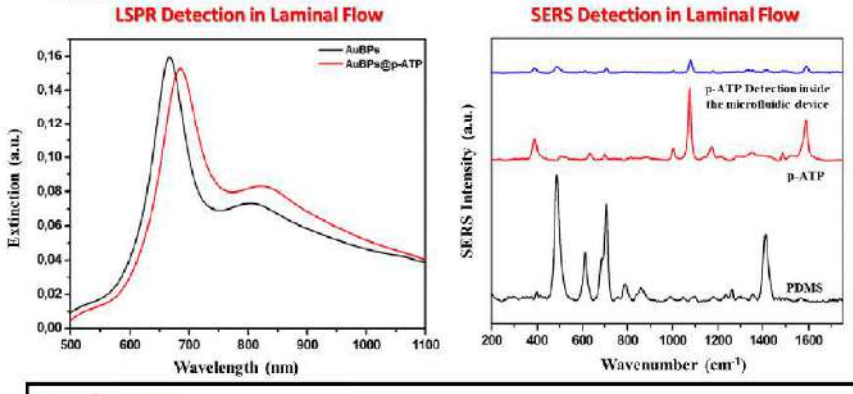
The nanobipyramidal Au film self-assembled onto the silanized glass substrate and PDMS microfluidic channel were brought in together in order to form a permanent bond , thus obtaining the final ready-to-use integrated plasmonic microfluidic device.



Schematic illustration of the final integrated plasmonic microfluidic chip.

Step 5: Dual-Modal Detection in continuous flow inside microfluidic device

The p-ATP target analytes were loaded into the microfluidic channel via a syringe pump system, ensuring their continuous flow conditions. Our robust device was able to volumetric detect p-ATP both by LSPR sensing, recording an 18 nm red-shift of the LSPR response, and by SERS through the specific identification of the p-ATP characteristic vibrational bands.



Advantages of the Invention

- ►**Portability and miniaturization** of the microfluidic device.
- ►**Real-time investigation** of biological fluids.
- ►Performing fast and ultrasensitive analysis.
- ►Decreased analysis time inside the microfluidic channel.
- ►Reduced sample volume used in the detection applications.
- ► Automatization of the investigated biological fluid laminar flow manipulation, avoiding thus sample contamination.
- ► The gold nano-bipyramids present high structural and chemical stability in different biological fluids, thus can be implemented directly in specific (bio)detection applications.
- ► The gold nano-bipyramids generate at their extremities enhanced electromagnetic fields ("hot-spots") for the successful implementation in the Surface Enhanced Raman Spectroscopy (SERS) detection.
- ► The introduction of non-invasive or little invasive procedures for the specific detection of target analytes of interest.

Conclusions

- The proposed integrated microfluidic plasmonic device efficiently combines the enhanced detection capabilities of the AuBPs with the benefits of microfluidics such as miniaturization, portability, low-cost, real-time detection, reduced analysis time and sample volume.
- AuBPs as transduction elements were successfully integrated in microfluidic channel, which due to their particular shape exhibit advantageous properties for real-time dual LSPR-SERS biosensing.

Patent Submission: OSIM Patent Application Number 00958/2018.
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INNOVATIVE CIRCULAR PROCESS FOR THE ELECTROCHEMICAL RECOVERY OF THE BASE METALS FROM WASTE PRINTED CIRCUIT BOARDS

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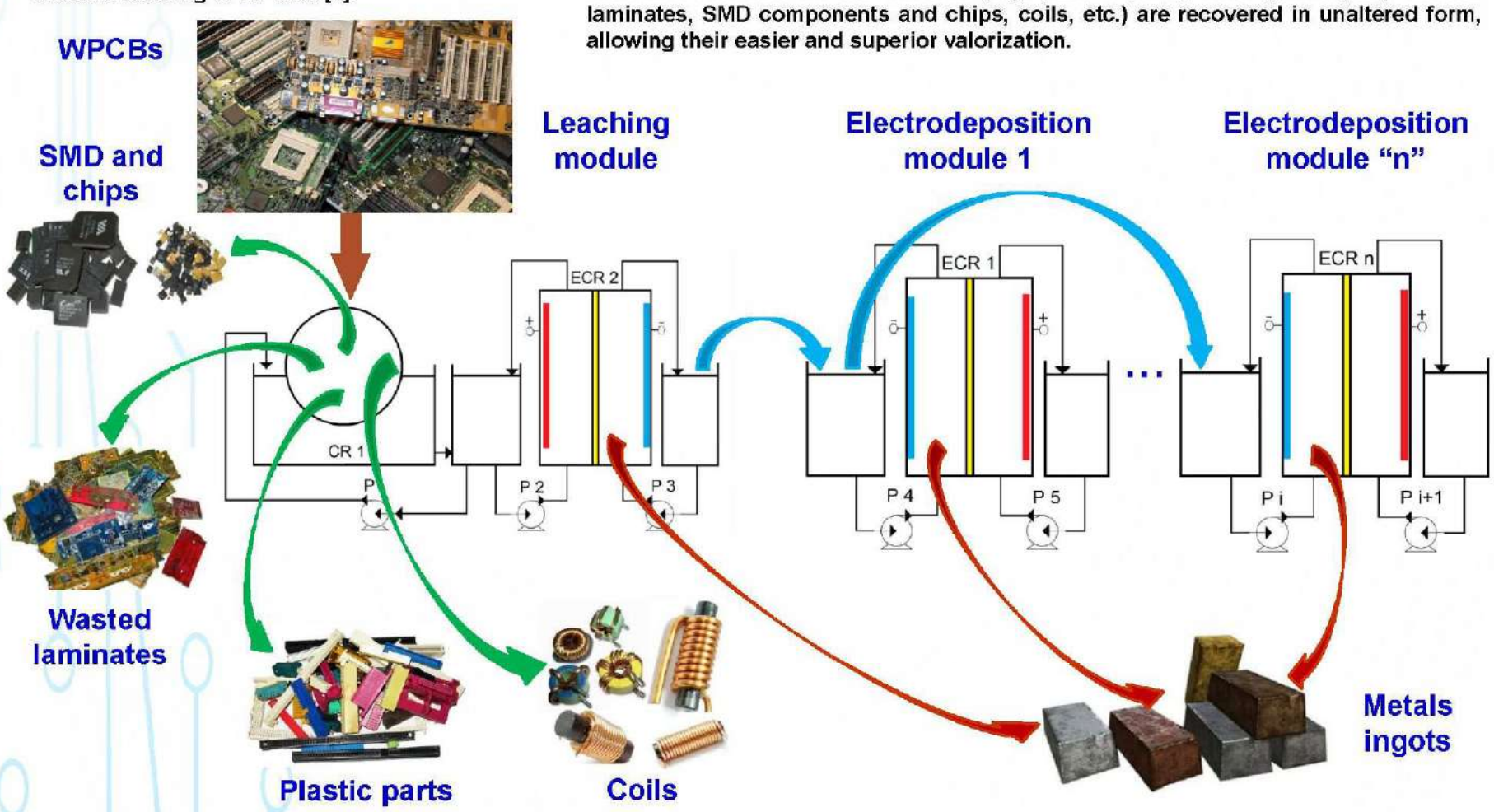
INTRODUCTION

The rapid technological innovations and natural resources decline [1] transforms the waste from printed circuit boards (WPCBs) in a huge source of recovered metals [2]. Otherwise, the inadequate WPCBs treatment involves a huge threat to the environment and human health [3]. Consequently, the development of recovery strategies is of supreme importance for the environment, but also in terms of valuable raw material existing in WPCBs [4].

INNOVATION

This work describes an original and innovative process used for the complete recycling of WPCBs resulting from depleted computers. Using the bromine/bromide leaching system, the proposed and tested technology allows, in a theoretical 100% closed circuit, the integral recovery of the exposed base metals (Cu, Sn, Pb, Ni, Fe, Zn and Al) from WPCBs. The process uses a combination of chemical and electrochemical steps, that allows the base metals dissolution in parallel with the electrochemical regeneration of the leaching solution and the electrodeposition of pure copper. In the next steps, the remaining dissolved metals can be also recovered from the leaching solution by electrodeposition. Moreover, the other recyclable materials included in the WPCBs (*e.g.* plastic parts, fiber glass/epoxy wasted laminates, SMD components and chips, coils, etc.) are recovered in unaltered form, allowing their easier and superior valorization.



CONCLUSIONS

- The proposed original technological processes allow their operation in a closed loop, ensuring easily, total and efficient regeneration of all involved reagent's flows, with an extremely low environmental impact.
- Based on all performed measurement, it turned out that the proposed and tested processes are perfectly feasible, allowing to obtain deposits of high quality and purity, with a high commercial value.

ADVANTAGES

- The proposed processes can be easily managed by electrochemical monitoring of the essential parameters (concentration, pH, ORP), ensuring their high energy efficiency.
- The solid resulting solid fractions can be easily separated from the solutions by simple decantation and/or filtration.
- High-quality and valuable final products can be easily obtained.
- The impact over the human health and environment is extremely low.

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ACKNOWLEDGEMENT

This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI - UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0652 / 84PCCDI / 2018, within PNCDI III.
Marian-Iosif Frîncu is also grateful for the financial support received from "Babeș-Bolyai" University Cluj-Napoca (Doctoral Grant).

Universitatea Transilvania din Brașov
FACULTATEA DE INGINERIE MECANICĂ

Lightweight disassemblable utility trailer made of 3D-printed parts

Bogdan Marian Coltan, BS[1]; Marius Nicolae Baba, PhD[2]
Transilvania University of Brasov, Faculty of Mechanical Engineering

Abstract

The objective of this paper is to demonstrate proof of concept of a disassemblable utility trailer. Resulting in having the convenience of storing the trailer in the urban areas, e.g. in a building basement. This will be possible by analyzing different design concepts, that are based on the concept of function, form, process, and material. Function representing the possibility of disassembling and storage in small storage areas. Form sustaining dynamic cycles of work required in exploiting the utility trailer. Suitable material aimed at reducing mass and achievable manufacturing process.

Methods and Materials

Using SLM (selective laser melting), also known as direct metal laser melting. This process offers rapid prototyping that will allow the concept to go through multiple iterations. This prototyping process allows creating of parts with the dimensional accuracy of approximately ± 0.1 mm[1]. Most importantly, SLM is compatible with manufacturing stainless steel parts. Resulting in a product with properties such as high wear resistance, great hardness, good ductility, and resistance to environmental elements.

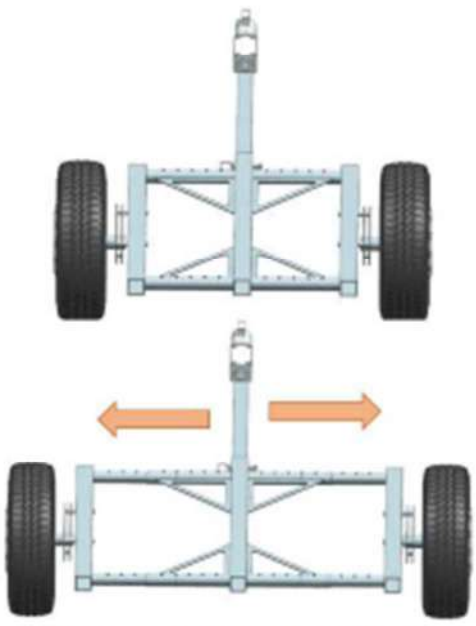

Figure 3: Extendable trailer bed

Introduction

As the proverb says, necessity is the mother of invention. The purpose of a utility trailer is to offer the user the ability to transport more than the vehicle can carry. Licensing, insuring, and in combination with low maintenance or upkeep can make you consider purchasing a utility trailer. The main problem especially in the urban area is parking the trailer, this problem is more acute in cities like Bucharest. Where parking sport in rapport with active vehicles on road is 5 cars to 1 parking spot. The main advantage of the disassemblable utility trailer is that the trailer can be dissembled and stored in building basements, small storage units, or more. As presented in figure 1, we have the pieces needed to connect the stub shaft to the cassis and the C element that ensures a distribution of mass over the trailer and offers the feature of extending and compressing the trailer bed. In figure 2., we have the two 16" wheels with stub shaft of 100 x 4 mm / 155 mm assuring the connection between the wheel and the trailer chassis, with the main part of the chassis.

Overall parts

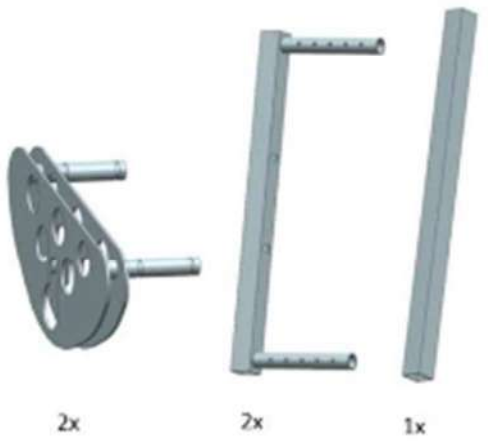

Figure 1: Overall parts

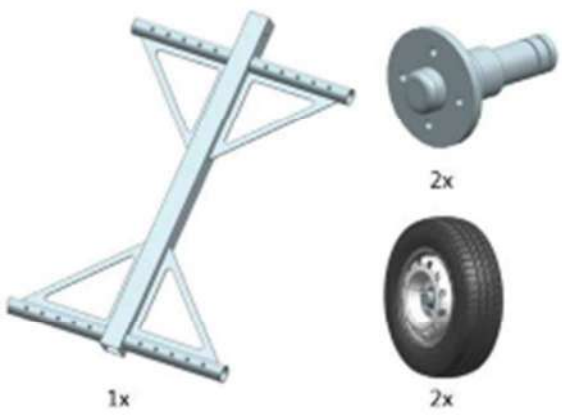

Figure 2: Overall parts

Features and benefits

As presented in Figure 3, one of the main trailer features is the ability to extend the bed size. This feature is possible due to the design of the connection between the elements, seen in Figure 4.

Figure 4: Elements connection

The full range of the extension is 200 mm on each side, resulting in the possibility to increase the total width of the utility trailer by 400 mm.

Conclusions

Technology has as the main driver the evolution, with that it accelerates with exponential progress over time. Utilizing technology such as SLM, in order to give contour to structures allowing this concept idea of a disassemblable utility trailer.

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TRACKED ROBOT FOR HUMANITARIAN DEMINING OPERATIONS

PETRIȘOR SILVIU MIHAI • BÂRSAN GHIȚĂ • MIHAELA SIMION • VIRCA IOAN • MOȘTEANU DĂNUȚ EUGENIU

„NICOLAE BĂLCESCU" LAND FORCES ACADEMY SIBIU, ROMANIA

ROMANIA
MINISTRY OF NATIONAL DEFENCE

PATENT APPLICATION RO a 00562/2017
Issued by O.S.I.M.

PATENT CLASS: Security, protection, rescue-antiterorism, disasters and accidents

DESCRIPTION:

The tracked robot is composed of two main organological structures: the tracked base and the serial-modular robot of type TRTTR (3 Translations and two Rotations) (fig. 1, fig. 2), plus the translation system of the device for unexploded mine detection. The robot with a modular construction (fig. 1, fig. 2, fig. 3), according to the invention, is made up of four independent modules: the basic translation module, the rotation module, the vertical arm, and the horizontal arm. Each module and/or arm possesses at least one degree of freedom, except for the vertical arm, which has two degrees of freedom (a vertical translation and a rotation by the y-axis). This results in an open-chain, modular-serial architectural configuration of a robot possessing in the cinematic chain structure 5 degrees of freedom given by each module, plus the parallel-plane translational motion of the fastening device corresponding to the tightening movement in the xOz plane and the horizontal translational movement of the translation system of the mine detection device. The design program used to create the robot's triorthogonal model allowed the definition of the materials used in the organological construction of each module (carbon steel and steel alloys, aluminum alloys and bronze alloys), highlighting, at the same time, the characteristics of each type of material such as: density, modulus of elasticity, Poisson's coefficient, flow limit, etc. Having thus defined the materials for each organological component, the program was able to determine the gross weight of the tracked robot as 425 kg, before its practical execution.

ADVANTAGES, NOVELTY AND ORIGINALITY:

According to the invention, the tracked robot offers the following advantages:
-flexibility of action by mounting in the front area of the robot's tracked base a translation system consisting of screw-nut-guide, which allows simultaneous operation of humanitarian operations of detection and demining, the mechanical structure of the technological product being provided with a storage compartment for the explosives required for specified operations;
-modular interchangeability by means of the possibility of replacing and/or attaching/mounting new translation/rotation modules, respectively horizontal and vertical arms, so that various architectures of robotic structures can be obtained, that are capable of facing the various requirements specific for humanitarian demining operations;
-high flexibility through independent drive with electric engines attached to each module, which allows high efficiency in operation and minimal energy consumption, obtained by means of a dynamic-organological mathematical calculation algorithm, in order to determine the moment necessary for activating the kinematic motion couplings for each mobile crew of the robot's organological components;
-protection of the human factor, of the organological components and of the communication equipment attached to robot structures exposed to high-risk humanitarian demining operations;
-the operation of the robot with "green" solar energy is an economical and ecological solution, thus contributing to both reducing environmental pollution and strengthening a culture of energy accountability among civilian and/or military population;
-compact and fully modular architecture, ability to operate on rugged land, easy to maintain, and relatively low construction cost;
-easy operation in automatic modes and movement programming through learning and manually.

APPLICATIONS:

The technological product the invention refers to has applicability both in the military (by improving the operational flexibility in humanitarian operations of detecting and demining antipersonnel and anti-armor mines in dangerous areas, in order to protect the civilian/military human factor, the active organological components in the area, and the environment) and the educational fields (through the formation of highly educated and specialized human resources in the academic field, designed to cope with the diversity of the present operations and challenges).

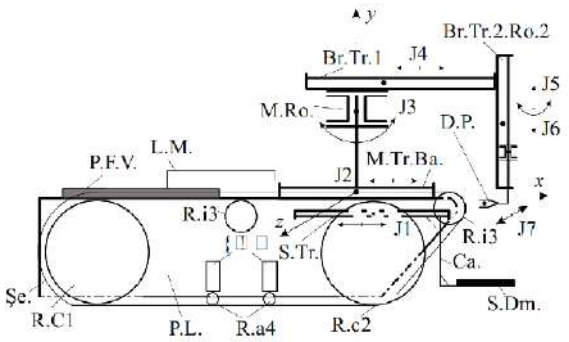

Fig. 1.
The schematic kinematic design of the tracked robot

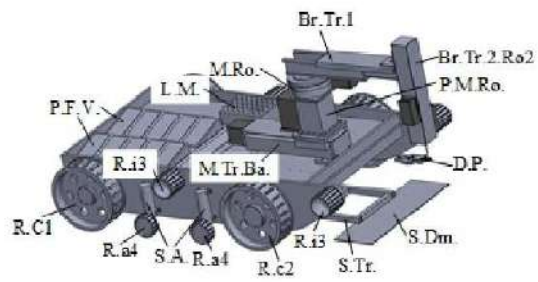

Fig. 2.
The triortogonal model of the tracked robot

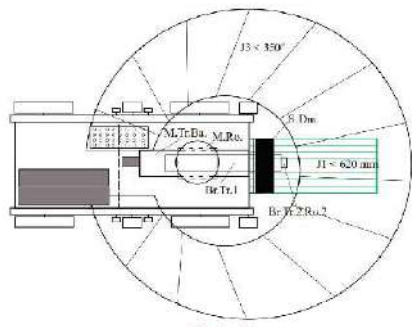

Fig. 3.
The work space defined by the kinematic axis J3 of the rotation module and of the translation system

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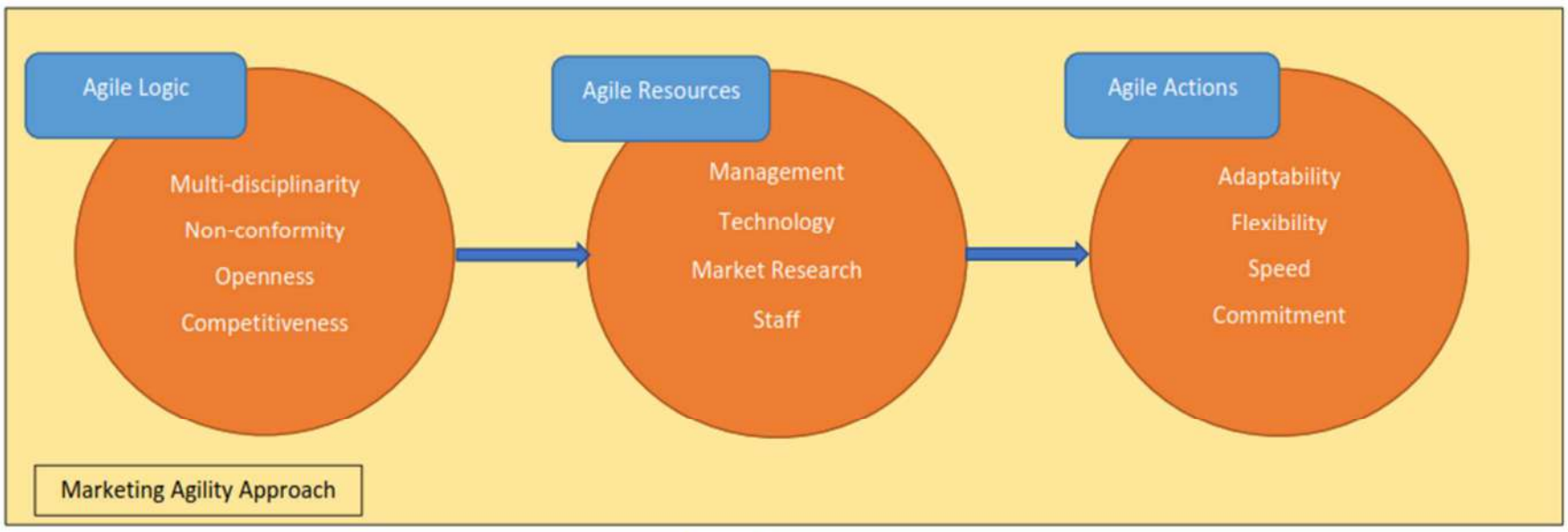
MARKETING AGILITY – AN INNOVATIVE MARKETING APPROACH

Professor Razvan ZAHARIA, PhD.

Bucharest University of Economic Studies, School of Marketing



Marketing agility is one of the most recent and important concepts in marketing theory and practice.

The aim of this paper is to propose the methodology for **developing a software** that determines the level of marketing agility of companies.

Description – State of the Art

In early 2021, Journal of Marketing mentioned Marketing Agility as one of the privileged directions of marketing research. The concept is not new, but its expansion in marketing is the result of a multidisciplinary approach, targeting scientific fields in business (management, human resources, information technology), but also in more distant fields, such as physiology, biology, sports, military sciences.

Marketing Agility is an inovation in marketing because it proposes a symbiotic perspective of classical marketing concepts as adaptation to the environment, speed of reaction, valorization of market challenges.

Purpose, Methods, and Expected Results

The purpose of our approach is to develop an effective tool for evaluating and optimizing the marketing agility of a company. Based on an exhaustive literature review, a conceptual model is developed, which includes all the factors involved in defining the concept of Marketing Agility. This model is tested with the help of expert panels, both theorists and practitioners. Then, the model is validated through a quantitative research, conducted among marketing specialists in companies.

Finally, a software will be developed to assess the level of Marketing Agility of a company. The software will be an innovative management tool, but could also be used for teaching purposes.

Conclusions and Further Developments

Starting from a highly topical theoretical concept, a high-performance management tool is being developed. This can be an excellent example of successful technology transfer from academia to business.

Subsequently, the product could be developed by specializing in different categories of markets and / or types of organizations.

Furthermore, the product could be adapted to the needs of teaching different marketing disciplines at the level of higher education.

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Patent RO 133306/2021

ANTIMICROBIAL PULVERISABLE SOLUTION FOR TREATMENT, CONSOLIDATION AND PROTECTION OF INORGANIC SURFACES OF BUILDINGS AND/OR HISTORICAL MONUMENTS

Radu Claudiu Fierascu[a], Irina Fierascu[a], Adriana Moanta[b], Ionela Petre[b]
[a]The National Institute for Research & Development in Chemistry and Petrochemistry—ICECHIM Bucharest, Romania, www.icechim.ro
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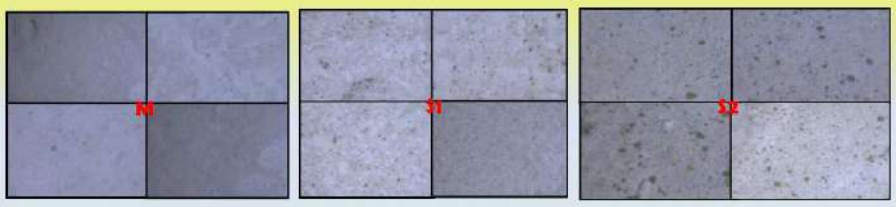
The invention relates to an antimicrobial composition for the treatment, consolidation and protection of inorganic surfaces of buildings and / or historical monuments. Antimicrobial suspensions are obtained by milling the solid material followed by dispersion in isopropyl alcohol solution, in varying concentrations, thus obtaining a pulverisable solution. Sprayable biocide solutions have an effect on both gram-positive strains and gram-negative strains.

Plaster material treated twice with solvent (left), solution S1 (center) and solution S2 (right), before (up) and after freezing / thawing tests.

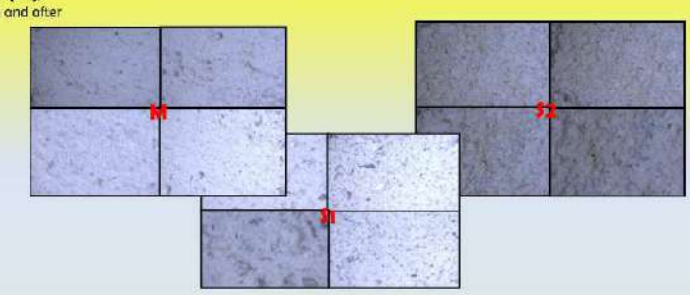
Lime mortar material treated twice with solvent (left), solution S1 (center) and solution S2 (right), before (up) and after freezing/thawing tests.

Cement mortar material treated twice with solvent (left), solution S1 (center) and solution S2 (right), before (up) and after freezing / thawing tests.

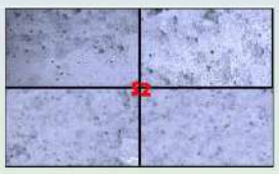
Appearance of microbial growth inhibition zones for suspensions (S1 - 2 ‰, S2 - 5 ‰) tested against *P. aeruginosa* and *S. aureus*; M - control (solvent).



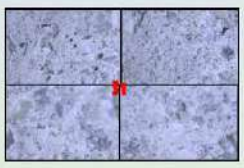
Microscopical aspects on treatment of plaster surfaces; M- untreated; S1/S2- treated with the solutions



Microscopical aspects on treatment of lime mortar surfaces; M- untreated; S1/S2- treated with the solutions



Microscopical aspects on treatment of cement mortar surfaces; M- untreated; S1/S2- treated with the solutions



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The present invention represents a result of the project "Innovative apatitic materials with enhanced antimicrobial activity for building materials and cultural heritage conservation" project PN-III-P2-2.1-PED-2016-0198, financed by the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI—UEFISCDI, within PNCDI III.

PN-III-P2-2.1-PED-2019-3495 ; Contract 259 PED/2020

Comprehensive approach to support precision agriculture and environmental management through satellite technologies and classic methods of investigation

GENERAL INFORMATION

Financing source: State budget
Program: PN-III-P2-2.1-PED-2019-3495, Experimental demonstrative project (PED)
Domain: Energy, environment and climate change
Total value of the contract: 600000 lei
Implementing period: 24 months
Contracting authority: Executive Unit for Financing of Higher Education, Research, Development and Innovation

CONSORTIUM

COORDINATOR
INOE 2000
Project coordinator:
Dr. Anca NEMUC

PARTNER
USAMVB
Project responsible:
Dr. Alina ORTAN

PARTNER
ICECHIM
Project responsible:
Dr. Habil. Irina FIERASCU

PROJECT DESCRIPTION

The overall project objective is the development and implementation of an alert system for precision agriculture and environmental management related to identification of air pollution and extreme weather events. The project will have as final product a near real-time alerting system for precision agriculture using a comprehensive integrated online platform where near real time satellite-based products and ready to use information for farming will be available for decision-making.

ESTIMATED RESULTS

- Studies
- Technologies
- Products
- Prototypes
- Pilot installations
- Technical documentations
- Scientific dissemination
- Patent applications
- Project dissemination

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This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number proiect PN-III-P2-2.1-PED-2019-3495, contract 259 PED/2020, within PNCDI III.

PN-III-P2-2.1-PED2019-3166 Contract 299 PED/2020

Green technology for pharmaceuticals removal from water using eco-friendly oxidation catalysts

GENERAL INFORMATION

Financing source: State budget
Program: PN-III-P2-2.1-PED2019-3166, Experimental demonstrativ project (PED)
Domain: Energy, environment and climate change
Total value of the contract: 634500 lei
Implementing period: 24 months
Contracting authority: Executive Unit for Financing of Higher Education, Research, Development and Innovation

CONSORTIUM

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Project coordinator:
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ICECHIM
Project responsible:
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PARTNER
ICPE Bistrita S.A.
Project responsible:
Dr. Eng. Sorin Claudiu ULINICI

PROJECT DESCRIPTION

„Green technology for pharmaceuticals removal from water using eco-friendly oxidation catalysts (GreenCatOx)" proposes a new water treatment technology for nonsteroidal anti-inflammatory drugs (NSAIDs) removal based on catalytic ozonation process with catalytic systems arranged in the form of thin films deposited on a glass substrate. This approach has incontestable advantages: Elimination of chemical reducing, stabilizing agents and solvent which bring a harmless environment for operators and reduce equipment corrosion; Reaction environment is clean, simple and mild; Avoidance of high reaction temperature; Environmentally friendly; Low energy requirement; Effortlessly scale – up with low costs.

ESTIMATED RESULTS

- Studies
- Technologies
- Products
- Prototypes
- Pilot installations
- Technical documentations
- Scientific dissemination
- Patent applications
- Project dissemination

This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number PN-III-P2-2.1-PED2019-3166, contract 299 PED/2020, within PNCDI III.

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PN-III-P2-2.1-PED-2019-4018, Contract 524 PED/2020

EVALUATION OF THE EXPLOATATION POTENTIAL OF POROUS MATERIALS IN THE TREATMENT OF MICROBIOTA-RELATED DISEASES

GENERAL INFORMATION

Financing source: State budget
Program: PN-III-P2-2.1-PED-2019-4018, Experimental demonstrativ project (PED)
Domain: Eco-nano technologies and advanced materials
Total value of the contract: 600000 lei
Implementing period: 24 months
Contracting authority: Executive Unit for Financing of Higher Education, Research, Development and Innovation

CONSORTIUM

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Project coordinator:
Dr. Conf. Denisa FICAI

PARTNER
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Project responsible:
Dr. Habil. Irina FIERASCU

PARTNER
INV-SN
Project responsible:
Dr. Coralia BLEOTU

PROJECT DESCRIPTION

The scope of the current project proposal is to develop novel micro- and mesoporous materials (MMMs) using recent synthesis methods and to further functionalize these materials for developing better performances in order to be used as drug delivery systems (DDS), especially for microbiota-related diseases. These drug delivery systems are developed for oral administration and are expected to be protected within the stomach and maintain their activity until reach the desired site.

ESTIMATED RESULTS

- Studies
- Technologies
- Products
- Scientific dissemination
- Patent applications
- Project dissemination

This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number PN-III-P2-2.1-PED-2019-4018, contract 524 PED/2020, within PNCDI III.

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PN-III-P3-3.5-EUK-2019-0226, contract 220/2020

TRANSDISCIPLINARY APPROACH FOR DEVELOPMENT OF TECHNOLOGICAL SOLUTIONS FOR TARGET COMPOUNDS RECOVERY FROM AGRO SIDE-STREAMS - E!13365/TARDIS

GENERAL INFORMATION

Financing source: State budget
Program: PN-III-P3-3.5-EUK-2019-0226, EUREKA PROJECT
Total value of the contract: 630000 euro
Implementing period: 36 months
Contracting authority: Executive Unit for Financing of Higher Education, Research, Development and Innovation

ROMANIAN CONSORTIUM

COORDINATOR
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Project responsible: Dr. Eng. Daniela IONESCU

PARTNER
ICECHIM
Project responsible: Dr. Habil. Radu Claudiu FIERASCU

PARTNER
USAMVB
Project responsible: Dr. Alina ORTAN

PROJECT DESCRIPTION

The general objective of the project is to underline, optimize and apply an integrate technology of sustainable and enhanced production of natural extracts with high content of biological active compounds from side streams of phytotherapeutical industries applicable for obtaining smart formulations for disorders of the 21st century, for which continuous research is carried out. The project will provide thus the necessary support for creating and developing a complementary research chain in bio-economy (industry, pharmacy, agriculture) that aims to achieve a high level of internationally recognized expertise. The project demonstrates an integrated cascading concept including pre-treatment, optimized extraction and separation technologies.

ESTIMATED RESULTS

- **Studies**
- **Technologies**
- **Products**
- **Prototypes**
- **Pilot installations**
- **Technical documentations**
- **Scientific dissemination**
- **Patent applications**
- **Project dissemination**

This work was supported by a grant of the Romanian Ministry of Education and Research, CCCDI-UEFISCDI, project number PN-III-P3-3.5-EUK-2019-0226, contract 220/2020 within PNCDI III.

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PROCESS OF PRODUCING MICRO (NANO) CELLULOSE CRYSTALS FROM PLUM SEED SHELLS

Patent no. 133172

Adriana FRONE,[1] Ioana CHIULAN,[1] Denis Mihaela PANAITESCU[1]

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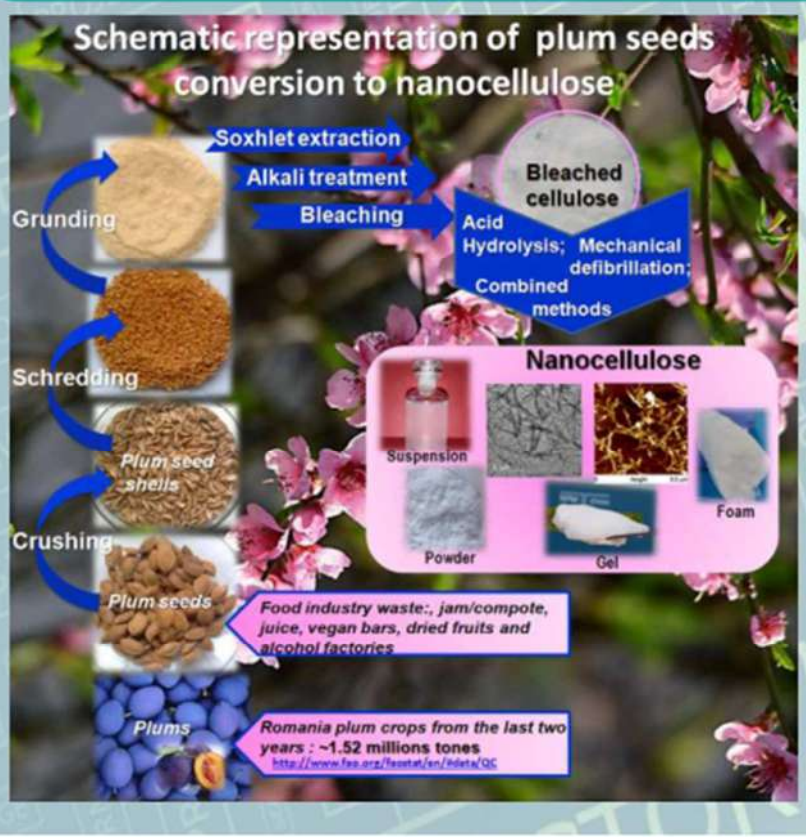
SHORT DESCRIPTION

The invention describes a process for the isolation of micro- (nano) cellulose crystals from agro-food waste. The micro- and nanocellulose crystals of the invention are obtained from plum seed shells through environmentally friendly operations consisting mainly of mechanical defibrillation routes. Plums production is widely spread in Romania and used especially for juice, brandy ("țuica") or jam production. The plum seed shell waste is discarded in the environment, raising important issues.



NOVELTY

The novelty of this invention referes to the exploatation of low-cost and abundant waste consisting in plum seed shells for the obtaining of highly added value products as micro- (nano) cellulose crystals.

ADVANTAGES

- The new and valuable micro- (nano) cellulose crystals are obtained starting from a cheap cellulosic source, a waste raising environmental issues;
- The micro- (nano) cellulose crystals can be obtained in a wide variety of forms: powdered, gel, film or suspension, depending on the desired application;
- The process of obtaining these micro- (nano) cellulose crystals is simple and environmentally friendly without the use of hazardous substances for humans or the environment;
- The obtained micro- (nano) cellulose crystals are characterized by high specific surface area, flexibility, low density, high mechanical properties, regenerability and durability;
- The obtained micro- (nano) cellulose crystals can be used in a wide range of applications including food industry as a food additive or thickening agent as well as in the pharmaceutical industry as a support or filler and as a reinforcement agent in different synthetic and natural polymer matrices.

APPLICATIONS

NC as modifier in different polymers processed by:

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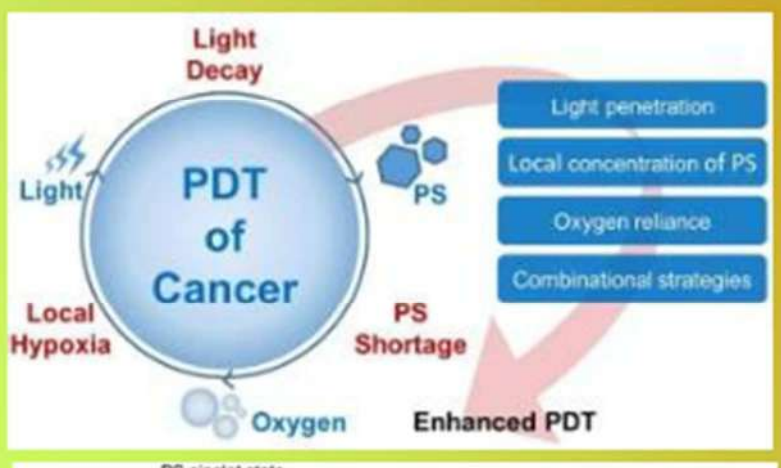
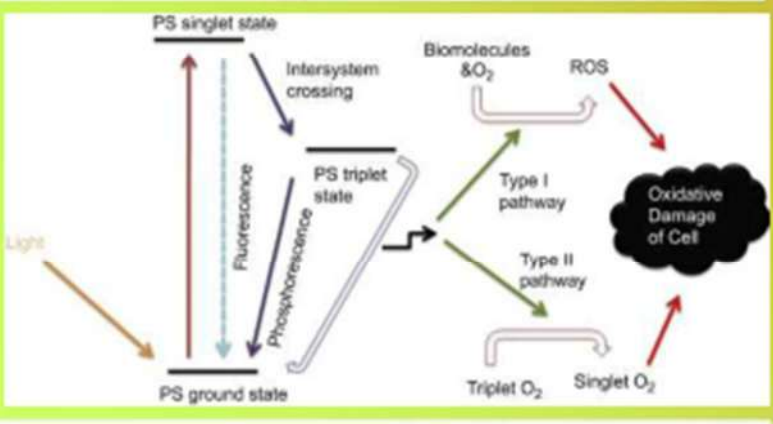
MEDICAL DEVICE FOR HSV-1 / SARS-COV-2 / COVID-19 ANTI-VIRAL PHOTODYNAMIC INACTIVATION ON SURFACES, METHOD OF MAKING AND USING IT

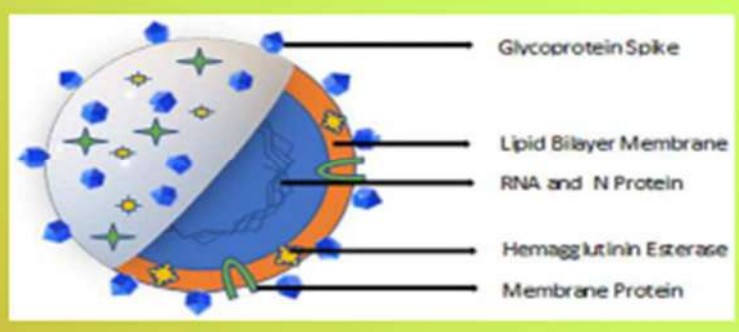
Rodica-Mariana Ion
ICECHIM, Bucharest, Romania

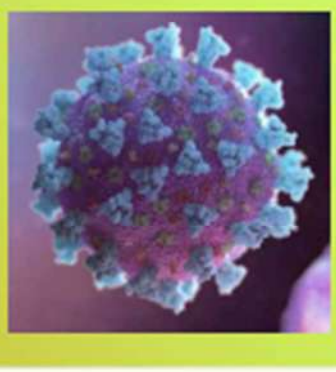
Patent application No. 00112/11.03.2021

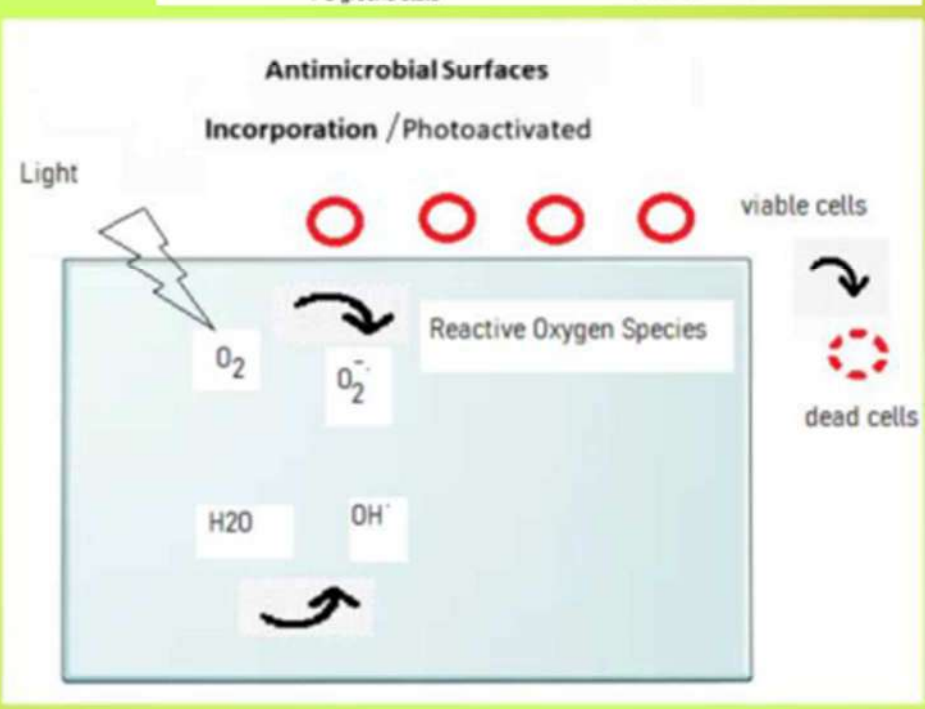
The invention relates to the use of a sulfonated porphyrin for the production of a hydrogel type medical device used for the antiviral photodynamic inactivation of HSV-1 / SARS-CoV-2 / COVID-19 on surfaces such as: furniture, medical instruments, laboratory vessels, access, etc., from the health system, hospitals, pharmacies as well as in other spaces for staff protection. The device is based on a sulfonated porphyrin embedded in the hydrogel, used for the photodynamic inactivation of HSV-1 virus as a model for SARS-CoV-2 (COVID-19), which is exposed to low power laser radiation and a short irradiation distance, leads to the destruction of viruses.

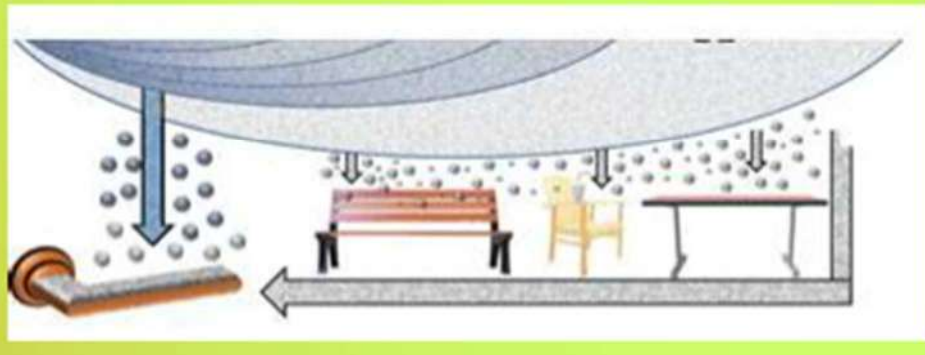












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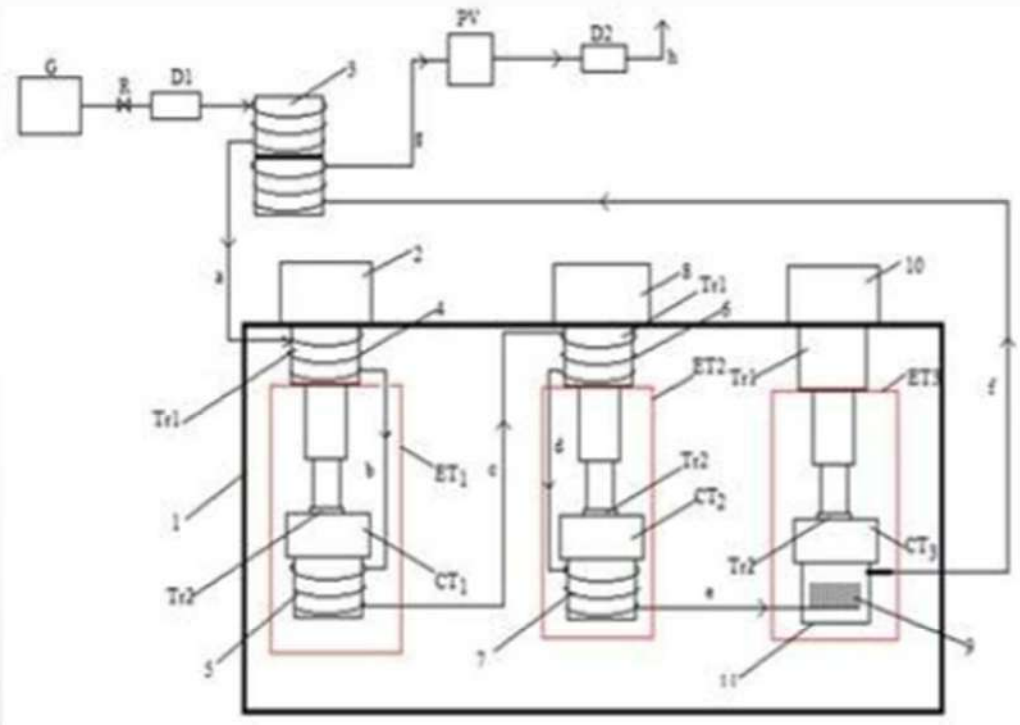
Assembly for cryogenic cooling and gas condensation / solidification

Patent Application No. A / 00972 / 2018
Authors: Dobrin Ion, Dumitru George, Dobrin Andrei, Enache Dan, Pintea Radu, Popovici Iuliu Romeo, Djourelov N., Leca V., Dinescu D.

Novelty/ Description

The invention relates to an assembly for cryogenic cooling and gas condensation / solidification using a cascade of heat exchangers coupled to cryocoolers, for step cooling of the gas to the necessary appropriate final temperature. The gas flows trough the cooling circuit from room temperature to the final desired temperature. The output temperature of the heat exchangers could be controlled by an electronic controller device. The number of cascade cooling steps can vary in order to cool down the gas to the final temperature desired from 4.2 K to any other value. The cooling assembly do not use cryogens or liquefaction devices.



Advantages:

- The use of cryocoolers as a cooling method, eliminates the need to use cryogenic cooling agents (LN_2, LHe_2);
- Ensures rigorous control over the final temperature of the gas;
- Ensures liquefaction / solidification conditions for a large variety of gases;
- Compared to the conventional systems, this assembly has a smaller and compact volume, while operating is more silent.

1 – Cryostat; 2, 8, 10 – Cryocoolers; R – Valve; G – Gas tank; D1, D2 – flow controller; 3 – heat exchanger; Tr1 – 1st cold head of cryocooler; Tr2 – 2nd cold head of cryocooler; a, b, c, d, e, f, g, h – pipes; 4, 5, 6, 7 – cooling path; CT1, CT2, CT3 – Temperature controller; ET1, ET2, ET3 – Thermal shields; 11 – Liquefaction/solidification chamber; 9 – Metallic condenser; PV – vacuum pump

Applications: cryogenic gas separation, gas liquefaction / solidification, gas thermal conditioning in cryogenic range.

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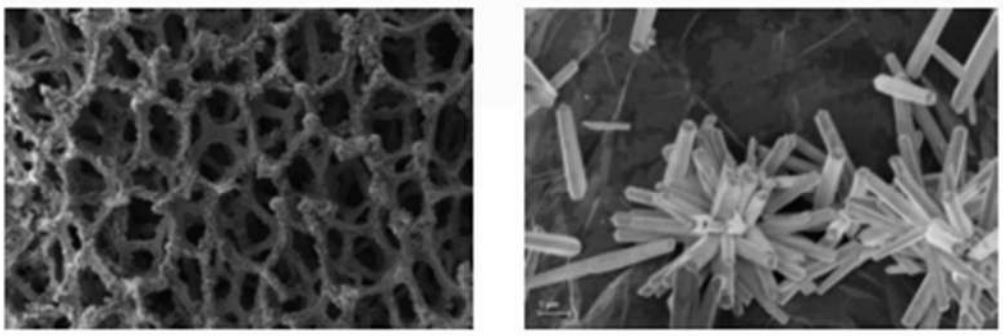
Zinc oxide - three-dimensional graphene network hybrid composite material and process for obtaining the same

Patent Application No. a 2019 00122
Authors: Banciu Cristina Antonela, Băra Adela, Chițanu Elena, Ion Ioana, Teișanu Aristofan Alexandru, Marinescu Virgil Emanuel

Novelty/ Description

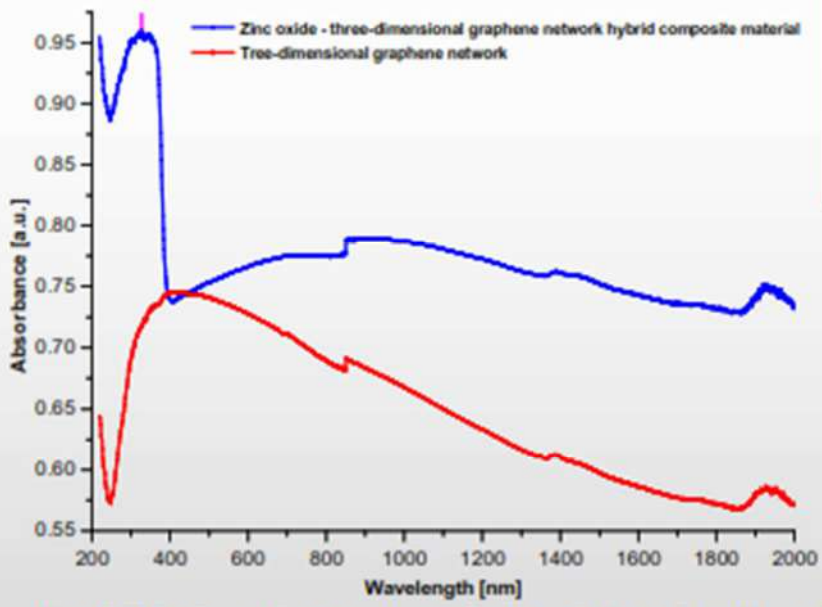
The invention relates to a process for obtaining a zinc oxide - three-dimensional graphene network hybrid composite material, used for making electrodes for energy storage and conversion devices. The process comprises the steps of growing graphene on nickel foam, obtaining the three-dimensional network of graphene by removing the nickel foam, and growing zinc oxide nano/microparticles on the graphene surface by the hydrothermal method, resulting in a zinc oxide - three-dimensional graphene network hybrid composite material of macroporous monolith type, having an electrical resistivity of 0.8 ... 1.2 x 10^{-5} S x m at 25°C, large specific surface area and maximum absorbance in the UV-Vis range of 0.96 a.u. at 327 nm.



Zinc oxide - three-dimensional graphene network hybrid composite material

Advantages:

- ❖ The hybrid composite material is flexible;
- ❖ The hybrid composite material has open porosity and a large specific surface area;
- ❖ The hybrid composite material has low electrical resistivity, close to that of graphite;
- ❖ The hybrid composite material has improved UV absorption compared to three-dimensional graphene without zinc oxide.



Comparative UV-Vis absorption spectrum of a hybrid zinc oxide - three-dimensional graphene network composite material with a three-dimensional graphene network

Applications:

The zinc oxide - three-dimensional graphene network hybrid composite material could be used for making electrodes for energy storage and conversion devices.

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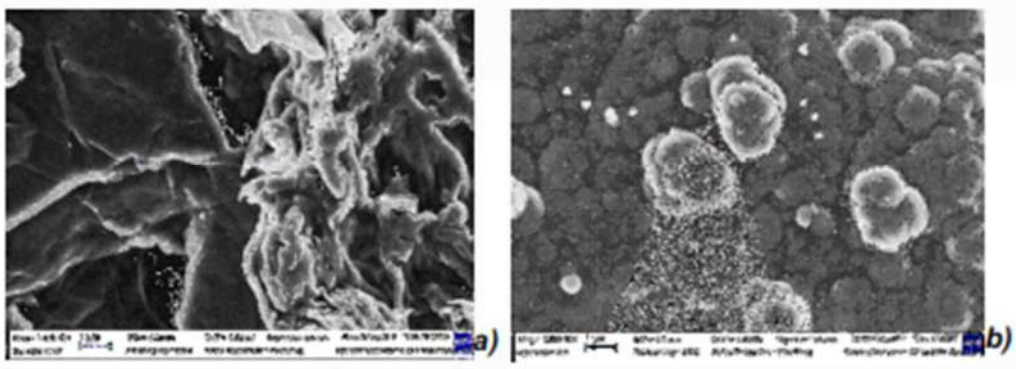
Graphene material for supercapacitors and process for obtaining the same

Patent Application No. a 2018 00814
Authors: Băra Adela, Banciu Cristina Antonela, Iordoc Mihai Nicolae, Prioteasa Paula Ionela, Marinescu Virgil Emanuel

Novelty/ Description

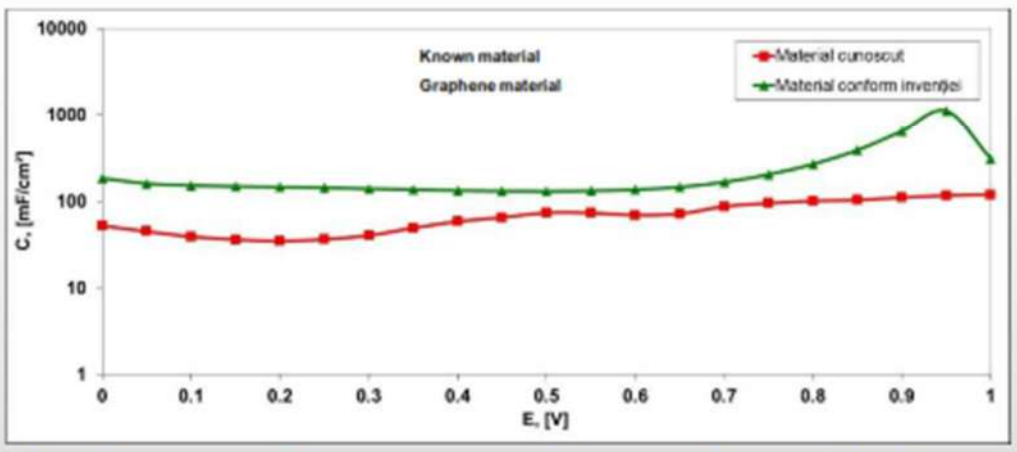
The invention relates to a process for obtaining a graphene material for supercapacitors. The process consists in the fact that a paste consisting of reduced graphene oxide and conductive carbon black, in a mass ratio of 1:1, mixed with tetrafluoroethylene copolymer binder, is scraped on a stainless steel support in the form of a disc and dried at room temperature, over which a conductive layer of polypyrrole obtained by electropolymerization by cyclic voltammetry is deposited, resulting in a graphene material having a specific capacity of 55-65 mF/cm^2.



Morphology of graphene material: a) before polypyrrole deposition, b) after polypyrrole deposition

Advantages:

- ❖ Increase in the value of the specific capacity as a consequence of the increase of the electrochemically active surface;
- ❖ Improving the adhesion of the active material on the support.



Variation curves of the capacitance with voltage drawn at 40 mHz in 0.2 M H_2SO_4 solution for known material and graphene material

Applications:

The graphene material could be used for making electrodes for energy storage and conversion devices.

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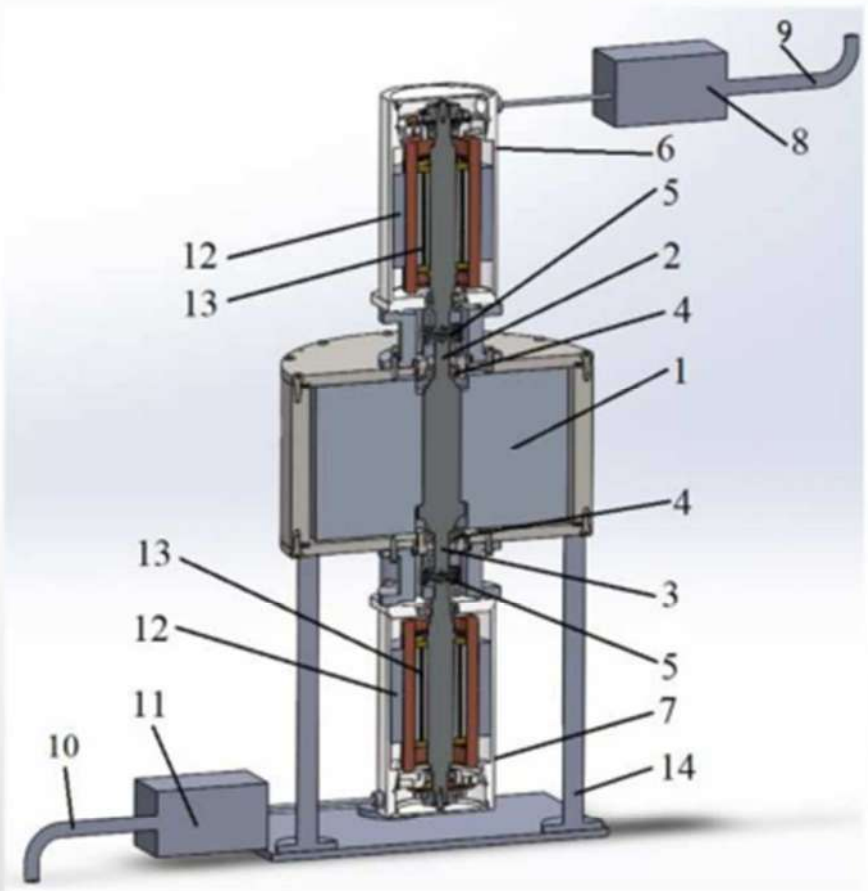
Inertial device for energy storage and protection for local micro-grid power supply

Patent Number RO 134279-A2
Authors: Ilie Cristinel Ioan, Mihaiescu Gheorghe Mihai, Chiriță Ionel, Nicoloaie Sergiu, Tănase Nicolae, Popa Marius, Popescu Mihail

Novelty/ Description

The invention relates to a designed inertial device for energy storage and protection of local micro-grids power supply, with special safety conditions, such as lighting and utilities supply in surgery rooms, powering computer equipment and devices in security laboratories, banks and other special applications. The device can protect both against voltage shocks and parasitic elements from the power supply network, as well as against espionage or sabotage actions, coming from the industrial network of distribution.

The inertial device consists of an inertial flywheel, dimensioned in size and speed for storing kinetic energy at the value required by the intended consumers for a specified duration, which is connected bilaterally with two electric machines. An electric machine acts as a motor, powered by a controller from the industrial network, to drive the flywheel and the second electric machine acts as a generator for converting kinetic energy from the flywheel to electricity to consumers, with an electronic converter and adapter of electrical parameters.



Advantages:

- Ensures the storage of kinetic energy for consumers;
- Ensures the protection of the micro-grid power supply that provide special consumers;
- High power density (the electrochemical batteries are an order of magnitude smaller);
- The life time is almost independent of the depth of the charge and discharge cycle;
- No periodic maintenance is required, easily and inexpensively maintained;
- Flywheels are highly reliable, safe, long life, energy efficient and non-polluting;
- Higher charging and discharging rate.

1 – flywheel; 2, 3 – shaft ends; 4 – bearing systems; 5 – coupling systems; 6 – electric motor; 7 – electric generator; 8 – controller; 9 - industrial power network; 10 - special micro-grid power supply; 11 - electronic converter; 12 – stator; 13 - rotor with permanent magnets; 14 - support.

Applications: Energy storage; protection of local micro-grids power supply; in mobile applications such as in the space field, for example for satellites, as well as in the automotive field, in the realization of hybrid vehicles.

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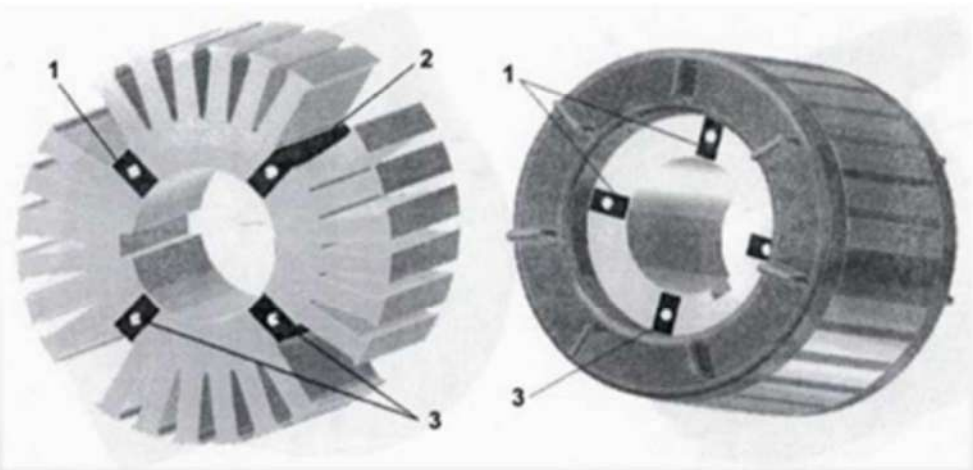
Realization Process of an Inductor for Permanent Magnets Synchronous Motor with Self-Starting

Patent No. RO 128961 / 2021
Authors: Popescu Mihail, Kappel Wilhelm, Nicolaie Sergiu, Mihăiescu Gheorghe Mihai

Novelty/ Description

The invention relates to a method of manufacturing an inductor for a synchronous motor with permanent magnets and self-starting, intended for equipping synchronous motors with permanent magnets. The process uses a well-known rotor lamination, used in the manufacture of the general purpose asynchronous motors, in which some rectangular holes/slots are additionally cut, which are made next to each rotor tooth and distributed so as to achieve a geometric symmetry and a metal bridge, which results from cutting to the inner centering hole, that has to not exceed 1 mm. In order to be able to execute the pressure casting of the self-starting rotor cage, two prisms are inserted in the rectangular holes/slots, provided with threaded holes, through which some rods having the same length as the rotor package to be executed are inserted. Then the prisms are extracted with the help of a screw extraction device, they are processed inside by turning so that the metal bridges are removed. In the rectangular holes some permanent magnets are inserted, taking into account the orientation of the magnetic field, so that the desired number of poles is obtained on the periphery of the inductor. The mounting position of the magnets is radially and axially ensured with some non-magnetic bushes, the whole assembly thus made being afterwards pressed on a non-magnetic material axis.



Left side - rotor package ready for casting. Right side - rotor package with cast cage
1,2 - prisms inserted in the rectangular holes,
3 - rods inserted into the threaded holes

Advantages:

- reduction of the nomenclature of parts used in the manufacture of the synchronous motor inductor by using the same lamination used in the execution of general purpose asynchronous motors of the same size;
- uses simple and low cost tools;
- does not require specialized personnel or equipment;
- the efficiency and power factor of the motor are higher than those provided by asynchronous machines;
- low energy consumption during operation.

Applications:

Applications based on synchronous machineries with permanent magnets in the range of small and very small powers, but also for wind turbines, traction motors, fans.

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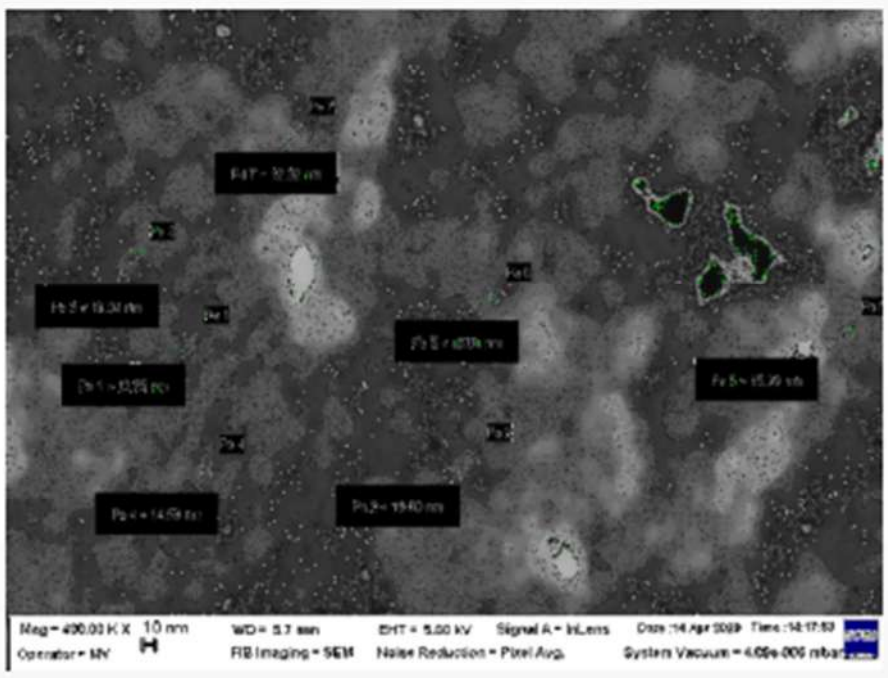
γ-Fe_2O_3 – biocompatible polymer nanocomposite

Patent Application No. a 2019 00256
Authors: Georgescu Gabriela, Mălăeru Teodora, Enescu Elena,
Pătroi Eros-Alexandru, Marinescu Virgil Emanuel, Sbârcea Beatrice-Gabriela

Novelty/ Description
The process consists in the preparation stages of a solution of iron acetate $Fe(C_2H_3O_2)_2$ and polyethylene glycol, the addition of 1M KOH for a *p*H value of 10 … 11, respectively H_2O_2, the reflux of the solution at a temperature of 100…220^{0}C, resulting iron oxide nanoparticles γ-Fe_2O_3 which are refluxed for 4…10h, together with biocompatible polyethyleneimine polymer, resulting in a hydrophilic nanocomposite with a particle size of less than 20 nm, used as a non-radioactive magnetic tracer in tumor diagnostic methods.



1. SEM image for γ-Fe_2O_3 – biocompatible polymer composite nanoparticles

Advantages:

- ❖ removes the disadvantages of the clinical investigation *sentinel node biopsy* (*SNB*), which is done with a radioactive magnetic tracer (technetium 99m);
- ❖ allows the early specification of the oncological diagnosis and the quantification of the efficiency of the surgical intervention;
- ❖ highlighting the sentinel node is done simply and quickly by making an aqueous suspension of γ-Fe_2O_3 – biocompatible polymer composite nanoparticles, interstitial injection, and intraoperative identification with a portable magnetometer and respectively by visual brown-black coloring of the nodules.

Applications:
as a non-radioactive magnetic tracer in the diagnosis of malignant tumors by magnetic (non-invasive) technique for *sentinel node biopsy*

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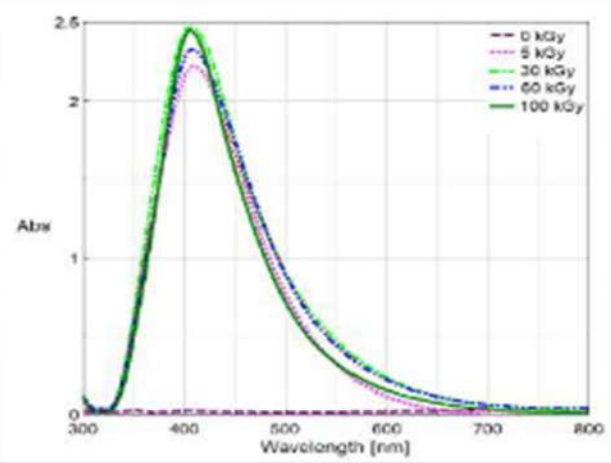
Silver nanoparticles with narrow dimensional dispersion and their manufacturing method

Patent Application No. A / 00971 / 27.11.2018
Authors: Lungulescu Eduard Marius, Setnescu Radu, Lupu Ana Maria, Nicula Nicoleta Oana, Mateescu Carmen, Ducu Robert, Ion Ioana

Novelty/ Description

The invention relates to Ag nanoparticles (AgNp) with narrow dimensional dispersion obtained by radiochemical synthesis and to their manufacturing method. Ag nanoparticles with narrow dimensional dispersion according to the invention are obtained by exposure to gamma irradiation of systems consisting of salt-precursor of Ag ions and a pair of coating and stabilizing agents based on water-soluble polymer and a compound of the form R(OH)x soluble or partially soluble in water, with SPR maxima between 390-482 nm, with average dimensions between 2-90 nm, with high stability over time, and with high antimicrobial activity.

Radiochemically synthesized silver nanoparticles



Surface Plasmon Resonance of silver nanoparticles

Advantages:

- the method of silver nanoparticles synthesis is simple and fast and can be performed at ambient pressure and temperature; it takes place in aqueous solution, which allows precise control of the parameters at any point of the reactor (concentration, temperature, dose), ensuring the reproducibility of the process;
- the synthesis does not require the use of toxic or high biological risk chemical reducing agents, the main reducing agent in the absence of oxygen being the hydrated electron which has a very high reduction potential;
- the synthesis process allows the obtaining of large quantities of AgNp with controllable size and structure, at a low price, being able to be applied on an industrial scale;
- the obtained AgNp have a uniform dispersion and high stability over time (of the order of years);
- the average size of the nanoparticles and the dimensional distribution depend critically on a small number of parameters that can be easily controlled (irradiation dose, the concentrations of the stabilizing agent and Ag ions, and the ratio of these concentrations).

Applications:

These nanoparticles can be used in various applications, such as optoelectronics, sensors, renewable energy technologies and catalysts, biomedical devices, antimicrobial agents, wastewater treatment, restoration and conservation of heritage objects etc.

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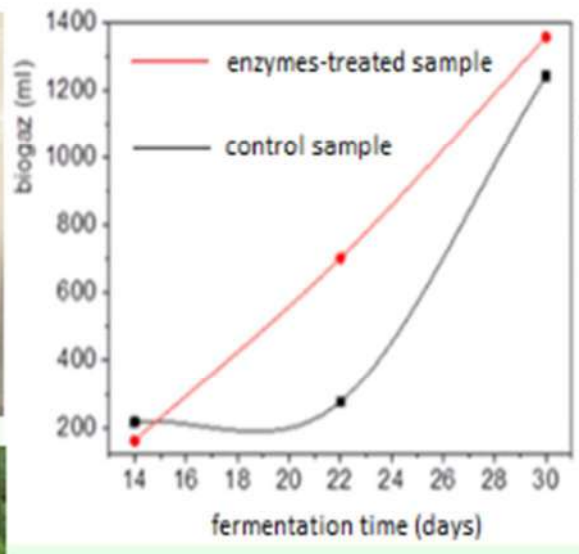
Process of algal biomass enzymatic pretreatment used for biogas production

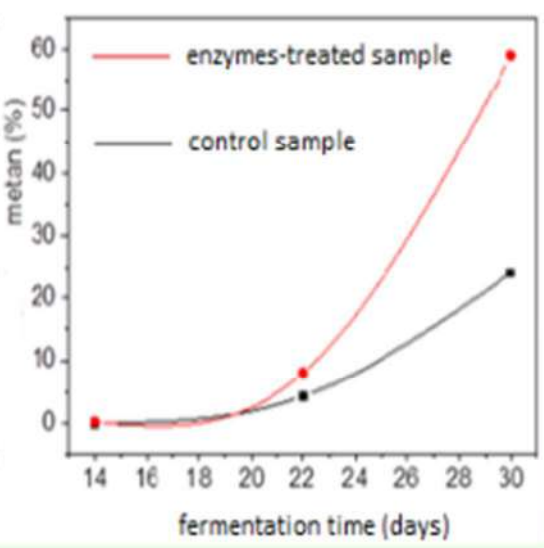
Patent Application No. a 2018 00523

Authors: Mateescu Carmen, Nicula Nicoleta Oana, Lungulescu Eduard-Marius, Török Liliana Paraschiva, Török Zsolt

Novelty/ Description

This invention relates to an enzymatic pretreatment of algal biomass used as a digestion substrate in anaerobic reactors for producing biogas. The pretreatment process claimed by this invention aims at dissolving compact macromolecular structures of carbohydrates (cellulose and hemicelluloses) from algal biomass under the action of a mixture of hydrolytic enzymes secreted by the following fungal species: *Trichoderma reesei, Trichoderma versicolor, Penicillinum chrysosporium, Fusarium solani, Chaetomium thermophile* and *Myrothecium verrucaria*, thus facilitating the access of anaerobic fermentation bacteria to heavily biodegradable cellulosic fibers, reducing fermentation time and increasing the production of biogas in anaerobic fermentation processes. The experimental results obtained for the *Ulva intestinalis* marine macroalgae, which was used as substrate for mesophilic anaerobic digestion, revealed significant increase in methane production in biogas by 83% for the enzymatically pretreated sample, compared to the control sample. The increase is due to the stimulating effect of the selected fungal mixture on biodegradation of the compact macromolecules from macroalgae structures.





Advantages:

- Reducing the conversion time of biomass to biogas by accelerating the hydrolysis stage of compact biopolymers;
- Increasing the energy value of biogas fuel by increasing the share of biomethane;
- Reducing pre-treatment costs, reducing the volume of residual organic matter and increasing the profitability of biogas plants.

Applications:

Energy recovery of algal biomass in biogas plant projects; Laboratory tests for research projects; Demonstration tests for didactic purposes in the field of evaluating the biomethane potential of various types of residual algal biomass.

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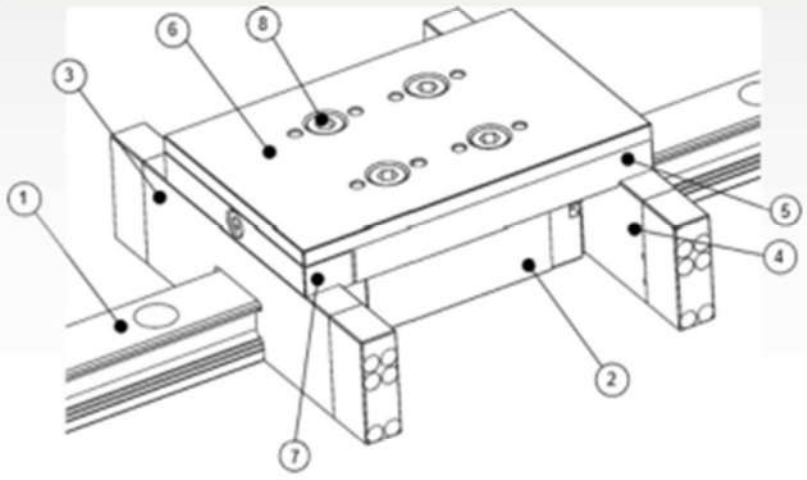
Piezoelectrically actuated linear positioning system for standardized guideways

Patent Application No. A 01064 / 2018

Authors: Ovezea Dragoș, Tănase Nicolae, Chiriță Ionel, Guțu Mihai, Ilie Cristinel Ioan, Popa Marius, Nedelcu Adrian

Novelty/ Description

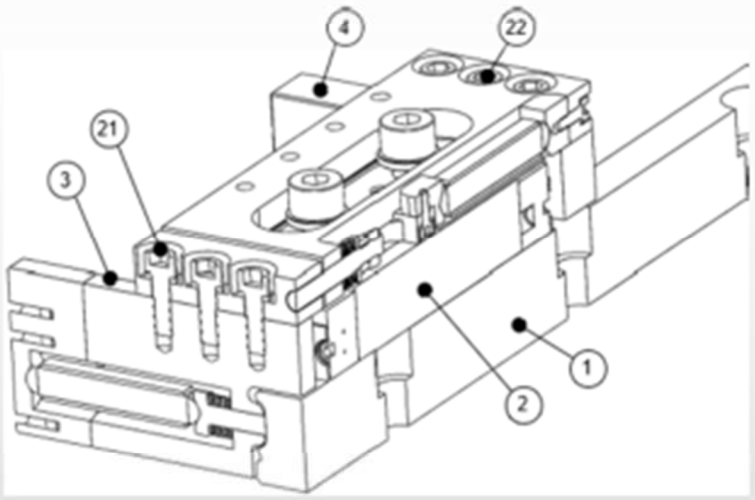
The invention offers a solution for a ppiezoelectrically actuated linear positioning system for standardized guideways. The movement is achieved by successive clamping and releasing of two piezoelectrically operated brakes, situated at the opposite sides of a piezoelectrically driven advance/retraction system which is mounted on a standardized translation platform.

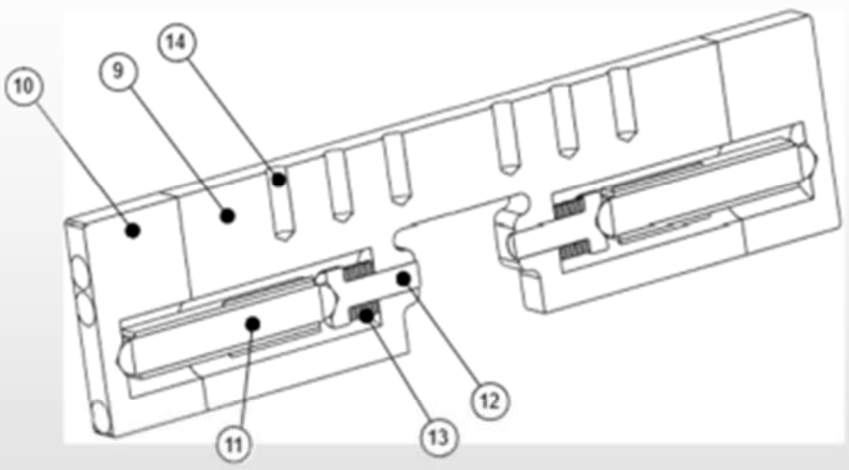


1 – positioning slide, 2 – positioning stage, 3 – brake, 4 – brake, 5 – translation assembly, 6 – cover, 7 – advance system, 8, 21, 22 – assembly bolts

Advantages:

- can be used to directly actuate a linear stage, allowing for large displacements;
- does not allow rotation with respect to the translation rail;
- can compensate very large mechanical play of the rail by using serial placed large displacement actuators;
- easy to manufacture and assembly;
- does not require special manufacturing technologies;
- can provide full-force since no movement amplifiers are involved;
- versatility: can be easily adapted to various types of linear stages provided the rail can be clamped by the brakes.





9 – main body of braking system, 10 – closing cap, 11 – piezoelectric actuator, 12 – brake cylinder, 13 – return springs, 14 – assembly holes.

Applications:

Compact, high precision, large displacement piezoelectric drives usable for positioning in special environments or for special applications such as aerospace, military or medicine.

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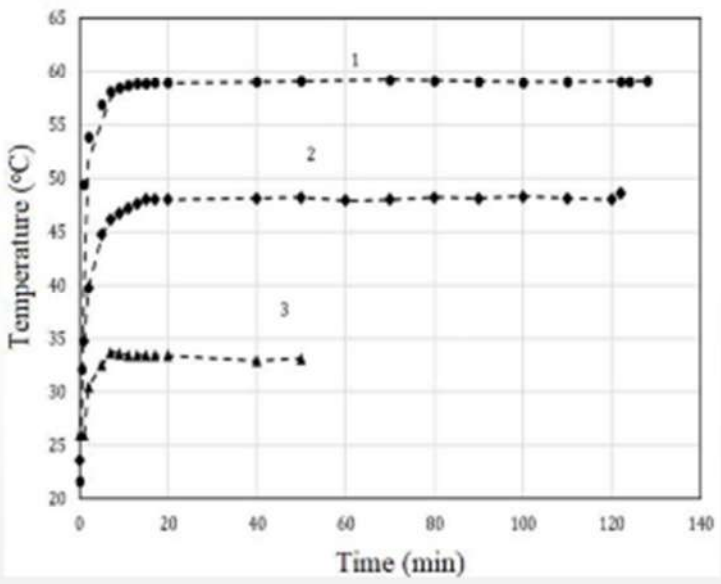
Electroconductive composite with thermal self-regulating effect and its manufacturing method

Patent Application No. A / 01053 / 05.12.2018
Authors: Setnescu Radu, Caramitu Ruxandra Alina, Lungulescu Eduard Marius, Mitrea Sorina, Băra Adela, Stancu Nicolae

Novelty/ Description

The invention relates to an electroconductive composite material with thermal self-regulating effect and method of its manufacturing. The material presents electrical conductivity at ambient temperature and electrical insulating properties at high temperatures between 50 ... 130°C, having thermal self-regulating properties without controlling them through external devices. The positive temperature coefficient (PTC) effect is enabled by a high crystallinity polymer matrix with low oxygen permeability, crosslinked by ionizing radiations, and a synergistic pair of antioxidants with different action mechanisms, one being a free radical scavenger and the other hydroperoxide decomposer, in concentrations of 0 ... 2%, as well as by a bicomponent system of conductive charges, one consisting of spherical particles of nanometric size and the other one of plane graphite particles of micron-range dimensions, in total concentration < 25% w/w. The manufacturing process uses gamma rays (or accelerated electron) at doses between 150 ... 250 kGy.



Dependence of the sample surface temperature on time and applied voltage: 1- 125 V, 186 kGy; 2 - 100 V, 186 kGy; 3 - 100 V, irradiated (0 kGy)

Advantages:

- the composite material shows a high jump of electrical resistivity determined by the crystalline nature of the transition related to the percolation / de-percolation;
- the composite material, has high resistance to thermooxidative aging;
- because the composite material does not require embedding/ encapsulation in protective resin, oxygen-tight, it results in the reduction of the dimensions and rigidity of parts that incorporate the composite, which contributes to increasing their efficiency, simplification technology and reduction of manufacturing costs;
- the composite material has a low concentration of conductive charge content (less than 25%);
- the manufacturing process is simple and involves low costs of raw materials and processing, the composite material can be processed with conventional devices for plastics manufacturing; irradiation can be done with laboratory or industrial irradiators - gamma sources or electron accelerators;
- irradiation processing can be applied at any time after the formation of the part; the material can be kept in the state of formation until irradiation for practically infinite time;
- compared to chemical processes, irradiation has the advantage of homogeneous distribution of crosslinking centers and easy process control (practically, the total dose is the only technological parameter to be monitored).

Applications:

- house heating elements and deicing of indoor pavement spaces around the buildings;
- mobile or incorporated deicing devices for aeronautics, automotive industry a.s.o.;
- textile industry and self-regulating temperature enclosures for different uses – foods, medical devices a.s.o.;
- due to their high versatility, the devices can be powered by regenerable energy sources for standalone applications, including those located in isolated regions.

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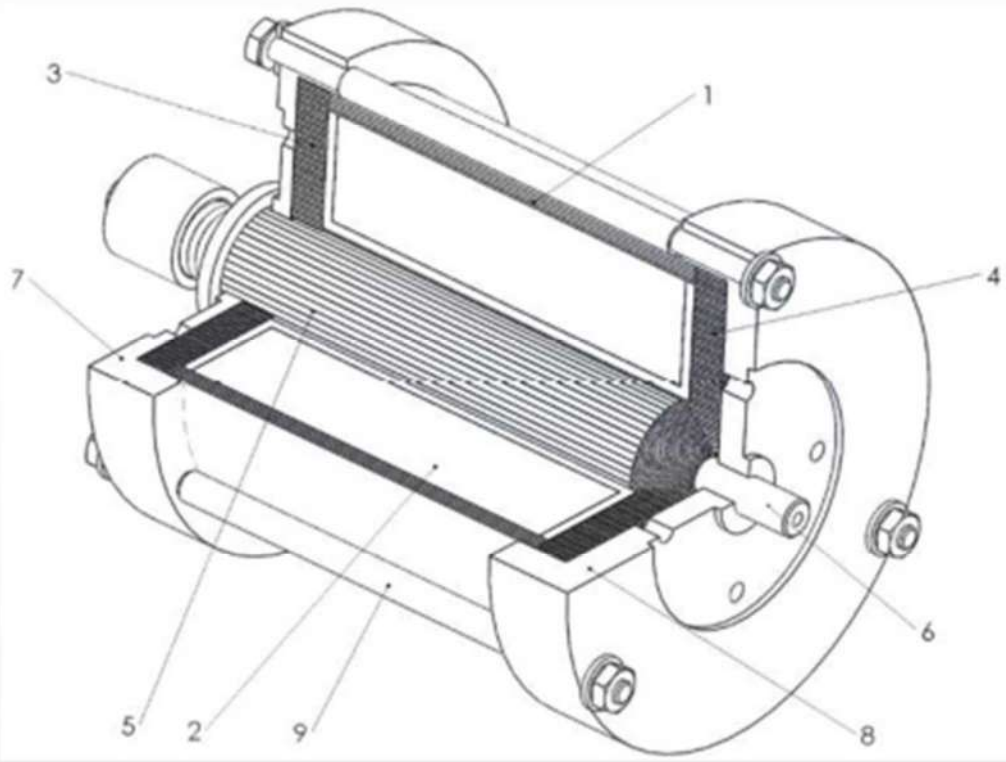
Electromagnet for Digital Hydraulics

Patent Application No. A / 00936 / 2018
Authors: Tănase Nicolae, Mihăiescu Gheorghe Mihai, Nicolaie Sergiu, Chiriță Ionel, Ilie Cristinel Ioan, Lipcinski Daniel, Ovezea Dragoș, Nedelcu Adrian, Popa Marius

Novelty/ Description

The electromagnet for digital hydraulics has a construction of direct current electromagnet with plunger, in the version with closed magnetic circuit and straight or conical sliding armature, but in which the closing yokes of the magnetic circuit (the outer cylindrical shell and side shields) as well as the inner cylindrical plunger, are in rolled lamellar construction and shaped according to concentric involute curves (the vortex of the involute has the property of constancy of the distance between adjacent curves) made from ferromagnetic electrotechnical sheets with a slope of high increase of the magnetization curve characteristic (for example "supermendur" alloys). This design promotes a reduced startup time of the plunger (which is the longest running time) and ensures minimal power losses through eddy currents and magnetic hysteresis, respectively minimal heating of the closing parts of the magnetic circuit. Regarding the electrical circuit, the winding, as number of turns and section of conductors, is correlated so that the context of supply voltage-inductance and electrical resistance of the coil to ensure the minimum value of actuation time and armature release time.



Advantages:

- Reduced value of the actuation time, between the triggering of the control voltage pulse and the end of the plunger stroke, both in terms of the starting time component (marking the increase of current and force until the predicted one is overcome) and in terms of the time component movement of the plunger until the end of the stroke;
- Avoiding the overheating of the winding and the closing parts of the magnetic circuit due to their lamellar construction from electrotechnical sheets with superior magnetic characteristics.

1 - outer cylindrical shell; 2 – coil; 3,4 – side shields; 5 – inner plunger; 6 – central axis; 7,8 – side flanges; 9 – threaded rods with tightening nuts.

Applications:
Ultra-Fast switch ON/OFF valves for digital hydraulics.

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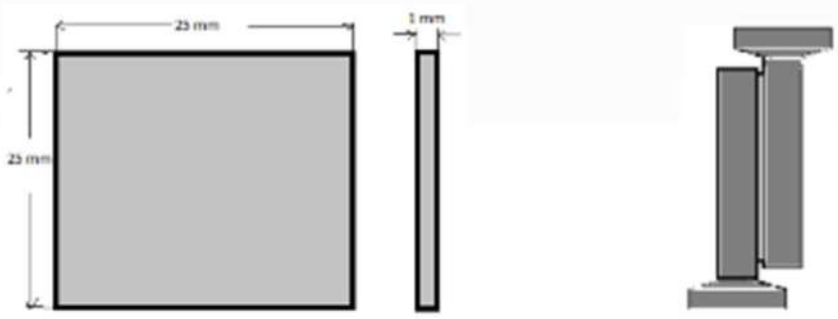
Thermoelectric generator of high power and efficiency, pulsating operation

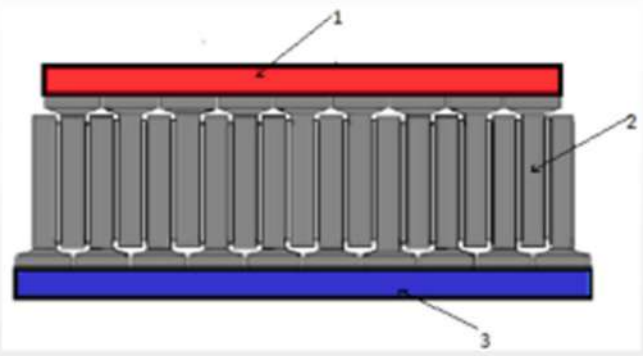
Patent Application No. A 2019 / 00336

Authors: Nedelcu Marin, Teișanu Alexandru Aristofan, Iordoc Mihai Nicolae, Prioteasa Paula Ionela

Novelty/ Description

The invention relates to a new type of thermoelectric generator consisting of a heating source (1), the thermoelectric unit itself (2), cooling unit (3), obtained by substantially increasing the dimensional factor, thermoelectric pleasant surface / thickness, (A / l) of at least 100 or compared to traditional thermoelectric modules and the non-stationary (pulsating) operation of such a unit at high frequencies of 100-500 kHz so as to obtain a high power per generator but also a substantial improvement in the conversion efficiency of thermal energy into electricity by avoiding the thermal dissipation of the electrical pulse energy.





1 – heating source, 2 – the thermoelectric unit, 3 – cooling unit.

Advantages:

- the electric power delivered by the generator can be controlled by the variation in design of the dimensional factor, A / l, depending on the power needs of the thermoelectric generator;
- it is thus possible to proceed to the manufacture of thermoelectric generators of very high powers unprecedented in the field of thermoelectricity;
- the conversion efficiency of thermal energy into electricity can be controlled from the operating frequency and the filling factor;
- thus opens the perspective of the transition of thermoelectric generators from the niche stage of the market to consumer products.

Applications:
Mobile and stationary energy conversion devices, space exploration.

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Monitoring of hydrodynamic and hydromorphological conditions on the Danube-Izvoarele-Vadul Oii sector, in order to develop measures to ensure environmentally friendly navigability

Authors: Eng. DEÁK GYÖRGY Ph.D. Habil.*; Eng. BURLACU IASMINA Ph.D., Eng. RAISCHI MARIUS Ph.D.; Eng TUDOR GEORGETA; Eng. URLOIU IRINA
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Introduction

The study sector is part of an area that over the years has been anthropically modified by hydrotechnical works, to ensure navigation conditions and the water flow necessary for the operation of the Cernavoda Nuclear Power Plant. The conducted researches aim to evaluate the real-time variation of hydromorphological conditions and to assess the impact of existing and future hydrotechnical constructions, by implementing a DKLB-C solution (hydrotechnical solution for redistributing the flows of a river between its main riverbed and its branch), to ensure the navigability in low water conditions on the Danube without endangering the migration routes of sturgeons.

Methods

- **Development of the physical model at a scale of 1: 100 000 - 1:75 000 for the Izvoarele-Vadu Oii sector**

Preliminary field tests were performed on an *in situ* physical model at a scale of 1: 100 000- 1:75 000 Izvoarele-Vadu Oii, as shown in Figure 2. To optimize the physical model, the hydrogeomorphological and hydrodynamic parameters were evaluated, as well as their evolution in the study area (Figure 1). The methodology included high-resolution multibeam measurements for the three-dimensional representation of underwater relief and single-beam ADCP measurements for assessing the river bed bathymetry and water velocity vectors in the selected sectors.

- **Achievement of the hydrodynamic and hydromorphological information volume in the study area**

In order to improve the information volume and update the existing database, *in situ* measurement campaigns of hydromorphodynamic parameters in the study area were carried out in 2020. Monitoring of the hydromorphological and hydrodynamic parameters was performed through high-resolution multibeam measurements (Figure 3) and single-beam ADCP measurement (Figure 4) campaigns. The data obtained were analyzed, processed and represented using both dedicated applications of the GIS

Figure 1: Location of the study area Izvoarele - Vadu Oii sector

Figure 2: *In situ* physical model 1: 100,000 - 1:75,000

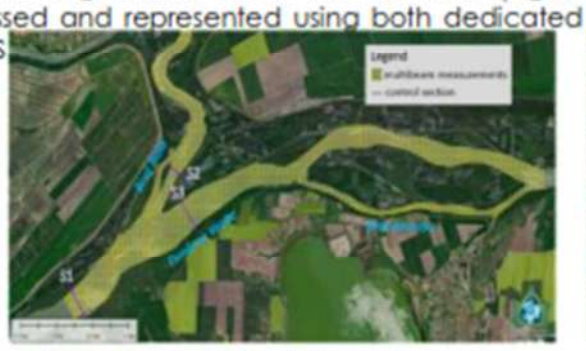
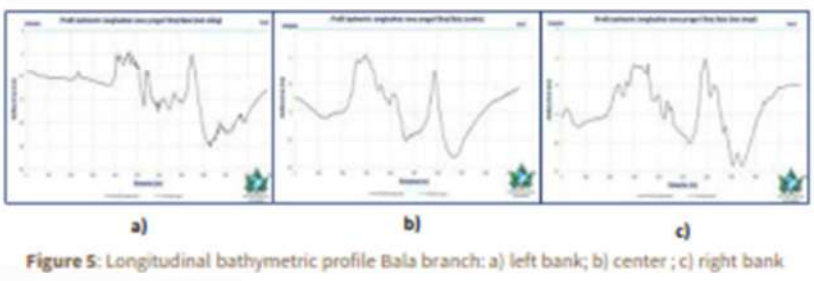


Figure 3: Area covered by multibeam measurements in the the control sections area of Old Danube - Bala Branch

Figure 4: Single-beam ADCP measurements in the Old Danube - Bala Branch - Epurașu dam area

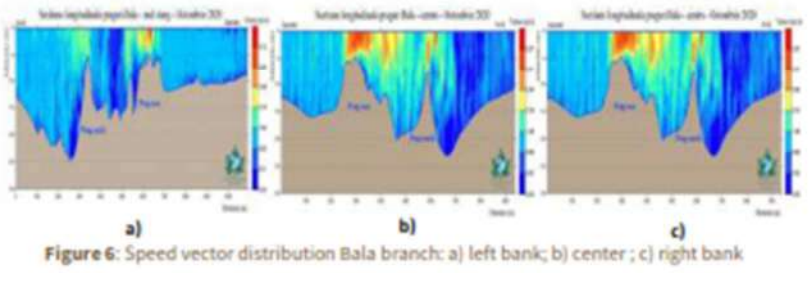
Results and conclusion

The results obtained from the monitoring of hydromorphological (Figure 5) and hydrodynamic (Figure 6) parameters contributed to the preliminary updating of the existing database. The changes determined in these researches will be the basis for eliminating the possible impact on the environment and for the development of "win-win" solutions for both the environment and navigation without endangering the aquatic biodiversity.



a) b) c)

Figure 5: Longitudinal bathymetric profile Bala branch: a) left bank; b) center ; c) right bank



a) b) c)

Figure 6: Speed vector distribution Bala branch: a) left bank; b) center ; c) right bank

Following field measurements, it was found that 58% of the flow is directed on the Bala branch and the remaining 42% to the Old Danube (Figure 7). The *in situ* physical model is an innovative and replicable solution, which will definitely ensure the possibility to develop favorable navigability in low water flow conditions on the Danube, without endangering the migration routes of sturgeons. The results of the researches, respectively the proposed technical solution, will ensure the real possibility of *in situ* implementation by the Ministry of Transport and the European Commission, to ensure the functionality of the Rhine-Danube corridor and, at the same time, the water flow required for operating the Cernavoda Power Plant.

Figure 7: Flows distribution at the Bala Branch – Old Danube bifurcation

Acknowledgments

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Determining the methodology and coefficients specific to Romania in order to quantify GHG emissions and absorbions for the quantification of climate change

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General objectives

- Comparative analysis of national and international regulations on the quantification of GHG emissions and removals
- Elaboration of the methodology in order to determine the value of Romania-specific parameters in order to quantify GHG emissions and removals for reporting in the LULUCF sector
- Presentation and analysis of the current level and forecasts of GHG emissions and removals compared to the reference year
- Elaboration of a strategy to ensure the favorable premises for Romania for the implementation of the Paris Agreement on climate change for 2030

Introduction

In the context of the implementation of the Paris Agreement adopted in 2015, applicable from 2020, the aim was to update and develop methodologies for assessing GHG emissions and removals and to develop a compliant strategy at the national level. The current situation regarding the quantification of GHG emissions and removals from the LULUCF sector results from the analysis of the GHG emissions and removals profile for Romania reported according to the National Emission Inventories. In Romania, the evolution of GHG emissions is decreasing. For land use and forestry, the emphasis is on assessing the ability of the forest to maintain and improve to act as an emission reduction basin by sequestering CO_2 in plants and soils. Additional issues include sustainable forestry management and the closely associated use of wood, the permanent conservation of croplands, the protection of wetlands and the potential for the development of natural forests to mitigate climate change.

Strategy for the implementation of the actions provided for under the Paris Agreement at national level, until 2030

Fig. 1 Evolution of GHG reported and targeted quantities (left axis: Total without LULUCF vs LULUCF) and percentage of GHG decreased related to 1990 baseline (right axis)

Data and methods:

- Use of **Efiscen** software (European Forest Information SCENario Model) to test modelling techniques, software and methods used / recommended for forecasting, according to Regulation (EU) 2018/841. EFISCEN is used to assess the consequences of the effects of climate change and the consequences of forest management practices.
- Phantom 4 Multispectral **drone** (Fig.4) and **RTK**

The vegetation indicators provided by data processing are NDVI, NDRE, GNDVI, LCI, OSAVI

- **QGIS; IPCC guidelines**
- **CO2 Gas Analyzer EGM-5** (Fig.2)

The portable CO_2 gas analyzer was used with a dynamic closed chamber, together with a sensor - Stevens HydraProbe attached to the chamber to determine the soil humidity and soil temperature.

Fig.2 Closed chamber measuring system-EGM-5

Fig. 3 Floating system for monitoring CO_2 flow

Fig.4 Phantom 4 Multispectral

Scheme of the IPCC methodology for quantifying GHG emissions and removals at national level

Conclusion:

In terms of storage capacity, soils can store large amounts of carbon in some ecosystems as forests, croplands and wetlands, as they can contain more carbon than all plant biomass. In present the LULUCF sector contributes efficiently to mitigate the effects of climate change through GHGs elimination from the atmosphere.

Case studies

1. Forest ecosystem case study - Production unit II - Hobana, Grivița Forest District, Galati Forestry Department

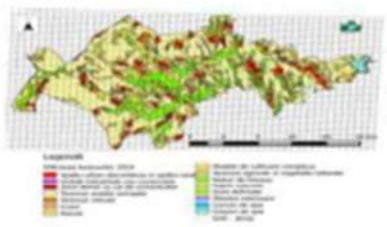

Fig.5 Distribution of surfaces of cover types and soils by processing in QGIS

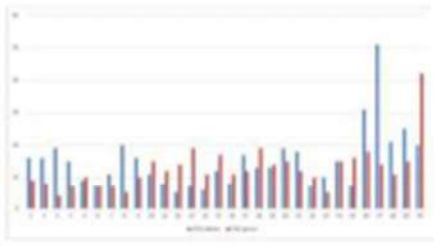

Fig.6 Evolution of CO_2 flux for each tree species

- Use of **EFISCEN** in the case study

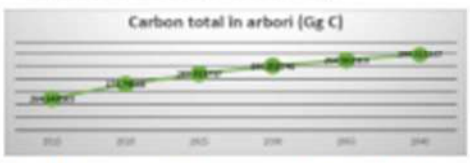

Fig.7 Projection of the total amount of carbon stored by forests for the period 2015-2040

Fig.8 Projection of the total amount of carbon stored by Oak forests during 2015-2040

2. Wetlands case study - Movileni Reservoir

Within this area, the CO_2 flux from the water was measured by a new tested method, thus, the chamber system being placed on a floating device specially designed for the use of water measuring devices. (Fig.10)

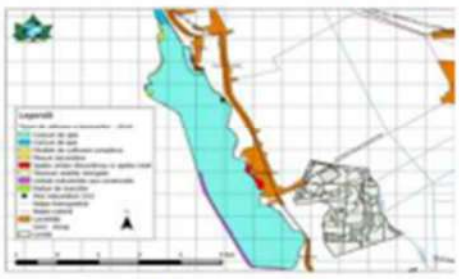

Fig.9 Types of land cover in 2018- Movileni Reservoir

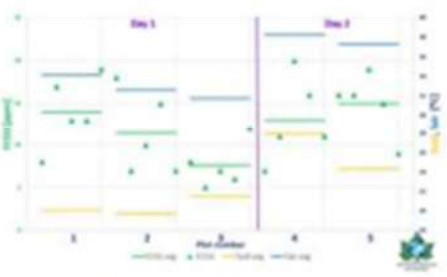

Fig.10 CO_2 flow, air and soil temperature representation

3. Cropland

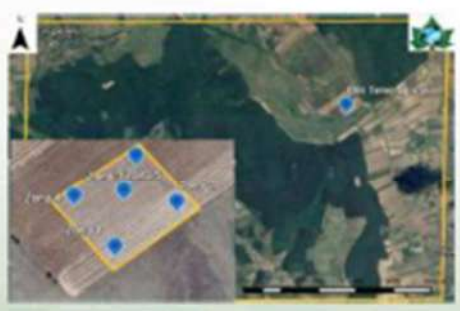

Fig.11 Plot design for soil carbon stock assessment

Fig.12 CO_2 flux analysis according to the main parameters

In next period the land use activities will gain importance regarding its proportion to GHG from LULUCF comparing with rest of the sectors, as supplementary targets are established, together with the aim to balance the emissions and absorptions until 2030. In this project is presented the CO_2 methodology to upgrade from level 1 to the higher detail levels, according to the IPCC recommendations by improving the methods. The methodology developed contains procedures for observation of those local conditions (weather, terrain, vegetation, sun exposure, etc.) of the actual measurement in order to establish their correlation with CO_2 flux for a better application of the analytical method or the one based on GIS technique. The results of CO_2 flux measured contribute to the development of emission factors for their improvement at national level, as well as to the reduction of uncertainties in national GHG emission inventories.

The ecosystem approach to identify and assess climate change adaptation and mitigation measures

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INTRODUCTION

The paper presents the results of the actual study. The aim was to develop a database with climate pressure indicators, state of ecosystems and services provided by them, in order to analyze the current state of ecosystems chosen as study areas. Another objective was to identify general adaptation and mitigation measures on the effects of climate change based on forest ecosystems and wetlands. Using the ecosystem approach, the proposed project deals in an integrated way with both mitigation and climate change adaptation measures by assessing how the implementation of such measures contributes to the dynamics of the services provided by the ecosystems concerned. The methods used to analyze the current state of ecosystems and the services provided by them in the study areas, as well as in the next stages of the project which will involve assessing the effects of the measures, have as starting point the DPSIR framework (figure 1) and the working steps of the instrument. for adaptation assistance presented on the Climate-ADAPT platform (figure 1).

MATERIAL AND METHOD

The study areas (Figure 3) consist of two wetland ecosystems and a forest ecosystem. Wetlands are part of protected areas of national interest and the forest ecosystem is part of a forest district.

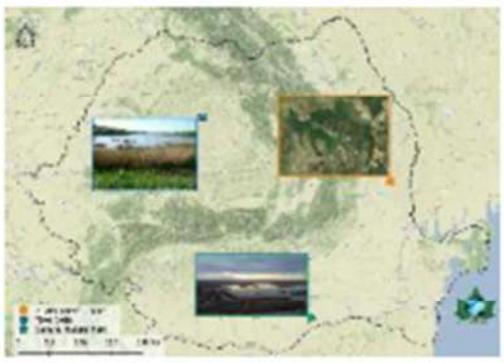

Figure 3. Location of study areas in Romania

The aim was to present the main pressures acting on wetland and forest ecosystems, highlight the status indicators of ecosystems at national level and describe the main indicators of ecosystem services, based on the work of the MAES working group.
Followed by an analysis of the current state and services in the selected study areas. Indicators for analyzing the current state of ecosystems and the services they provide in the study areas were selected according to the influence of the targeted measures on their dynamics. The targeted measures were selected from the management plans of the protected areas of which the study areas are part, respectively it was taken into account that these measures contribute to adapting to the effects and mitigating the causes of climate change.

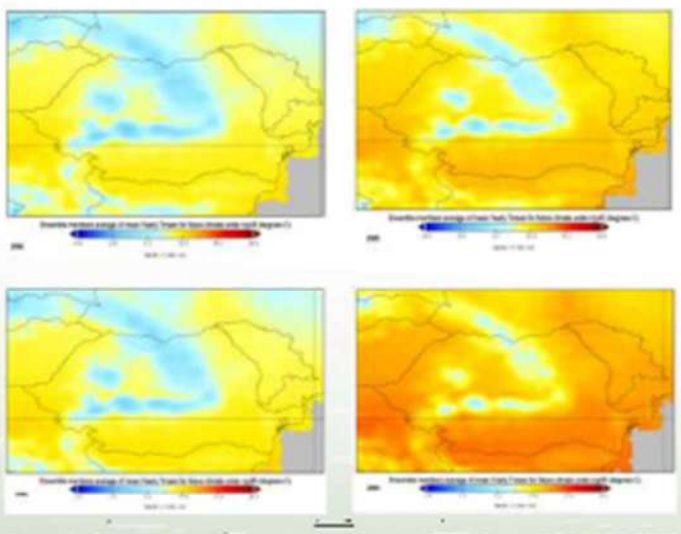

Figure 4. Climate Model: Temperature change (RCP 4.5 and 8.5) 1986-2085

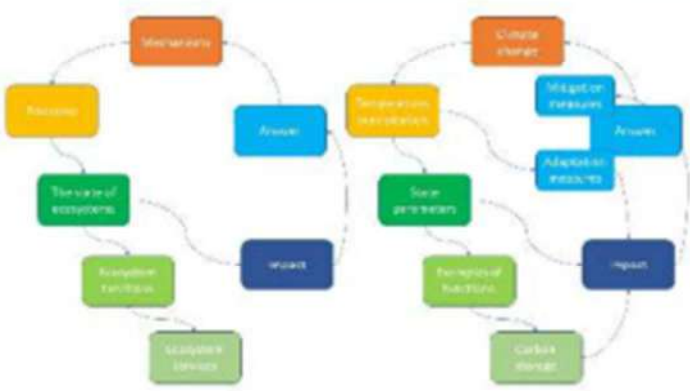

Figure 1. Drivers-Pressures-State-Impact-Response framework and its adaptation to the specifics of the project

Figure 2. Working steps within the adaptation support tool

RESULTS

I. Climate projections (RCP 4.5 and RCP 8.5) – temperature (figure 4)

II. Satellite indicators - obtained by processing satellite images - NDVI and NDMI (Figure 5)

III. Assessment of measures simulated in the forest ecosystem (Figures 6 and 7)

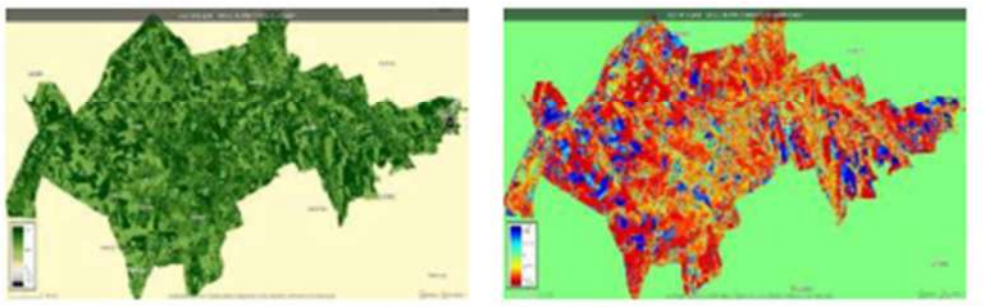

Figure 4. Satellite indicators: NDVI and NDMI

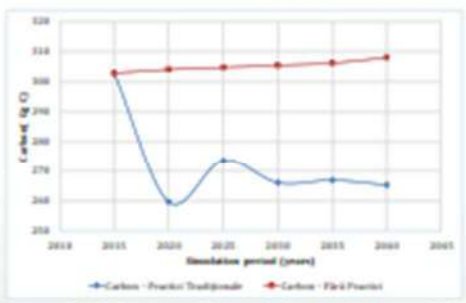

Figure 6. Carbon stock evolution sequestered in biomass. It can be observed that the managed forest is affected by the practices (blue), the forest loosing its capacity of sequestering carbon. However, if no management practice will be allowed, the results of the simulation (red) showed an increasing capacity in carbon sequestration.

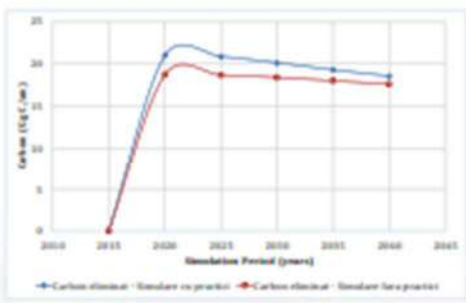

Figure 7. Carbon released into the atmosphere (gross) GgC/year. The observed effect of the measure is that the level of carbon removed from is lower if the forest is treated in a strict regime, without management practices, compared to the values in the simulation in which forests are managed.

CONCLUSIONS

Efiscen software was used for forest ecosystems, being a matrix model in which the state of the forest is described as a distribution of area by age and volume classes, based on data of area, growth stock and growth by age classes and the type of forest within the study area. The adaptability of ecosystems to climate change is influenced by their ecological status, depending on abiotic factors, such as climate or hydrological regime, as well as biotic factors related to biodiversity. Both wetland and forest ecosystems are affected by the effects of climate change, along with pollution, and overexploitation of natural resources. All this leads to the inability of ecosystems to provide ecosystem services, affecting the well-being of people and the environment.

ACKNOWLEDGEMENTS

Analytical Method Development for Microplastic Detection in Environmental Samples

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Key Development Stage: *Synthetic microplastic materials preparation and their purification for spike studies on biological and other environmental matrices*

Authors: *Alexandru IVANOV, Ecaterina MARCU, Cristina MARIA*, Ioana SAVIN, Carmen TOCIU*

Microplastics – environmental presence

Plastic pollution is a main form of pollution of aquatic environments, reported since the 1970s. Plastics represent about 60-80% of marine waste and 90% of waste floating on seas/oceans. According to The Convention on Biological Diversity (2002), more than 663 marine species are affected by the presence of plastics. Microplastics (MPs) are small synthetic polymers (0.06-0.5 mm) resulting from the degradation of plastics in the environment under the influence of UV light or mechanical action. Some MPs are directly manufactured products (e.g., microspheres from personal care products, pharmaceuticals) and other are decomposition products of macroplastics (e.g., textile microfibres, tires, plastic packages).

There are numerous adverse health effects of microplastics presence in the environment, such as the alteration of the biogeochemical cycles and dynamics of aquatic food chains, inducing physical damage due to their small size - entanglement, breathing difficulties, asphyxia, damage on the respiratory and digestive tract, the release of additives from the composition of the plastic, adsorption/absorption and release of other toxic pollutants from the environment (e.g., PCBs, PAHs etc.), being just a few of the more direct effects.

Dâmbovița River near Budești (June 2018).

Research objectives

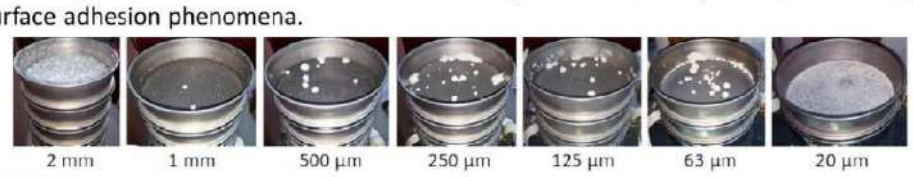
- Assessing the presence of micro- and nanostructured elemental pollutants in the environment.
- Proposing technological solutions to improve the water treatment process in order to protect the environment and the population.

Obtained results

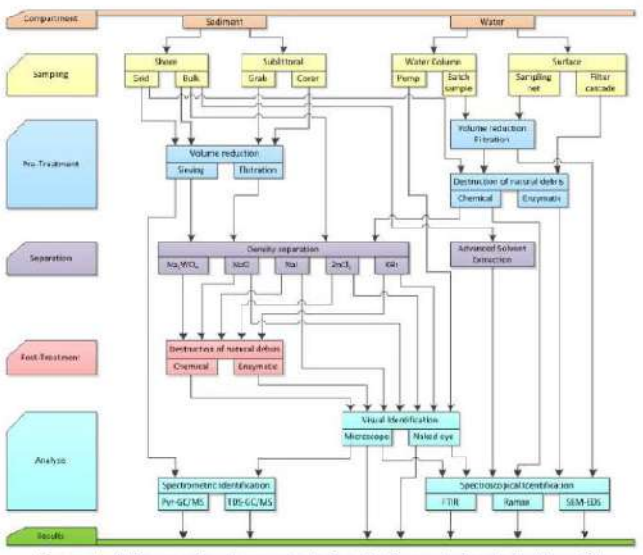
1. Several synthetic microplastic manufacturing methods were developed, based on grinding selected polymeric materials from commercial packaging. The obtained microplastics are useful for standard solutions and for spiked samples in latter analytical method development steps.

2. MPs separation method were tested, based on the density difference between various solutions (such as sodium chloride, sodium iodide, zinc chloride or sodium polytungstate) and the micro-structured materials density used in the experiments. After coarse fragments separation, the remaining microplastics were filtered and rinsed with absolute ethanol and ultra-pure water. The obtained synthetic MPs were evaluated through laser-granulometry and optical microscopy to reveal their quality and their micro-structure.

3. To improve the MPs separation method and to obtain more useful reference materials for the method development stage, a granulometric separation through wet cascade sieving was introduced, with sieves ranging from 2 mm to 20 µm. The addition of a surfactant (e.g., sodium lauryl sulfate) was essential for a better and faster separation of microplastics, attenuating most of the surface adhesion phenomena.



4. Identification of microplastics from synthetic samples by naked eye observations or with an optical microscope indicated the shapes, colors and textures of MP particles. Most microplastics have a fluffy appearance with complex irregular 3D shapes and rarely distributed fibers.



Conceptual diagram of environmental microplastics analysis, adapted from [3].

Future research

- Developing methods for the quantitative separation of MPs from environmental matrices.
- Testing the analytical performance of the developed methods.
- Application of the developed methods for quantifying the MPs from water, sediment and biota samples taken from Argeș, Dâmbovița, Mureș, and Jiu rivers.
- Study on the abiotic and biotic interphase distribution of MPs and elemental pollutants at the level of the evaluated ecosystems (Argeș, Dâmbovița, Mureș, and Jiu rivers).
- Study on MPs removal technologies from freshwater resources.

Conclusions

- The method developed for the MPs reference materials provides adequate micro-structured plastics from 0.5 mm to under 0.02 mm range.
- Greater experience was achieved in manipulating MPs suspensions and achieving quantitative transfers. Different behaviors were observed for PET and HDPE suspensions, allowing tests on their density-based separation.

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Acknowledgment

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Contamination with Ecologically Relevant Pharmaceuticals of the Argeș-Vedea, Buzău-Ialomița and Dobrogea-Litoral river basins and of the Danube River

(Project RESCMANS 39N/2019 – PN 19 43 04 02)

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OBJECTIVES OF PROJECT

The main objectives of the project are to assess the level of emerging pollutants in the category of pharmaceuticals (estrogen hormones, antibiotics, anti-inflammatory medicines and other pharmaceuticals) from complex matrices specific to aquatic ecosystems in order to transpose the EU directives at national level regarding priority substances and ecotoxicological risk estimation associated with their presence in aquatic ecosystems.

RESEARCH DESCRIPTION

The results obtained in this project, materialized by the development and optimization of analytical methods for the detection and quantification of 36 pharmaceutical micropollutants, in the category of estrogen hormones, antibiotics, anti-inflammatory medicines, analgesics, beta-blockers, benzodiazepines respectively, as well as of elemental/isotopic inorganic pollutants, from different complex environmental matrices, will contribute to the completion of the available information on the presence and levels of pharmaceutical micropollutants in aquatic ecosystems in our country, in the hydrographic basins of Argeş-Vedea, Buzău-Ialomiţa and Dobrogea-Litoral and of the Danube River.

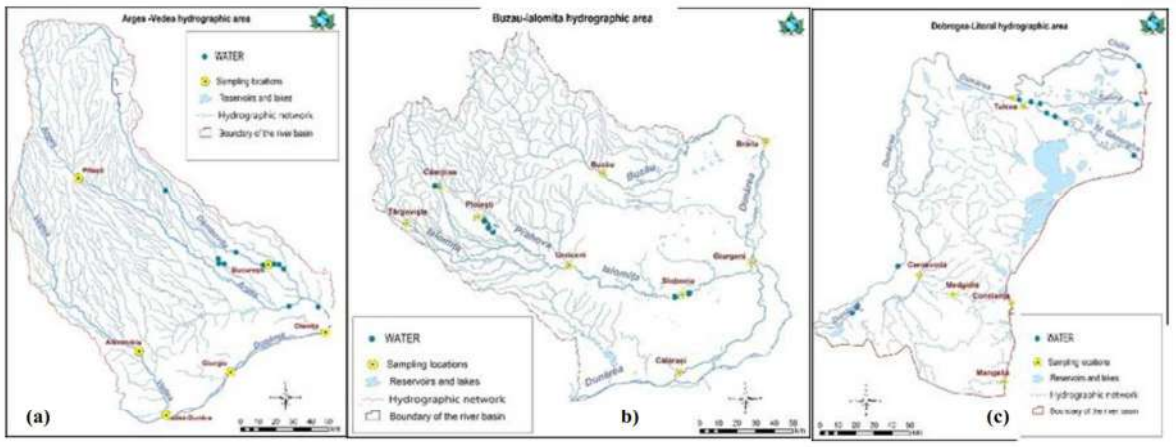

Fig. 1 - Sampling location – River basins of Arges-Vedea (a), Buzau-Ialomita (b), Dobrogea-Litoral (c)

The results will also allow the assessment of risks associated with the presence of emerging pollutants in the aquatic environment. The study also aimed to investigate the prevalence of antibiotic resistance of potentially pathogenic bacteria isolated from aquatic environments and to assess the impact of effluents from wastewater treatment plants on the antibiotic resistance of bacterial populations in the receiving river, in order to identify links between environmental antimicrobials and development and spread of antimicrobial resistance in aquatic environments.

➢ Development and testing of quantification methods for micropollutants in the pharmaceuticals category by ultra high performance liquid chromatography (UHPLC-MS / MS)

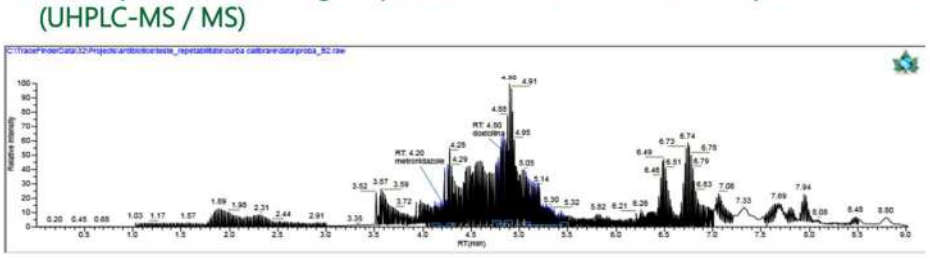

Fig. 2 – UHPLC-MS/MS selected-reaction monitoring (SRM) transitions screening for pharmaceutical compounds – surface water sample taken from Dâmbovița River – downstream of Glina Wastewater Treatment Plant

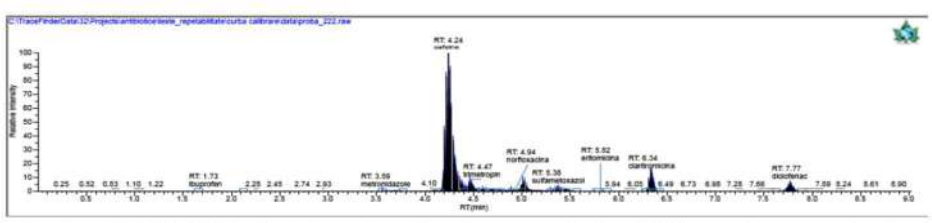

Fig. 3 – UHPLC-MS/MS selected-reaction– Danube areamonitoring (SRM) transitions screening for pharmaceutical compounds – biota sample (fish) – Epurașu Branch

➢ Testing the quantification methods for elemental constituents by inductively coupled plasma mass spectrometry (ICP-MS)

Fig. 4 – Testing the quantification methods for elemental constituents by inductively coupled plasma mass spectrometry (ICP-MS)

➢ Identification of isolated bacterial strains belonging to 5 genera: *Escherichia coli, Klebsiella sp., Serratia sp., Citrobacter sp. and Enterobacter sp.*

Fig. 5 – Identification of bacterial strains using API microstest systems (BioMerieux)

➢ Analysis of susceptibility/resistance phenotype for the isolated and identified bacterial strains comprised a number of 22 antibiotics

Fig. 6 – Disc Diffusimetric antibiogram on 2 strains of *E. coli* (C33 and C39) isolated from surface waters: Dâmbu River - upstream and downstream of Ploiești Wastewater Treatment Plant

CONCLUSIONS

The main results of the study contribute to the development of advanced analytical methods for the detection and quantification of pharmaceuticals as micropollutants in different aqueous matrices and represent useful tools for more detailed environmental risk assessments in line with the European Union environmental objectives. These high performance methods and techniques with very low detection limits comply with the environmental standards of EU Directive 39/2013 - amending Directives 60/CE 2000 and 105/EC/2008 - *as regards priority substances in the field of water.*

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Rapid Extraction Method for the Determination of Biota Antibiotics (Fish) by Ultra-High Performance Liquid Chromatography Coupled with Tandem Mass Spectrometry (UHPLC-MS / MS)

Patent application no.: A/00754/2020)

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SHORT PRESENTATION

The main concerns due to the presence of emerging pharmaceutical micropollutants in surface waters are their potential for bioaccumulation and bioconcentration in aquatic organisms that can cause various adverse effects such as changes in behavior, sexual differentiation, reproduction and bioenergetic parameters. In order to carry out these types of researches, highly sensitive analytical techniques are needed for the detection and quantification of pharmaceutical micropollutants, including rapid methods for their extraction from biota. Fish are representative indicators of the aquatic environment pollution, due to ability to take up and concentrate the micropollutants contained in water, in their tissues.

The invention relates to a rapid extraction method for the determination of antibiotic residues from biota samples (fish). The technical problem solved by the invention consists in the elaboration of a rapid extraction method for the determination of antibiotic residues from biota samples (fish) by extraction with organic solvents at temperature and pressure, followed by treatment of the extract by online solid phase extraction (Solid Phase Extraction- SPEonline) in acetonitrile flow and simultaneous detection of antibiotics by ultra-high performance liquid chromatography coupled with tandem mass spectrometry (UHPLC-MS/MS).

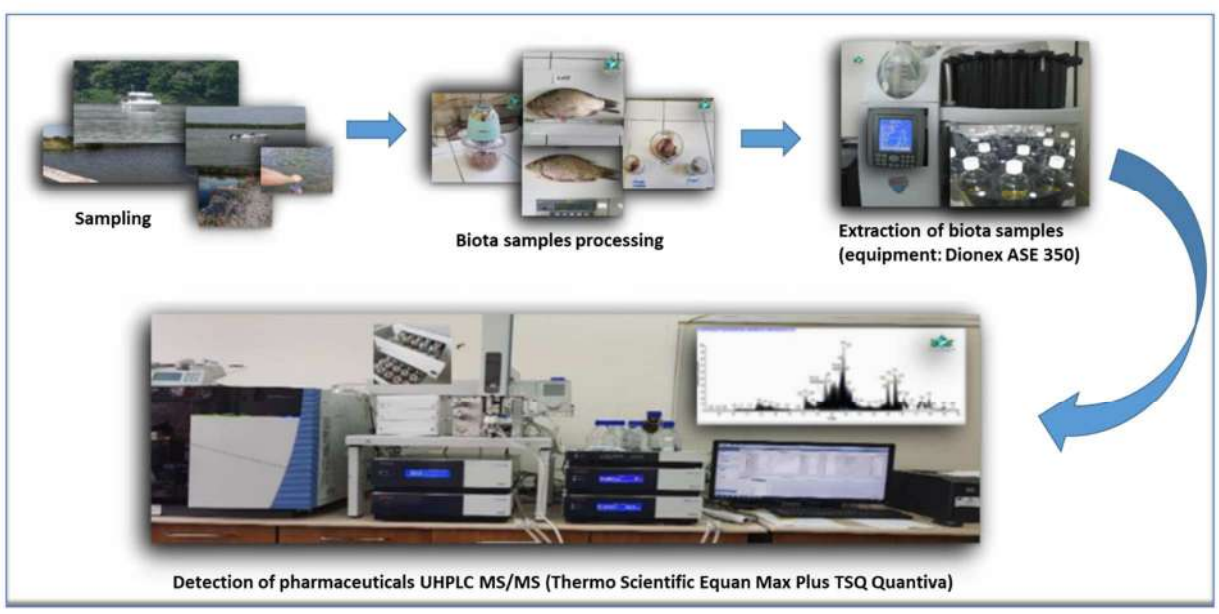

Table 1 - Detection, quantification and confirmation for pharmaceuticals products

Compound	Retention Time (min)	Polarity	Precursor ion (m/z)	Product (m/z)	Collision Energy (V)	Chemical formula
Doxycycline	4.8	Positive	445.2	154 428	27 18	Molecular formula: $C_{22}H_{24}N_2O_8$ Molar mass: 444,43 g/mol
Metronidazole	4.2	Positive	172	82 128	23.9 14	Molecular formula: $C_6H_9N_3O_3$ Molar mass: 171,064 g/mol

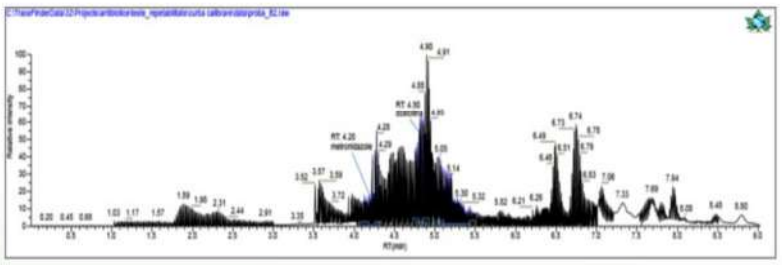

Fig. 1 - Screening (SRM) for the detection of pharmaceutical micropollutants - biota sample (fish) - Branch Epuraşu area - River Danube

CONCLUSIONS

Method development for the detection of the antibiotics doxycycline and metronidazole was carried out in accordance with the criteria of Directive 96/23 / EC on methods of analysis and interpretation of results. Detection and quantification of the antibiotics doxycycline and metronidazole from the extract obtained by the rapid extraction method for the determination of antibiotic residues from biota samples (fish) was performed with the equipment SPE-online-UHPLC-MS/MS.
Compared to other extraction methods reported in literature, the method has a low extraction time, a high selectivity and detection limits of antibiotic residues in the biota at ng/g.

Acknowledgments
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Innovative environmental friendly materials such as nanostructured materials and inorganic binders, with applicability in environmental protection - Assessing the capacity of innovative functionalized environmental friendly nanomaterials to retain different classes of pollutants from wastewater

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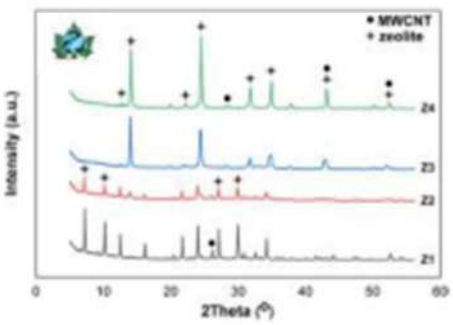
PROJECT DESCRIPTION

The project aims to develop innovative ecological materials such as nanopowders and inorganic binders with alkaline activation, applicable in the field of environmental protection (e.g. for wastewater treatment, encapsulation of hazardous pollutants, etc.).
Among the project's objectives was to obtain nanostructured materials with a zeolite structure from secondary materials that can represent valuable sources of alumina and silica.

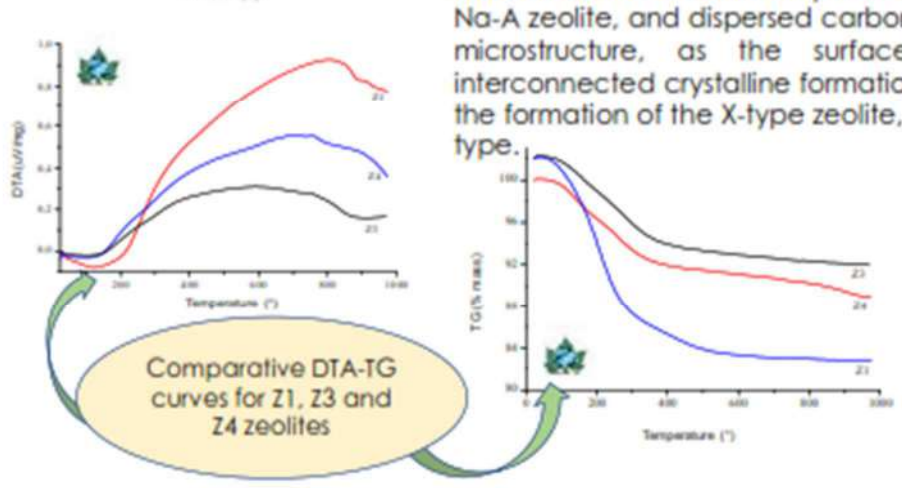
MATERIALS AND METHODS

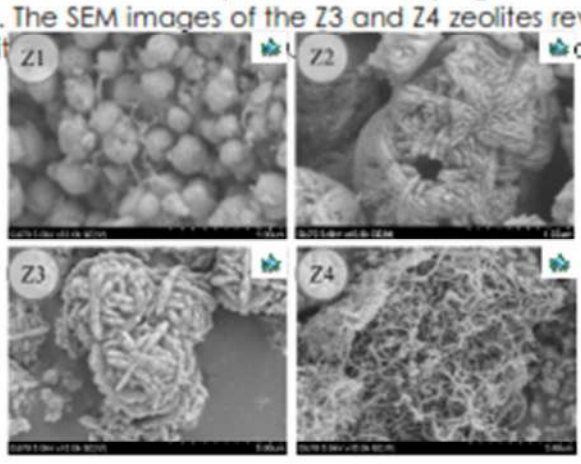
Pure precursors (pure sodium silicate, Merck reagent) and obtained through various synthesis routes from agricultural waste (rice husks) and metal wastes (aluminium cans and foil) were used for the synthesis of zeolite materials. Thus, sodium silicate solutions were mixed with sodium aluminates in different ratios at room temperature for 1 hour. The resulting gel was left crystallized for 1 to 3 days at room temperature, and then dried for 24 hours at 80°C. The resulting material was grounded, washed with excess distilled water and alcohol and dried at 80 °C. Some of the zeolites were also functionalized with MWCNT during the synthesis process to assess the retention capacity of wastewater pollutants.

RESULTS



By varying the Si/Al ratio of the chemical composition, 4 types of zeolites were obtained. The XRD spectrum highlights the formation of the Na-A and X zeolites, the diffraction peaks being attributed to this structure (2θ = 7.22, 10.19, 12.48, 16.13, 21.68, 24.01, 26.15, 27.15, 29.96 and 34.21°). The addition of MWNTC results in a higher degree of crystallinity, and the peaks overlap with those of the zeolite structure. Thermogravimetric analyses, performed up to 1000°C at a heating rate of 10°C/min has showed a maximum mass loss of 16% for Z1 (a higher porosity and therefore a greater amount of water existing in the structure) and up to 5% in the case of Z3 and Z4.
The morphology and size of the crystals of the synthesized zeolites were analyzed by SEM. Z1 zeolite consists of spherical crystalline units, corresponding to the small-sized Na-A zeolite, and dispersed carbon nanotubes. Z2 zeolite develops a slightly modified microstructure, as the surface of the microspheres developing lamellar, interconnected crystalline formations. The SEM images of the Z3 and Z4 zeolites reveal the formation of the X-type zeolite, wit[illegible]asite type.





CONCLUSIONS

The developed zeolite materials were subjected to physical, chemical and microstructural characterization. Different Si/Al reports led to different structures (e.g. zeolites type X and Na-A). This, the XRD and SEM analyses highlight the formation of the Na-A type zeolite in the Z1 and Z2 samples, and type X in the Z3 and Z4 samples. The addition of 0.05 g MWCNT in the Z1 sample results in a higher degree of crystallinity. The TG – ATD curves show a maximum mass loss of 16% for Z1 (a higher porosity and therefore a greater amount of water existing in the structure) and up to 5% in the case of Z3 and Z4 zeolites.

ACKNOWLEDGEMENTS

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Additive mortar composition for finishing works of old monuments and obtaining and application process

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INNOVATION DESCRIPTION

The invention relates to a composition of an additive mortar for finishing works of old monuments and its obtaining and application process with the following characteristics: a volumetric weight below 250 kg/m³, the thermal conductivity coefficient below 0,08 Kcal/m·h·°C, mechanical strengths more than 7 daN/cm² allowing a good compatibility with the operating support and by staining it in mass, before application, does not affect the patina. The mortar application process involves two cases: its application on surfaces without holes, but chromatically degraded and with thick deposits and its application on damaged areas with deep lacunar zones.

NOVELTY TO THE STATE OF THE ART

The invention could be applied for facades restoration of historical monuments (structural-superficial and chromatic reintegration), the self-cleaning effect on chromatic deviation under the influence of environmental factors and pollutants and microbiological agents, allows the realization of specific applications for hydro-, thermo- and sound-insulating plasters. The problem solved by the invention consists in using a light mortar having as aggregate the expanded perlite and finely divided eggshells, both doped with very fine powders of ZnO, TiO_2 and three burnt clay ceramics differently colored in titian red, brown and black, as a mineral binder, along with Portland cement, fine powder of calcium oxide (dehydrated calcium lime), fly ash from the burning of sunflower husks and acrylic binder.

THE PRINCIPLE OF THE METHOD

The composition consists of 15 parts by weight mixture of fly ash resulting from the burning of sunflower husks, Portland cement and ground calcium oxide to a fineness of 6 ... 10% residue on a sieve of 4900 mesh/cm², in gravimetric ratio ash:Portland cement: calcium oxide = 1: 2: 2 and 10 parts by weight mixture of expanded perlite and fine eggshell powder, both with a grain size less than 0.1 mm and ZnO, TiO_2 additives and three burnt clay ceramics colored differently, in titian red, brown and black, in gravity ratio perlite: eggshell: ZnO: TiO_2: colored ceramics = 6.00: 3.60: 0.16: 0.04: 0.20. For the last mixture, the ZnO - TiO_2 content and the three colored ceramics are optimized beforehand, using very fine powders (with granulation below 0.01 mm) from the three burnt clays by changing the rate of addition of eggshell powder with a reformulated percentage for the three fine colored ceramic powders. Then the whole system is mixed with 25 parts by weight water, containing dispersed acrylic binder (in gravimetric ratio water: binder = 2: 8).

PRINCIPAL CHARACTERISTICS OF THE OBTAINED ADDITIVE MORTAR COMPOSITION FOR FINISHING WORKS OF OLD MONUMENTS

The advantages of additive mortar composition are structured in two execution levels

- **at commissioning**
  - allows a proper structuring of the uniform and homogeneous thin layer and a grouting in the intervention area
  - does not present micro cracks to contraction; adheres well to the operating support; offers a good workability; it is economical and can be applied to both exterior and interior walls
  - the composition can be applied to any type of plaster, by spreading it in a thin and uniform layer, as the workability of the paste is achieved by changing the content of water added for wetting in relation to the redispersible solid powder
  - can be applied manually or mechanically on any type of facade with chromatic deviation, chemical degradation (efflorescence, segregation, etc.) and physical-structural and mechanical damage (dynamic cracks, lack of material, etc.)
- **after commissioning**
  - achieves an efficient consolidation and a compatible restoration through structural and chromatic integration of the intervention area; does not generate the appearance of inflorescences and microbiotic attack; has a self-cleaning effect over time
  - does not produce chromatic deviations and other alterations or microstructural destructions of the surface and interior; provides superior thermal insulation to many similar materials; it is a light and durable material; has good hydro-, thermo- and sound-insulating capacity
  - allows the breathing of the interior masonry and shapes the water balances in the volume phase of the wall

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Consolidation and preservation of historical monuments using innovative materials based on doped or non-doped nanolime, freshly synthesized

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PROJECT DESCRIPTION

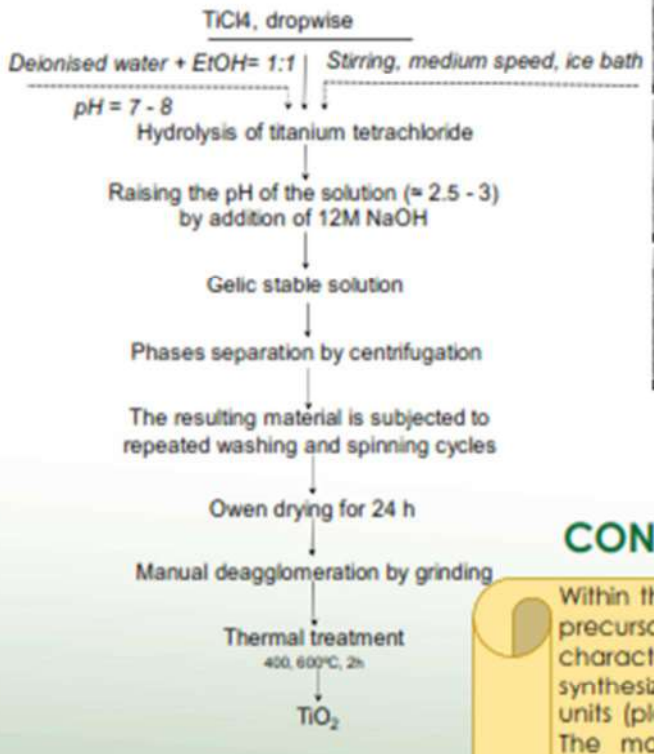
The project aimes to develop innovative nanolime based materials, with self-healing and cleaning properties, proper for consolidation and preservation works of stone monuments, plasters and architectural surfaces. To this purpose, nanostructured calcium hydroxide (nanolime), synthetized by recycling eggshells waste is doped with photocatalytic ions Zn(II) and Ti(IV). The consolidation, self-healing and cleaning properties of the developed nanolime based materials is assessed by applying them on physical models. The specimens will be firstly deteriorated through certain procedures (freeze – thaw cycles, UV radiation, controlled cracking) and subsequently will be treated with the nanolime based suspensions (spaying surface coating and inner injection). For assessment of the preservation state of the physical models the following analysis will be carried out: porosity, capillary water absorption capacity, compressive strength, sulphate attack resistance before and after treatment, macro and microstructural surface assessment and color changes. To assess the penetration depth of the nanolime dispersed in alcohol, the consolidator uptake value will be measured by using inorganic indicators. Additionally, the consolidation and preservation effect of nanolime based materials will be assessed on miniature statues specimens exposed in natural environment for 360 days.

MATERIALS, METHODS AND RESULTS

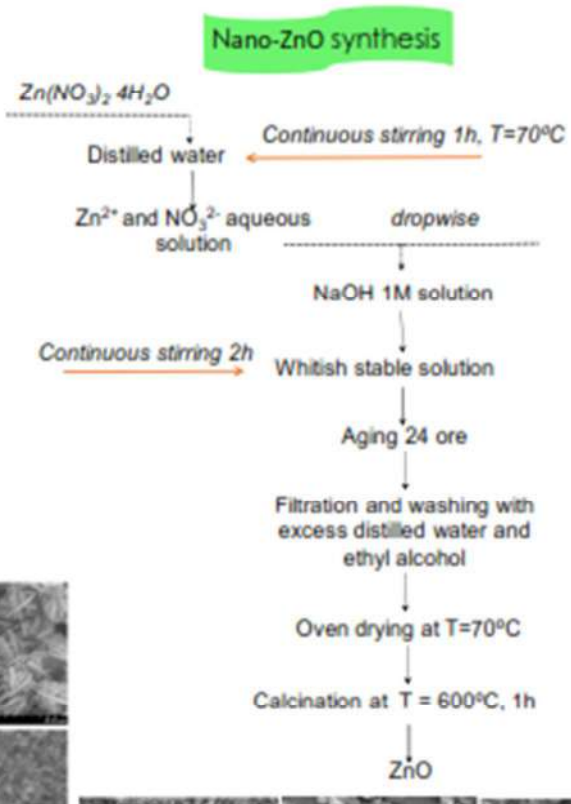
Nano-$Ca(OH)_2$ synthesis

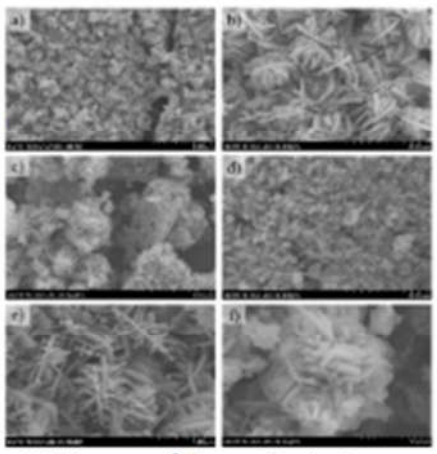
In the first stage of the process, the concentrated $CaCl_2$ solution was obtains. The eggshells were washed under water to remove the organic residues. Subsequently, they were dried in an oven until the water was completely evaporated, and then crushed by grinding to facilitate the dissolution process. 25% HCl was added over the milled shells, the mixture being stirred continuously until completely dissolved. The last stage of the process was the $Ca(OH)_2$ precipitation in the presence of 12M NaOH.

TiO_2 synthesis

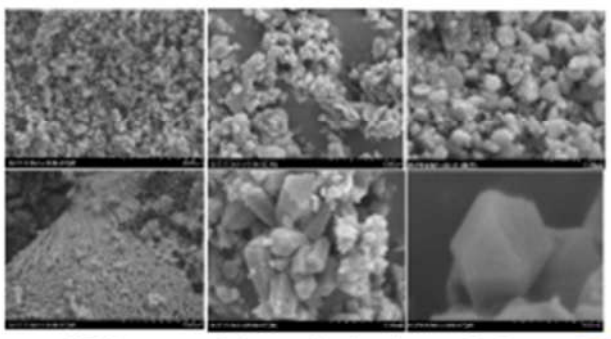


Nano-ZnO synthesis





SEM images of the synthesized nano-ZnO at different magnifications



SEM images of the synthesized nano-ZnO at different magnifications

CONCLUSIONS

Within this work nano-$Ca(OH)_2$ was synthesized from eggshells, ZnO and TiO_2 from chemical precursors of advanced purity. The obtained nanometric powders were preliminarily characterized by electron microscopy (SEM) coupled with X-ray spectrometry (EDS). The synthesized calcium hydroxide is very well structured consisting of small hexagonal crystalline units (platelets or elongated prismatic formations) (<100nm) often overlapping or clustered. The morphology of ZnO nanoparticles corresponds to lamellar crystalline formations, interconnected in the form of a "flower". In addition to these well-crystallized formations, spherical particles were also observed. The thickness of ZnO lamellas varies between 50 and 100 nm, and their length can reach up to 1.2 µm. At a larger magnification of the "flower" type nanostructure the holes between the lamellas and the porous wall were observed.

ACKNOWLEDGEMENTS

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Monitoring and assessment of air pollution in the central and peripheral areas of Bucharest city

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Introduction

According to the World Health Organization (WHO), air pollution represents the greatest risk to human health. The European Environment Agency (EEA), mentions that traffic emissions as the main cause of pollution in major European cities [1]. Also, given the high density of inhabitants and industrial activities, the risk of accidental emissions is higher in the area of big cities. Accidental emissions have a significant impact on air quality in the immediate vicinity of the source, but also at a distance from it, the dispersion of pollution being directly influenced by meteorological factors.

National Institute for Research and Development in Environmental Protection - INCDPM has been involved recently in the research studies of the influence of meteorological parameters on the dispersion of pollutants, also in the *in-situ* monitoring of air quality in central and peripheral areas of Bucharest city.

Methods

Assessment of pollutant dispersion by season (winter-spring)

Presented figures 1 and 2 show the pollution dispersion in different periods, winter and spring. During the analysis of air quality, the estimation was made taking into account only the emissions sources of a single road, the Regina Elisabeta Boulevard of Bucharest. The values presented in the dispersion maps represent the maximum PM_{10} concentrations estimated for April 2018 (fig. 1) and December 2018 (fig.2).

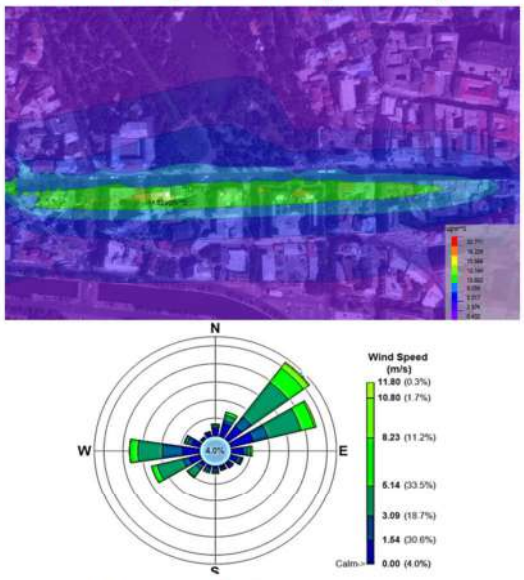

Fig. 1 Dispersion of pollution in April 2018

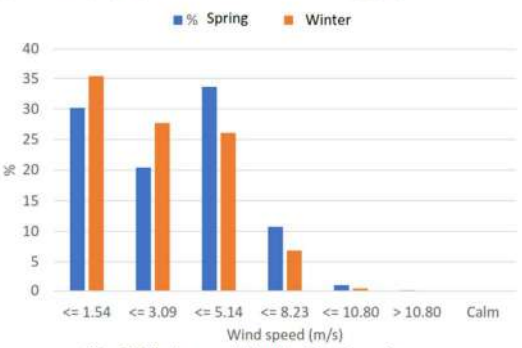

Fig. 3 Wind speed distribution in spring - winter 2018

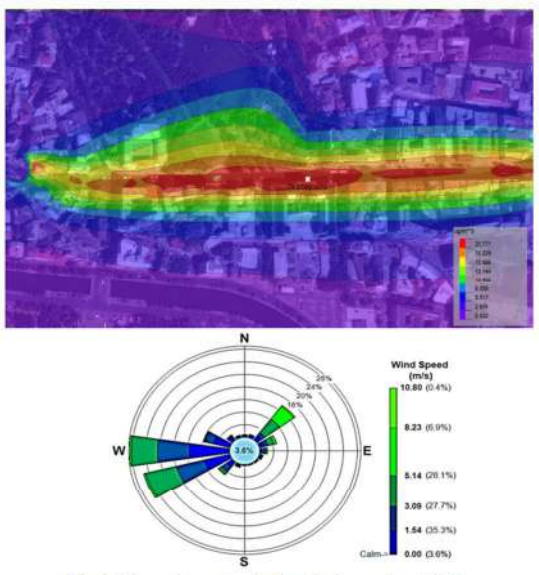

Fig. 2 Dispersion of pollution in December 2018

From the data presented, the dispersion of pollution for the analyzed sources was lower in the cold season. According to the literature, during the winter, the air can become loaded with combustion products resulting from road traffic, such as PM, VOC, CO, and nitrogen oxides (NOx), the cause being slow atmospheric dispersion [2]. Figure 3 shows the distribution by classes of the wind speed recorded for the 2 months for which the estimate was made. It can be seen that the values of high wind speeds (over 5.14 m/s) were recorded in the spring season, which favored the dispersion of pollution. Maximum values for pollutant concentrations were obtained in December, caused by low wind speed and other meteorological factors.

Analysis of air quality during pollution incidents

Another factor that can have a significant influence on air quality in big cities is the occurrence of pollution events. Figure 4 shows images from the measurement campaign carried out by INCDPM in 2020, when a pollution incident was monitored in a peripheral area of Bucharest. Measurements of the concentrations of the main air quality indicators and meteorological parameters were performed using the INCDPM air quality laboratory shown in Figure 5.

The impact of accidental pollution leads to significant exceedance of the values of short-term pollutant concentrations. PM_{10} concentrations recorded during the pollution incident on a consecutive period of 21h are presented in figure 6. According to the wind rose presented in figure 5, it can be seen that the wind had a predominant direction from the NE. During the monitored pollution episode, for the most exposed areas on wind direction, the concentration of PM_{10} exceeding with over 200 % the maximum limit allowed by Law 104/2011.

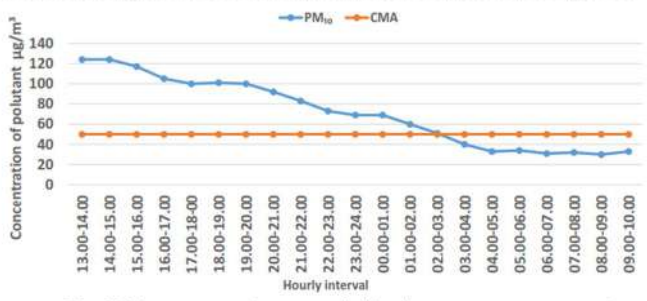

Fig. 6 PM_{10} concentrations recorded in the measurement campaign

Fig. 4 Images of an accidentally polluted area / Location of the air quality monitoring laboratory/2020

Fig. 5 Air quality monitoring laboratory of INCDPM

Results and conclusion

According to the data presented, it is observed that certain meteorological conditions influence the concentrations of pollutants at the receptor areas. From the dispersion modeling scenario presented in fig. 1 and fig. 2, for the same traffic emission flow of only road traffic of one of the main boulevard in Bucharest, the concentrations of pollutants reach a maximum value higher by 57 % in the winter months, compared to those of the spring months. Thus, the maximum concentration of PM_{10} in December 2018 was 25.26 µg / mc, compared to 14.63 µg / mc, in April 2018.

Also, when it comes to air quality, an extremely serious problem in big cities is the impact of accidental pollution. A large number of inhabitants and the diversity of activities carried out in the peripheral areas of the city, lead to an increase in the risk of accidental air pollution. In the case of incidents, pollution concentrations can exceed hundreds of times the limits allowed by legislation in force, as was the case of the incident monitored by INCDPM in 2020, when concentrations of PM_{10} near the source exceeded by more than 200% the maximum value allowed by European Directive 2008/50/EC, for a consecutive period of 7 hours.

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Aknoledgments - The research activities that underlie the work has been performed in a project which is part of Research Program *PN 19 43 07 01 Assessment of air quality at the surface and underground spaces of Bucharest city*– contract **no. 39N/2019**, financed by the Romanian Ministry of Research, Innovation and Digitalization

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DEVICE FOR LABORATORY TESTING OF PROTOTYPES OF RENEWABLE ENERGY PRODUCTION FROM MULTIPLE SOURCE Patent application no. A/00126/2021

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Introduction

In order to make laboratory tests of some prototypes and installations and to simulate the production of renewable energy from several sources (wind and hydrodynamic energy) a smart device was made, shown in figure 1. If the renewable energy production prototypes under test are also equipped with photovoltaic cells, the device being mobile can be adapted to this source, either by using reflectors in the laboratory or by testing prototypes outside.

Constructiv parts of the device

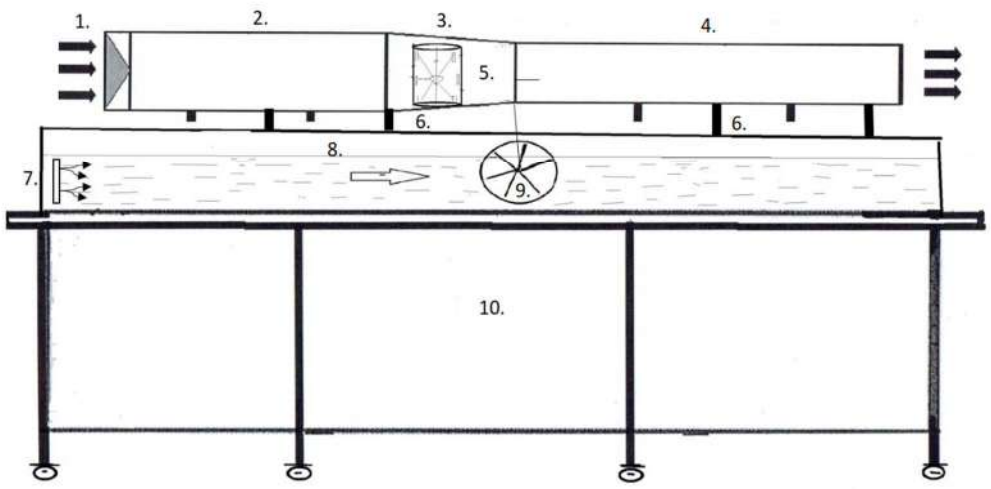

Figure 1: The schematic representation of the device for laboratory testing of prototypes of renewable energy production from wind and water sources

No. Crt.	Component parts and dimensions
1.	Air production source
2.	Plate sheet tubulature 40x40x150 cm
3.	Trapezoidal chamber for laboratory prototype positioning, L= 50 cm
4.	Plate sheet tubulature 40x40x150cm
5.	Wind turbine module
6.	Platband and corner insert L= 4 x 1,5 m
7.	Source of water production
8.	Stiplex basin L= 300 cm, H= 40cm, l=75 cm
9.	Hydroturbine module
10.	Laboratory table with swivel wheels

Conclusion

The laboratory test device can be used for multiple types of tests of the energy production prototypes, in order to identify the possibilities of improving the efficiency of the installations and to realize complex installations systems.

Presentation of the technical problem solved by the invention: A characteristic of the various installations made worldwide for testing the performance of conversion of renewable energies is that they only could test prototypes that use one or a maximum of two renewable sources for producing energy, while the present device can test simultaneously, prototypes which use three renewable sources.

Advantages of the invention: The necessity of the presented invention results from the fact that the device offers a way to test and verify in the laboratory some models and prototypes of installations, in order to realize them at a real scale. The device is compact and allows the simultaneous tests of energy transformation of renewable energies from several sources: wind, hydraulic and solar.

To all these considerations is added the fact that, in order to increase the renewable energy in the EU to almost one-third of the total energy produced, it is necessary to develop viable solutions for the use of clean energy, with low impact on the environment, but also with superior energy production yields. At the same time, it is necessary to ensure renewable energy in areas hard to reach by conventional energy networks, but which have important natural potential.

Recently, Rumanian National Institute for Research and Development in Environmental Protection (INCDPM) has been involving in the development of prototypes for the production of electricity from renewable sources. The problems encountered were that in certain situations, it was not possible to determine the total efficiency of renewable energy production from multiple sources, such as solar wind and hydrodynamics. Thus, the device shown schematically in figure 1 was made and used in the studies developed by INCDPM in the last period (figure 2).

Figure 2: The device for laboratory testing of prototypes of renewable energy production from wind and water sources - foto

Acknowledgments

This work was supported by a grant of the Romanian Ministry of National Education-UEFSCDI, project number 81PCCDI/2018, "Innovative technologies for the production of renewable energy from natural sources integrated into complex installations – TEACHERS", within PNCDI III.

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Innovative Paddles/Blades for hydraulic/wind turbines with geometry inspired by the bioengineering model of the black marlin caudal fin Patent Application no. A/00796/2020

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Introduction

The research relates to the innovative paddles for the submerged parts of the renewable energy production installation from watercourses and is based on a bioengineering model inspired by nature, namely the shape of the caudal fin of the black marlin fish species (*Istiompax indica*). Taking into account the constructive part of the energy production installation, the innovative paddles can be tubed into a vertical shaft turbine, fitted with slots and fixed deflectors, to direct the water flow. In figure 1 are presenting the shape of the paddle inspired by the caudal fin of black marlin fish and the possibility of developing an energy production installation that uses paddles with the presented bioengineering model geometry. This type of geometry can also be used to make blades, instead of paddles, which could be used for wind turbines for the same purpose, to produce renewable energy.

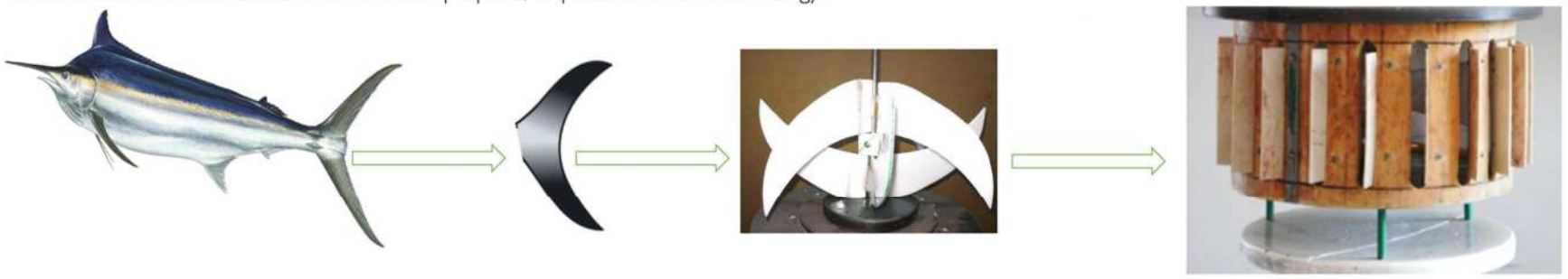

Figure 1: Paddles with geometry inspired by a bioengineering model

Methods

Starting from the previously developed complex systems described in the patent applications A / 00580/2016 - *Renewable energy production complex in flowing water* and A / 00397/2016 - *Off-shore production complex of renewable energy*, this innovative product of paddles aimed to increase efficiency in energy production of the patented systems.

In order to test the increase in energy production by using the new paddle products, after the production of them, laboratory tests were made. Following these tests it was observed that the turbines provided with paddles having the shape adapted to the caudal fin of the black marlin fish species present higher efficiency compared to the solutions proposed by the above mentioned patent applications. The results of the laboratory tests are presented below (Table 1)

Paddle type	Amplitude of waves	Rotational speed of paddles [rot/min]
Initial Trapezoidal Paddles	lower	12
	medium	13
	high	15
Innovative Model Paddles 	lower	15
	medium	16
	high	17

Table 1: The results of the laboratory tests

In the submerged energy production installation, the paddles are arranged on the central axis and placed in perpendicular planes. Vertical slots and fixed deflectors for the concentration of water flow are provided on a cylindrical construction, being inclined towards the walls of the cylinder. The opening of the slots is fixed and the height of them is proportional to the height of the submerged cylinder (Figure 2).

Figure 2: A Laboratory model of the renewable energy production installation

In the case of developing blades for wind turbines using the geometry adapted from the model of the caudal fin of the black marlin fish, they have to be placed in a cylindrical aerial model and provided with mobile slots and deflectors. The mobility of the slot-deflector assembly is necessary to direct the air currents to the blades inside and to increase the air current velocity that enters the module, increasing the effective power for conversion into renewable energy, at a small wind velocity.

Results and conclusion

The convenience and necessity of the present invention result from the fact that, compared to other types of paddles geometries, the laboratory tests indicated that the paddles executed according to the caudal fin of the black marlin fish species showed superior characteristics. The yields were higher by up to 25% by using the new paddle, in the case of the smallest amplitude of the waves.

Therefore, this invention brings, on the one hand, a reduction in the carbon footprint through the use of a "clean" energy resource, and on the other hand an increase in the conversion efficiency of water energy into electricity, with important consequences on increasing the renewable energy / energy from fossil fuels ratio.

Acknowledgments

This work was supported by a grant of the Romanian Ministry of National Education-UEFSCDI, project number 81PCCDI/2018, "Innovative technologies for the production of renewable energy from natural sources integrated into complex installations – TEACHERS", within PNCDI III.

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Advenced treatment process of wastewater from livestock farms – EpurAgroTech/EchO

Patent application no. A/00399/2019

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Introduction

The invention addresses the ***water management*** issue related to wastewater treatment which should be considered from the perspective of current concern of authorities and specialists for identifying alternative water resources in areas affected by water shortage and preventing environment pollution.

Livestock wastewater reuse has been practiced long time in irrigation purposes as it contains high levels of nutrients. Local livestock wastewater treatment is usually performed by mechanical or aerobic/anaerobic biological methods provide insufficient reduction of pollutans loads. The method employed for the treatment of wastewater in order to reuse in irrigation purposes should produce a final effluent with a quality suitable to the requirements of the crop intended to be irrigated.

Methods

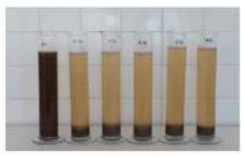
The invention describes an advanced (tertiary) wastewater treatment process which enables the removal or reduction of chemical and microbiological pollutants from livestock wastewater under certain limits (**ISO 16075-2:2015; STAS 9450:1988)** by chemical methods.

The treatment takes place in two stages:

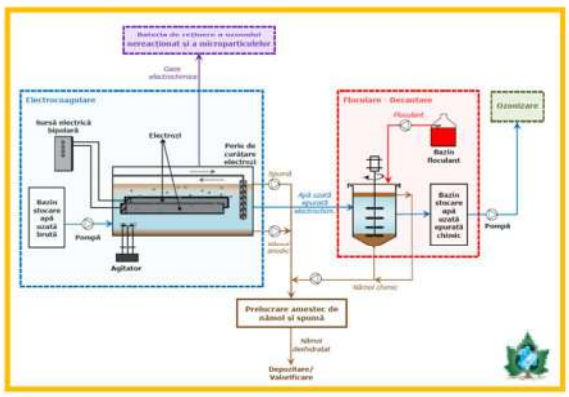
(1) electrochemical treatment which facilitates the removal of organic and inorganic contaminants by means of electrocoagulation with aluminium electrodes followed by flocculation and sludge separation;

(2) advanced oxidation of organic matter and disinfection using ozone, followed by pH adjustment with phosphoric acid which provides also nutrient (phosphorus) for plants growth.

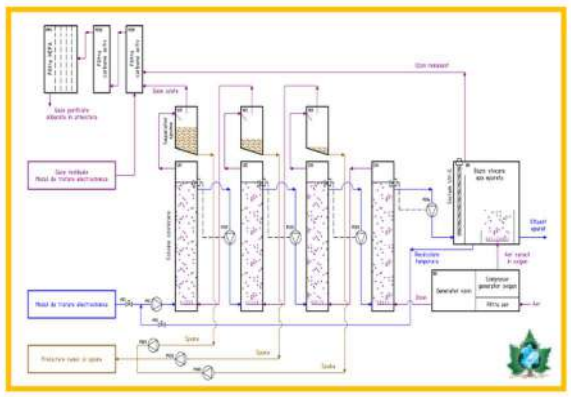
EpurAgroTech/EchO



The technological solution ensures superior efficiencies for the removal of organic substances (60-90% COD), biodegradable organic substances (60-80% BOD), suspended matter (over 80%), reduction of saline residue (40-60%) and up to 100% inactivation of faecal coliform bacteria.



Electrochemical treatment module



Ozonation module

Results and conclusion

- The coagulation with electrochemically generated aluminium ensures the removal of the contaminants from wastewater and avoids the drawbacks deriving from the use of chemical compounds (e.g. aluminium sulphate), among which the increase of water salinity is worth mentioning as it limits the volume of effluent to be applied on soil due to the salinisation effects and crop degradation.
- The treatment process enables the advanced removal of the dissolved and undissolved impurities from wastewater, including persistent compounds (pesticides, antibiotics, et.) which cannot be degraded through conventional methods.
- The results have proven a very good anti-microbial efficacy, thus ensuring the reduction of bacteria and virus content of livestock wastewater. The monitored bacteriological indicators were inactivated in proportion of 99.9% and **even** up to 100% in case of faecal coliforms and faecal streptococci.
- The organoleptic properties of the final effluent have registered a decrease of colour intensity and odour up to acceptable values; this may enable a better public acceptance towards different practices implying the reuse of wastewater in projects of irrigation.

The process employs a technology with relatively low requirements for space and wastewater feeding volume which allows the development of mobile setups with fast initiation of wastewater treatment. Moreover, the high flexibility of the solution enables the development of modular equipment, easily adaptable to the specific treatment requirements.

Acknowledgments

This work was supported by a grant of the Romanian Ministry of Research and Innovation CCDI - UEFISCDI, Project "Innovative technologies for irrigation of agricultural crops in arid, semiarid and subhumid-dry climate", Project no. PN-III-P1-1.2-PCCDI-2017-0254, Contract no. 27PCCDI/ 2018, within PNCDI III.

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Research on morphological and hydrodynamic evolution tendencies in the Chilia - Bystroe transboundary area - Numerical modelling activities for hydrodynamic and morphologic analysis

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INTRODUCTION

As it began to form over 16 000 years ago, the ***Danube Delta*** represents an area of great ecological significance that includes a variety of habitats and species, many of them seriously threatened in the rest of Europe, being the largest water purification system in Europe as it filters the Danube water at its mouth into the Black Sea. It's value as a Wetland of International Importance was recognized by the Ramsar Convention in 1991 and was included in 1998 by UNESCO in the World Network of Biosphere Reserves, in the program Man and Biosphere - MAB UNESCO and in the World Heritage List (1991).

In it's Delta, the Danube forks into three main branches: Chilia, Sulina and Saint George. From the transboundary ***Chilia branch*** sector, shared by Romania and Ukraine, it bifurcates the ***Bystroe Channel*** on the Ukrainian territory (Fig. 1). The hydrotechnical works, carried out since 2004 by Ukraine in order to make this channel operational for large ships navigation, lead to international controversy over the environmental impact of construction and maintenance of the canal that would significantly affect the whole delta region with transboundary effect, thus disregarding the provisions of international Conventions (*Convention regarding the regime of navigation on the Danube (Belgrad, 1948); Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991); Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979); Convention on Wetlands (Ramsar, 1971); Danube River Protection Convention (Sofia, 1994)*).

This project's phase ***main objective*** was to develop a calibrated and validated ***hydrodynamic numerical model for the Chilia – Bystroe cross-border area,*** using in situ measurements campaigns' results and MIKE 3 by DHI modelling software.

Fig. 1 Chilia Branch – Bystroe Channel area

MATERIAL AND METHODS

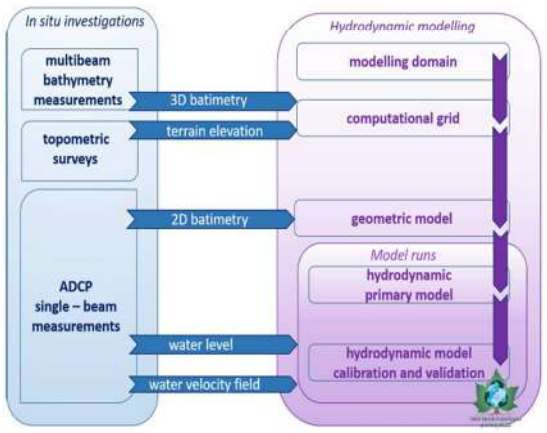

Fig. 2 Diagram for the hydraulic modelling process carried out by INCDPM

In order to develop the necessary input data for the numerical model (geometry, boundary conditions, model calibration and validation data – Fig.2), *in situ* campaigns have been carried out :

- high resolution ***multibeam bathymetry*** measurements (3D riverbed bathymetry)
- ***single-beam ADCP*** (Acoustic Doppler Current Profiler) measurements (cross-section bathymetry, water current velocity vectors and discharge values) – for different Chilia branch river flow conditions
- ***topometric surveys***.

The 3D riverbed relief data has been used for the geometric model by integrating the resulted elevation values into the numerical model computational grid.

For the ***model calibration/validation processes***, in order to obtain highly reliable results, there have been used water discharge/water level pairs for the upstream/downstream model domain limits (on the Chilia branch) and for the Bystroe Channel access area.

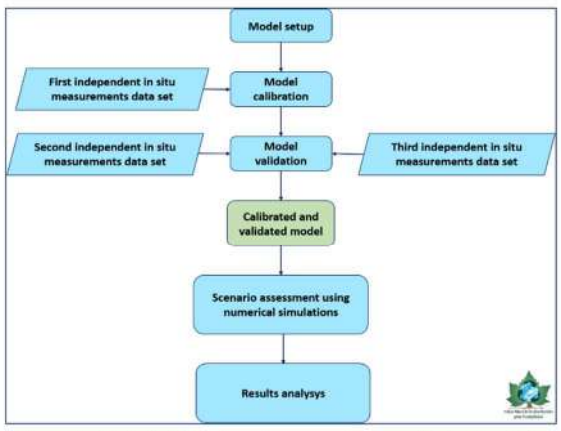

Fig. 3 Diagram of calibration/validation/scenario assessment processes in hydraulic modelling - adaptation of (Opdyke D., 2008)

RESULTS AND DISCUSSION

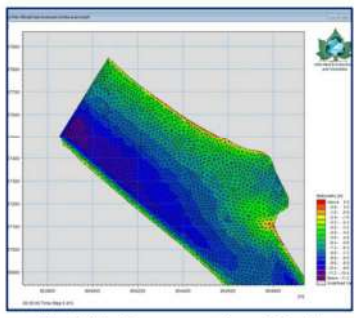

Fig. 4 Chilia – Bystroe geometric model detail

The ***model domain*** covered about 9 km from the Chilia branch, upstream the bifurcation with the Bystroe Channel and following along the Stambulul Vechi branch.

On the ***computational grid*** for the Chilia – Bystroe model (17680 triangular elements; 9446 nodes) it was implemented the 3D measured bathymetry, thus determining the ***geometric model*** (Fig. 4).

For the vertical dimension of the geometric model, there have been defined 10 sigma layers, with variable thickness (2,3,4,6,8,10,12,15,20,20 % from the bottom – layer 1 to the top – layer 10).

For the ***hydrodynamic primary model***, there have been set up ***boundary conditions*** (water discharge at the upstream domain limit, water level for the downstream limit and Bystroe channel. The run time for the simulations consisted in 350 timesteps of 1 minute, results being recorded every 10th timestep.

Fig. 5 Chilia – Downstream domain boundary modelled discharge variation - calibration

Model calibration was carried out for flow conditions corresponding to a discharge distribution of 54.11 % (Stambulul Vechi branch) and 45.89 % (Bystroe Channel).

Successive test-models have been run, by variation of the simulation parameters, until the ratio modelled (MdDisc)/measured (MsDisc) discharge value at the downstream domain limit was : MdDisc/MsDisc=101, 42 % (Fig. 5).

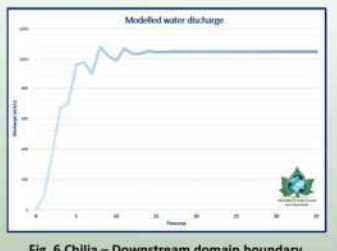

Fig. 6 Chilia – Downstream domain boundary modelled discharge variation - validation

The water flow conditions used for ***model validation*** were considered as 52.89 % discharge towards Stambulul Vechi and 47.11% towards Bystroe Channel, the boundary conditions have been updated while values setup for the other determined modelling parameters remained unchanged. The simulation resulted in the ratio MdDisc/MsDisc =90.20 % (Fig. 6).

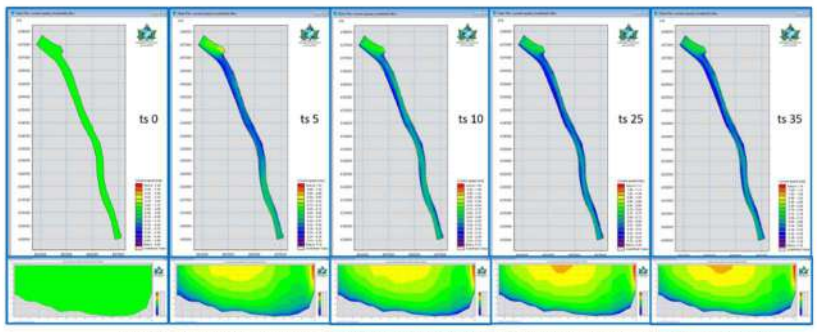

Fig. 7 Modelled water current speed distributions in the top layer (above) and in the control vertical profile (bellow) during the simulation – timesteps 0, 5, 10, 25 and 35

MIKE 3 instruments allow the display of the ***water velocity distribution*** along each sigma layer on the entire model domain and on vertical user-defined profiles for each timestep (Fig. 7). As also seen in Fig. 5 and 6, the simulation computations reach model stability around timestep 25.

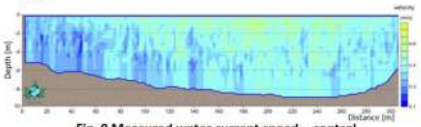

Fig. 8 Measured water current speed – control vertical profile

For a control cross-section located downstream the Chilia branch – Bystroe Channel bifurcation, comparative analysis between the modelled (Fig. 7 – bellow) and the measured (Fig. 8) current speed distribution and values showed similarity.

CONCLUSIONS and RECOMMENDATIONS

- ✓ The results obtained in the model calibration and validation steps confirmed that the developed numerical model for the Chilia – Bystroe Channel can provide data with a high degree of confidence.
- ✓ The in situ measurements, numerical modeling techniques applying MIKE and the process flow used for this research can be adapted to similar river sectors and can be used as a starting point for a multitude of applications, such as hydrodynamic and morphologic analysis, water quality assessment, sediment transport studies, ichthyofauna habitats assessment etc.
- ✓ Continuation of investigations and research activities is necessary given the strategic importance of the study area and the fact that the specific results of this phase, as well as those expected for the entire project will reduce the data deficit on morphological and hydrodynamic parameters specific to Chilia-Bystroe area, constituting a solid scientific basis both for determining the current situation and for establishing the trends of morphohydrodynamic evolution of the studied sector.

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ACKNOWLEDGEMENTS

This work was supported by a grant of the Romanian Ministry of Research, Innovation and Digitalization, within the Research Programme NUCLEU RESCMANS (39N/2019), project *RESEARCH ON MORPHOLOGICAL AND HYDRODYNAMIC EVOLUTION TENDENCIES IN THE CHILIA - BYSTROE TRANSBOUNDARY AREA* (PN 19 43 03 02).

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Study regarding the inventory of danubian fish fauna from Bazias till the Black Sea

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INTRODUCTION

This study aims to contribute to the updating of the knowledge base regarding the identification of the fish species from the Lower Danube River course, using data collected from the literatures as well as data from the monitoring campaigns undertaken by the expert teams of the INCDPM Bucharest and to underline the consequences of the river stabilize (bottom sills, dams) over the populations effectives.

The monitoring campaigns have included scientific fishing campaigns on the Danube River to identify the fish communities as well as determining the behavior during migration of the sturgeon species using ultrasonic transmitters and the patented receiver stations DKTB and DKMR-01T.

MATERIALS AND METHODS

The study area was located in the Lower Danube River and the analysis of the fish fauna was done by dividing the Romanian Danube sector into five sections (Figure 1).

The teams of experts from INCDPM Bucharest have undertaken several monitoring campaigns of the Danubian fish fauna using either scientific electrofishing (SR EN 14011/2003) to monitor the fish species that occur near the shoreline or by use of filtering tools (trammel and gill nets) to capture the pelagic fish from the middle of the channel or at bigger depths.

Figure 1. Maps showing the five different river sectors.

RESULTS

Analyzing the distribution of the fish species from the Lower Danube (Figure 2), an increase in the number of species from upstream to downstream can be observed.

The river stretch between Iron Gates II (rkm 853) and Danube Delta (rkm 0 – Black Sea) has the highest species richness. In each river sector, 53 fish species are identified. These represent 80.30 % of the total identified fish species of the Lower Danube.

The analysis of Figure 3 shows that anadromous fish are missing from the ecological structure of the aquatic ecosystems from Baziaș – Iron Gates I sector (rkm 1075 – 943) and the Iron Gates I and II sector– missing data (rkm 943 – 853).

The gobies fish guild is present in all the river sectors, including upstream of the Iron Gates I.

Figure 4 shows the results of the intense monitoring on the Călărași – Isaceea river sector including the Caleia branch. In general, there is no evidence of a shift in the ecological guilds, with rheophil B and eurytopic being dominant.

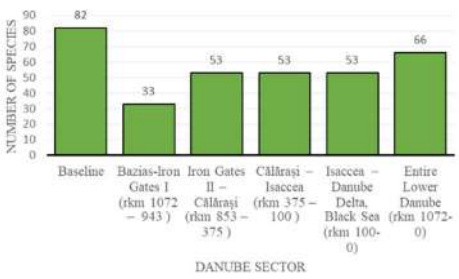

Figure 2. Distribution of fish species on the Lower Danube River course (2005 – 2020).

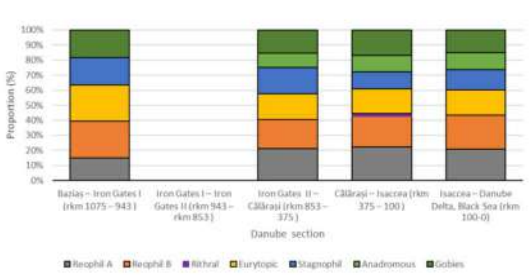

Figure 3. Distribution of the fish species classified by fish guilds on the entire Lower Danube (based on presence data).

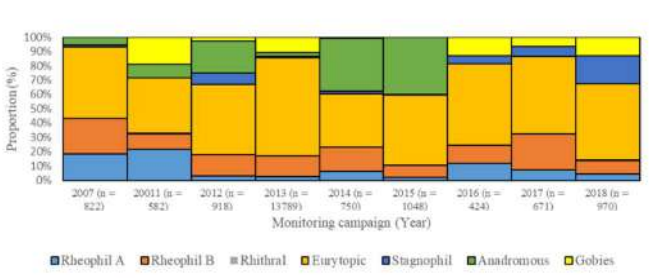

Figure 4. Relative abundance of the fish species occurring in the Călărași – Isaceea (rkm 375 – 100) river sector grouped by fish guilds (based on calculated abundance).

CONCLUSIONS

The main goal of the current study was to analyze the fish species of the Lower Danube River course in the context of river engineering projects that have modified the river bed and river shores and added structures which were necessary for flood protection, converting terrain to agriculture and maintaining the navigation lanes.

- A total of 66 fish species were identified on the entire Lower Danube.
- The results highlight that, to date, 80.49 % of the fish species identified in the reference period of 1726-2003 are still present on the Lower Danube River course.
- The findings of this study show the fact that the highest species count (53 species) is found in the river sector spanning from the Iron Gates II to the Black Sea.
- The two rivers sectors Călărași- Isaccea and Danube Delta contain 22 fish species of Community interest.
- Anadromous migratory species are absent upstream of the Iron Gates II areas.
- The biggest pressure that negatively affects the conservation state of sturgeon species by limiting their population numbers is the phenomenon of poaching
- Sturgeons can swim against the water current and successfully pass over the bottom sill areas from the Bala and Caleia branches, given their actual crest height.

ACKNOWLEDGEMENTS

The work was supported by a grant of the Romanian Ministry of Education and Research, within the Research Programme NUCLEU – RESCMANS (39N/2009), project „The evolution regarding the sturgeons populations and ichthyofauna within Lower Danube in the context of the course changes in the last decades" PN 19 43 02 01

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Electronic tag for alarming and remote location (cartesian coordinates) of valuable fish (sturgeon) used against poaching through Multicale LORA/GSM/SAT radio communication network

Patent application no. A/00178/2021

Authors: Eng. DEÁK GYÖRGY Ph.D. Habil.*,[1]; GEORGESCU TUDOR [2] ; BĂNICĂ COSMIN-KARL [3]; Eng. BURLACU IASMINA-FLORINA Ph.D.[1]
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Introduction

The invention relates to an **Electronic Anti-Poaching Alarm Tag (EAAT)** and remote location of poaching for valuable fish (sturgeons) using a **LORA/GSM/SAT Multicale Radio Communications Network** to monitor illegal fishing activities on the Lower Danube and the Black Sea coastal area. The patent addresses an issue in the field of biodiversity, conservation and protection of valuable fish by locating poaching remotely using the radio alarm when the protected fish is caught (is removed from the water at a longer time than the pre-set (order seconds). **The proposed invention is necessary** because the problem of poaching along the Danube, according to the information volume held by INCDPM (over 10 years of *in situ* monitoring of wild sturgeons, tagged with ultrasonic transmitters) shows that **over 70%** of sturgeons were **poached** (Figure 1), losing an important volume of scientific information on the behaviour of this highly endangered species during the migration from the Black Sea to the Iron Gates and vice versa.

Figure 1. *Specimen of poached sturgeon*

Methods

The invention consists of **two parts:**

I. The **device part** that is placed on valuable fish (sturgeons) for locating the area susceptible to poaching and photochemical tagging is represented in Figure 2 a) and b). The electronic triggering system for intervention and location uses a chemical tagging solution by the pyrotechnic release of a photo detectable tagging substance. The electronic tag will be placed using an elastic fixing system of the device that allows the growth (thickening of the fin) during the life of the fish, ensuring its normal development and the position does not hurt the fish.

II. **The network of radio communications** and signal transmission of ultrasonic transmitters for monitoring sturgeon species and alarm in case of poaching is represented in Figure 3. The assembly will be used to monitor the population of valuable fish (wild sturgeons) by using two types of tags (ultrasonic transmitters and autonomous ultrasonic detection stations), connected to the LORA NET communication network, which will allow both poaching and alarm by emitting a radio alarm signal when the protected fish is caught, in case of poaching.

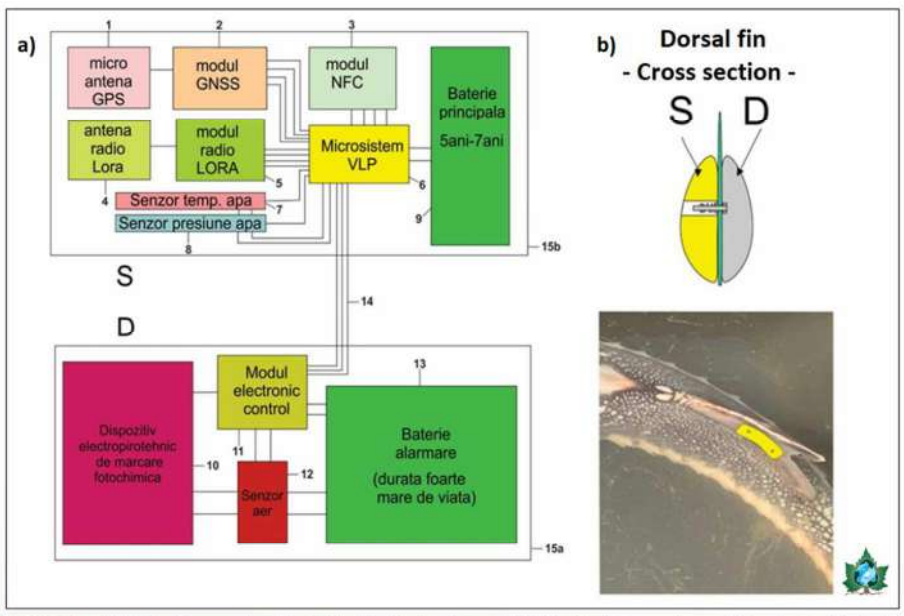
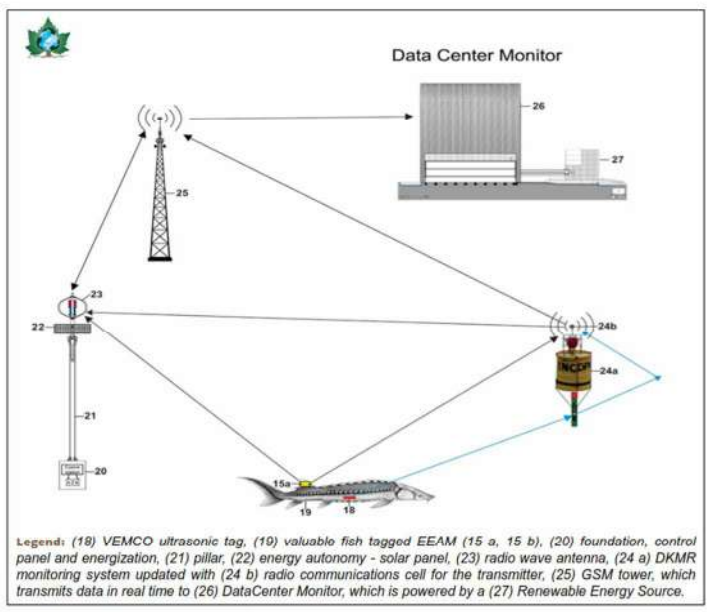


Figure 2. ***a)*** *Block diagram for dual attachable device and* ***b)*** *Elastic fixing system of the device that allows the growth (thickening) of the fin during the life of the fish ensuring its normal development*



Legend: (18) VEMCO ultrasonic tag, (19) valuable fish tagged EEAM (15 a, 15 b), (20) foundation, control panel and energization, (21) pillar, (22) energy autonomy - solar panel, (23) radio wave antenna, (24 a) DKMR monitoring system updated with (24 b) radio communications cell for the transmitter, (25) GSM tower, which transmits data in real time to (26) DataCenter Monitor, which is powered by a (27) Renewable Energy Source.

Figure 3. *Remote poaching monitoring, alarm and location network for valuable fish (sturgeons)*

Conclusion

The innovative assembly that will be used to monitor the population of valuable fish (wild sturgeon) using two types of tags (ultrasonic transmitters and autonomous ultrasonic detection stations), connected to the LORA NET communications network, will provide data both in the detection of poaching and in the alarm when the protected fish is caught, in case of poaching. As a result, it has a high potential to be applied in the field of aquatic biodiversity conservation, in the protection of valuable fish (sturgeons) in the Lower Danube and the Black Sea coastal area, contributing to the significant reduction of poaching and recovery of valuable fish stocks (sturgeons).

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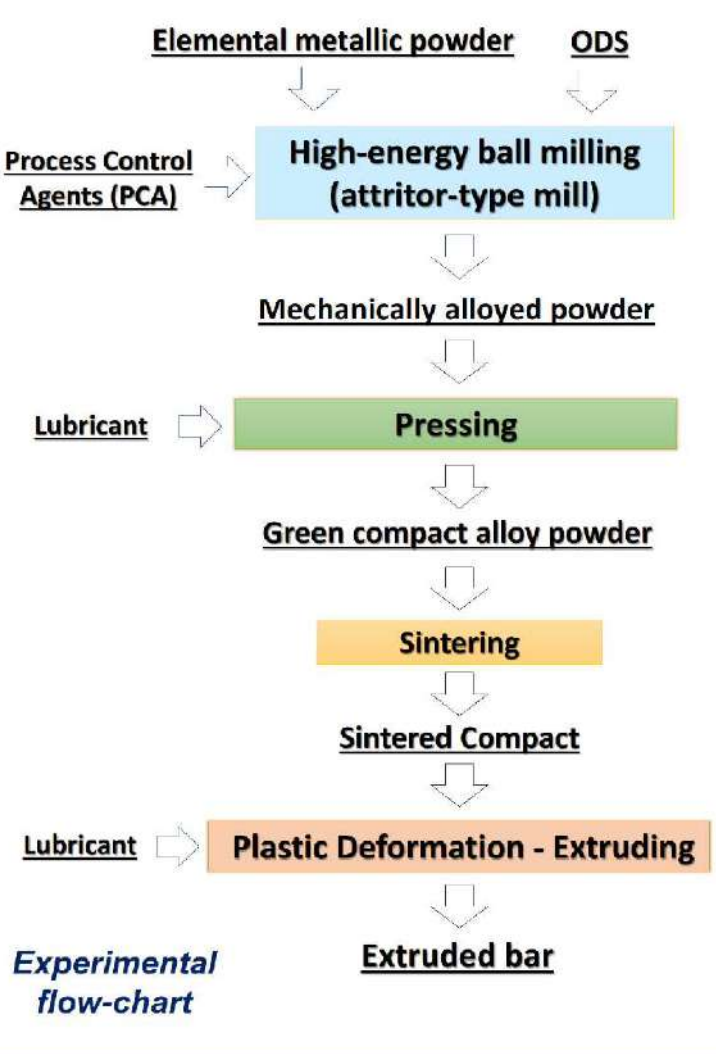
PROCEDURE FOR OBTAINING A SEMI-FINISHED BAR SINTERED FROM METALLIC POWDERS OF Al-Mg-Mn-Cr-Ti ALLOY

Marian BURADA, Vasile SOARE, Dumitru MITRICA, Adrian CARAGEA, Ionuț CONSTANTIN, Daniela Violeta DUMITRESCU
National R&D Institute for Nonferrous and Rare Metals – IMNR, *email: mburada@imnr.ro*

PATENT No.: RO 130769 B1 / 2020

An obtaining process of a semi-finished extruded bar sintered from metallic powders of oxide dispersoid strengthened (ODS) 5083 alloy (Al-Mg-Mn-Cr-Ti) is presented. The alloy was obtained by mechanical alloying of metallic element component, with addition of 5…10 wt.% alumina, in a high-energy ball mill (attritor-type). Mechanical alloying (MA) is a solid-state powder processing technique involving repeated welding, fracturing, and rewelding of powder particles in a high-energy ball mill. MA has now been shown to be capable of synthesizing a variety of equilibrium and non-equilibrium alloy phases starting from blended elemental or prealloyed powders. The obtained ODS alloy powder was compacted by pressing, sintered and hot extruded in 2…4 stages up to 8mm diameter. A mechanical strength of 420…480 MPa and an elongation of 7…9 % was measured.

EXPERIMENTAL



Experimental flow-chart

5083 Al alloy composition

Element	Mg	Mn	Cr	Ti	Al
wt. %	4.9	1	0.25	0.15	balance

ODS - Oxide dispersion-strengthening phase	Al_2O_3
Content [wt.%]	5 … 10

Metallic powder high-energy ball milling parameters (Retsch PM-400)

Parameters	Ball-to-powder weight ratio	PCA - Methanol	Inert gas	Time [hour]
Value	10:1	1 ml/batch	Argon	8 … 16

Mechanical alloyed powder pressing parameters

Parameters	Pressing power	Die diam [mm]	Lubricant	Pressing time [s]
Value	4 … 6 tf	30	1 %	30 … 60

Green compact sintering parameters

Parameters	Temperature [°C]	Duration [h]	Protective atmosphere
Value	550 … 620	1 … 5	Argon

Hot plastic deformation - extruding parameters

Param	Pressing power	Temperature [°C]	No. of passing	Die angle [drg.]	Initial Diameter [mm]	Final Diameter [mm]
Value	25 tf	450	2 … 4	0 … 45	30	8

Sintered compact & extruded bar

RESULTS AND CONCLUSION

Mechanical characteristics of extruded bars

ODS content [wt.%]	Mechanical strength [MPa]	Relative elongation [%]
5	400 … 420	9
10	460 … 480	7

The patented procedure has the following advantages vs. conventional methods of 5083 alloy obtaining (direct melting):
- High content of reactive metals (Ti, Mg), by reducing metal oxidizing loss;
- Uniform distribution of ODS phase;
- Obtaining of nano and quasicrystalline phases, with could increase the mechanical properties.

Acknowledgements: This work was supported by the Romanian Ministry of Education, Research and Innovation, through the Core Funding Research Project PN 2010-2014

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ELECTROCHEMICAL SYNTHESIS OF HIGH ENTROPY ALLOYS WITH SUPERIOR TRIBOLOGICAL AND CORROSION RESISTANCE CHARACTERISTICS

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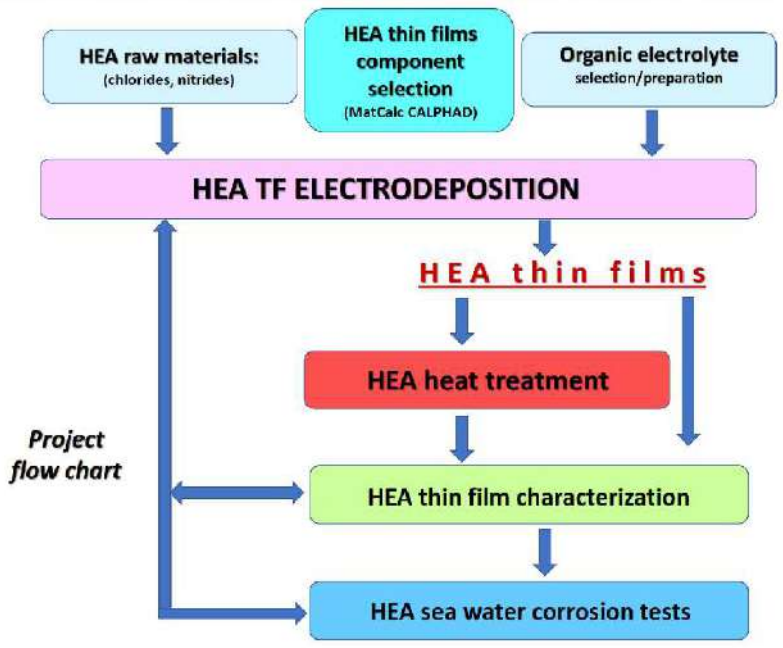
Abstract: *Steels, copper* and *aluminium* alloys are the most important metallic materials widely used in marine engineering due to their good resistance to corrosion as well as their many other excellent properties. One promising approach for improving their corrosion resistance in seawater it would be to develop a controllable physical barrier to corrosion in the form of films and coatings. Many different approaches, including coating with polymers, organic layers and other ***metals and alloys***, have been developed.
High entropy alloys (HEAs), being composed of five or more principal elements in different ratios, are potentially suitable for many applications due to their simple crystal structures and extraordinary properties such as high strength, *corrosion and wear resistance*.
The goal of this demonstration experimental project (PED) is the development of a new laboratory technology for the electrochemical synthesis of high-entropy alloys (HEAs) coatings with superior corrosion resistance and mechanical characteristics, for applications in marine environments
Project partners: **CO**: *Romanian Academy, "Ilie Murgulescu" Institute of Physical Chemistry* , **P**: *National Research&Development Institute for Non-ferrous and Rare Metals - IMNR*
Duration: *2020 – 2022*
Methodology: The HEA thin film coatings will be obtained by the electrochemical co-deposition of the component elements in non-aqueous electrolytes, using various complexing agents. The obtained thin films will be physical, structural, tribological and mechanical characterized. The corrosion tests will be done in the operational environment (sea water). The thin films properties will be improved by heat treatment processes



CALPHAD modeling & preliminary electrochemical studies

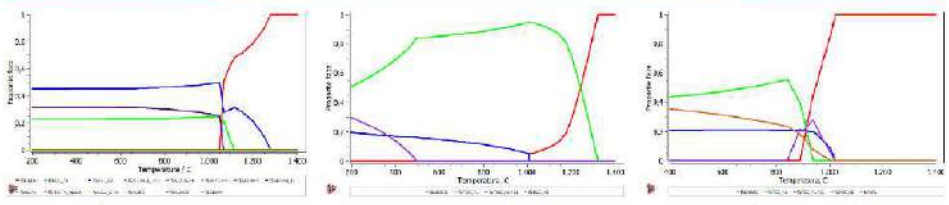
HEA components									
Main elements (4 ... 7 elements in equimolar ratio)							*Secondary elements (1...5wt.%)*		
Al	***Co***	***Cr***	***Cu***	***Fe***	***Ni***	***Mn***	*Bi*	*Sn*	*Zn*

Organic Electrolyte System		
Dimethylformamide DMF	Acetonitrile	Lithium perchlorate
Dimethylsulfoxide DMSO		
Ratio (by vol.) 4	**1**	**0.1 ... 0.5 mol×l^{-1}**

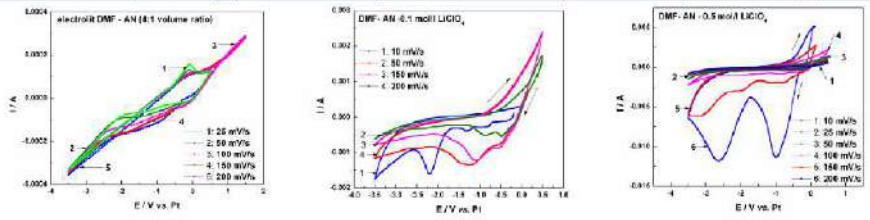
HEA corrosion tests methodology

- ***Immersion testing*** - the weights of dried test specimens are measured by an analytical balance before and after being exposed to a corrosive environment for a specific period of time
- ***Electrochemical testing*** - can provide valuable information about corrosion electrochemical reactions and the mechanisms behind them. Various types of electrochemical corrosion tests will be investigated:
  ◦ Linear Polarization Resistance (LPR) , ◦ Potentiodynamic Polarization Tests , ◦ Cyclic Polarization Method ;
  Testing media: artificial and natural sea water

Electrolyte	*Density [g/cm]*	*Conductivity [mS/cm]*	*Electrochemical window [V]*
DMF-AN (4:1 in volume)	0.853	$53.53 \cdot 10^{-3}$	5.0 (20-200mV/s)
DMF-AN-0.1 mol/l $LiClO_4$	0.856	3.135	1.80 (10-150mV/s)
DMF-AN-0.5 mol/l $LiClO_4$	0.899	9.137	4.0 (10-100mV/s)



• Al-Cr-Cu-Fe-Ni • Co-Cu-Fe-Mn-Ni • Al-Cu-Fe-Ni-Mn
Possible phases in the investigated HEA systems



Cyclic Voltammetry studies for the determination of electrochemical window of organic electrolyte DMF-AN-LiClO4

HEA TF electrodeposited on Cu and Al substrate:

Expected results of the PED project

- HEA composition selection for coatings applications in marine engineering (shipping facilities, naval propellers, fittings, etc)
- HEA thin films electrodeposition parameters: *electrolyte composition, complexing agents, voltage, current density, process duration, deposition thickness,*
- HEA heat treatment parameters: *temperature, duration, controlled atmosphere, heating and cooling rate*
- HEA characterization: *chemical analysis, structural (XRD, optical microscopy), mechanical (adherence, scratch tests, abrasion tests)*
- HEA corrosion resistance determination in sea waters; comparation with usual Al, Cu alloys used in marine engineering
- Approval of the HEA electrodeposition technology (TRL 4)
- Dissemination: articles, national and international conferences, patent grant application

HEA TF coatings applications:

Marine engineering
shipping facilities, naval propeller, fittings, etc

Acknowledgements: This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI – UEFISCDI, project number PN-III-P2-2.1-PED-2019-0022, within PNCDI III (contract number 330PED/2020)

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Graphene-based composite material with conductive and antistatic properties obtained by plasma functionalization

Patent Application No. A/00814 / 2020, Class no. 9

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Description

The invention refers to a composite material with electroconductive properties obtained by RF plasma treatment and a polymeric dispersion applied to a textile support. The composite can be used for actuators, sensors and electromagnetic attenuation screens.
The composite material consists of two components of textile support (A) and polymeric dispersion (B) based on graphene oxide (GO) and polyvinylpyrrolidone (PVP) obtained by ultrasonication technique at a frequency of 37 kHz. The raw fabric (A_0), having a mass of 398-405 g/m^2, was made of 100 % cotton yarns and presented initially a hydrophobic character.
The first component (A) having a hydrophilic character, was obtained by treating A_0 with a low pressure RF O_2 plasma at two different frequencies such as 13.56 MHz or 40 kHz for only 3 minutes. The second component (B), a polymeric dispersion based on GO in the polymer matrix PVP was used to immerse the component A and create the composite material after drying.

RF O_2 plasma

Component A_0 treated with an RF O_2 plasma

Component A treated polymeric dispersion based GO and PVP

Advantages

➔By functionalization with the RF O_2 plasma, raw fabric (A_0), initially hydrophobic, becomes hydrophilic and allows the adhesion of substances from polymeric dispersion (B) based GO and PVP, to the textile surface without need of classic finishing process (alkaline scouring);
➔Due to the thermal drying process, the substances from polymeric dispersion are fixed on the fabric and allow the obtaining of antistatic textile surfaces having values of the surface resistance between 10^8 - 10^9;
➔Due to free drying process, the composite material becomes electroconductive after free drying at a temperature of 18-22° C, for 100-120 minutes, having the value of the surface resistance 10^5 specific to conductive materials;
➔By immersion in the polymer dispersion (B) of the textile support (A), the composite material can be used for electrodes, actuators, flexible sensors or electromagnetic attenuation screens.

Novelty

The novelty consists in functionalization of raw fabric (A_0) with RF O_2 plasma, using two generator in MHz or kHz, to generate a hydrophilic effect and to improve the absorption capacity of polymeric substances, but also in development of the electroconductive composite material by immersing the fabric (A) in a polymeric dispersion (B) based on GO and PVP.

Applications

The composite material has applications in development of textile flexible electrodes for actuators, sensors, and electromagnetic attenuation screens, technical applications in electronics or for intelligent textiles.

Acknowledgment: The Ministry of Education and Research has funded this research through the project **3D Electrotex, PN 19 17 01 01**

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DENIM-TYPE FABRICS DEVELOPED TO IMPROVE THE MECHANICAL POTENTIAL AT REPEATED STRESSES OF TRACTION, FRICTION, TEARING, BY OPTIMALLY COMBINING THE PATTERN OF THE FABRIC, THE FIBROUS COMPOSITION AND THE STRUCTURE OF THE COMPONENT YARNS

Patent application No. A/000610 / 2020
Author: A. Dorogan

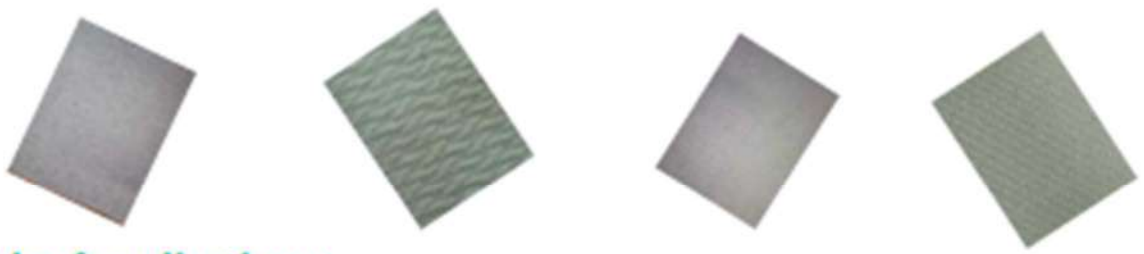
Description:

The invention relates to developed denim fabrics, as a fibrous structure and composition.

Woven structures can be used to make independent products, but also as a component of textile systems with the role of protection, safety and comfort in wearing, suitable for organized and / or random activities (PPE, clothing for high-performance sports activities, active leisure time, for daily activities of people with some disabilities, including people of extreme age).

Compared to the denim fabrics, known per se, the developed woven structures have an improved mechanical potential, at repeated stresses of traction, friction, tearing, by the optimal combination of bonding, fibrous composition, and yarn structure.

Insignificant percent, no more than 2% of UHMPE fiber, in a denim type woven fabric, provide significant mechanical performance. For individual protection 3-8% of UMHPE fibers provide products lighter without compromising on strength and durability, without compromising on comfort.



Fields of applications:

Textile industry – woven structures, with a oriented and /or personalized design, meant for individual protection, active leisure, performance sport activities, recovery & support for a good quality of life and social reintegration.

Invention Classification: *9. Chemical and Textile Industry*

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BIODEGRADABLE POLYMERIC COMPOSITE BASED ON NATURAL RUBBER AND FUNCTIONALIZED WOOD WASTE

Laurenția Alexandrescu, Maria Sonmez, Mihai Georgescu, Daniela Stelescu, Mihaela Nituica

National Research and Development Institute for Textiles and Leather (INCDTP) – Division: Leather and Footwear Research Institute - ICPI , 93 Ion Minulescu, Sector 3, Bucharest, Romania, e-mails: laurentia.alexandrescu@icpi.ro;

Patent application: A 00539/27.08.2020

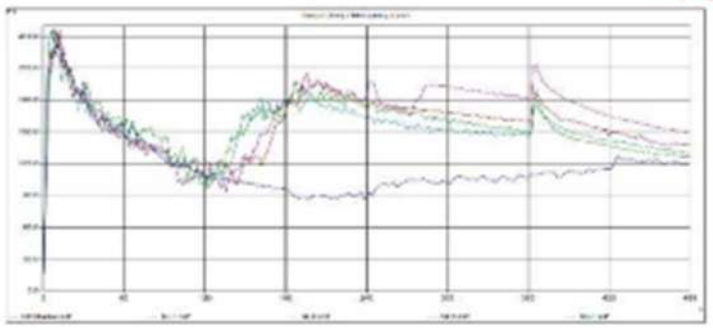
NOVELTY: biodegradable polymer composite based on natural rubber and wood waste ground to nanometric dimensions and functionalized with potassium oleate, intended for obtaining products for the food, medical, consumer goods and footwear industries. The obtaining of composites has also been achieved through more efficient and easy to process technologies.

FORMULATION: a mixture of 1-100 parts by weight natural rubber, 1-2 parts stabilizer-stearin, 1-3 parts antioxidant-Irganox 1010 (pentaerythritol tetrakis (3- (3,5-di-tert-butyl-4-hydroxyphenyl) propionate), 1-5 parts active filler zinc oxide, 0-50 parts precipitated chalk, 0-50 parts functionalized wood waste, 1-3 parts mineral oil, 0.1-0.6 parts PEG, 1-1, 2 parts Cz accelerator, 0.1-0.15 parts D accelerator and 1-1.5 parts sulfur, per 100 parts plasticized polymer

PROCEDURE: Wood waste was collected from wood processing plants. Wood waste was grinded by a cryogenic mill with a speed of 12.000 rotations / min and separated through a sieve with meshes of 100 nm at dimensions of 50-100 nm. After grinding, the wood fibers were mixed with 20% potassium oleate and stirred mechanically for 4 hours at 60°C. The biodegradable polymer composite was obtained on a two-cylinder roller, having the following parameters: temperature on the roller cylinders - 35-45°C, speed - 27 rpm, distance between cylinders - 1.5... 2.5 mm, time - 20-25 min. Plasticize the natural rubber, in an amount of 1-100g for 3-5 minutes, afterwards gradually add 2 g of stearic acid, 5g of zinc oxide, 0-50 g of precipitated chalk, 0-50g of functionalized wood waste , 3 g mineral oil, 3 g antioxidant IPPD and 0.6 g PEG 4000. Mix the ingredients on a roller to homogenize for 5-10 min. After homogenization, vulcanizing agents, 1.2 g Cz accelerator, 0.15 g D accelerator and 1.5 g sulfur are added for 2 min. Refine the mixture for 3 min.

Physical-mechanical characteristics

Properties	SYMBOL			
	NL1	NL2	NL3	NL4
Hardness, °Sh A	51	57	61	63
Modulus 100%, N/mm²	1,08	1,36	1,46	1,33
Modulus 300%, N/mm²	2,19	2,14	2,00	1,83
Modulus 500%, N/mm²	4,48	4,48	3,68	3,42
Tensile strength, N/mm²	7,11	7,59	6,93	6,85
Elongation at break, %	580	600	600	660
Remanent elongation, %	28	32	32	36
Tear strength, N/mm	24,01	24,36	25,57	19,50
Specific weight, g/cm³	1,17	1,15	1,11	1,06
Abrasion resistance, mm³	209,73	201,89	232,33	208,45



APPLICATIONS: for obtaining products for the food, medical, consumer goods and footwear industries. Products that could be manufactured: caps, gaskets and O-Rings, products for footwear, soles, soleplates, insoles etc. These product's properties will comply with specific product standards and will be biodegradable.

BENEFITS

- Resistance to high temperatures ranges
- (-40 - +200°C);
- Hardnesses from 50-70° Sh;
- Long time thermo-oxidative aging resistance;
- Resistance to atmospheric weather, ozone and UV rays;
- Optimal processability of ingredients for mixing due to the functionalization of wood waste with potassium oleate;
- Abrasion resistance below 200 mm³.

CLASS 1: Environment - Pollution Control

ACKNOWLEDGEMENTS

This patent aplication was supported within the PN 19- 17 01 03 project

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THE COMPOSITIONS FOR THE TREATMENT OF MEDICAL FURS

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[2] *SC MEDIMPACT SA, Mediaş, România*

Patent aplication: OSIM A/00654/14.09.2017

Technical field in which the invention can be used: Manufacture of fur and fur articles

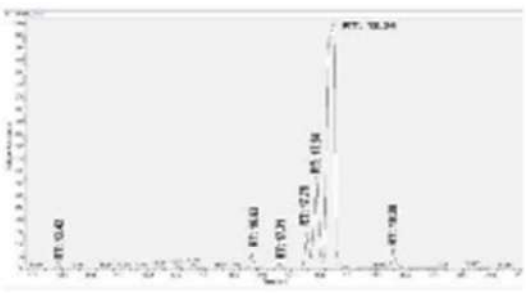
DESCRIPTION

- There are a number of people with rheumatic, joint and muscular diseases and medical treatment of patients suffering from these diseases requires improvement through alternate methods.
- Many species of plants containing essential oils bring their contribution all over the world in preventing various diseases.
- Essential oils are very concentrated in active chemical elements and have various properties: they are analgesic, anti-inflammatory and relaxing, immunostimulant, antibacterial, antiseptic etc.

NOVELTY

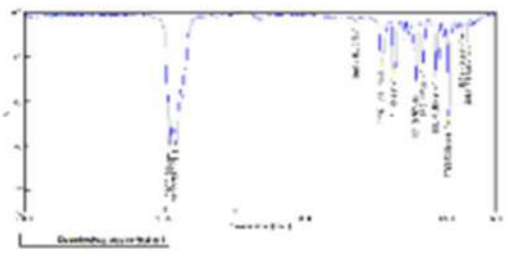
- The invention relates to the manufacture of a product based on essential oils, ethyl alcohol, polyethylene glycol, hexadecyl-trimethyl ammonium bromide, biodegradable nonionic emulsifier and water, used to treat the medical fur surface (as a final operation).
- The compositions for the treatment of medical furs consists of 55-65% Eucalyptus oil, or 55-65% Cajeput oil, or 55-65% Mint oil, or 55-65% Ginger oil, and 10-15% Ethanol, 8-10 % Lauryl alcohol ethoxylated with 7 moles of ethylene oxide, 8-10% Polyethylene Glycol 400 and water.
- The products based on essential oils, are homogenous yellowish white fluids with with 17-26% dry substance, pH: 4.0-6.0, density: 0.840-0.890 g/cm^3, total nitrogen: 0.4-0.6%.
- Sheepskins were tanned with syntans based on phenolsulphonic acids and aromatic oxisulfones, and in the final finishing phase it was treated with a product based on essential oils with therapeutic properties (eucalyptus, cajeput, mint, ginger).
- The products can be used to treat the surface of finished sheep furskins (free of metals) for medical purposes and improve the quality of natural fur and fur articles (lumbar belts, knee pads, knee elbow) used to prevent, relieve and treat rheumatic, muscular, circulatory disorders, complementing the medical treatment of patients suffering from these conditions, keeping the fur-covered area warm.

Chromatogram of organic compounds in the Eucalyptus oil



The following compounds are found in the highest amount: Eucaliptol - 73.23%, d-limonene - 14.99%, ocymene - 4.10% and gama-terpinene - 2.82%.

Spectra for film obtained from the product based Eucalyptus oil



The main bands of eucalyptus oil are : 2965 and 2922 cm-1 – indicating the presence of aliphatic CH2 groups, 1644 cm-1 – indicating the presence of C=O group from ester, 1463 and 1375 cm-1 – assigned to the C-H group, 1213 cm-1 and 983 cm-1 given by the C-O group from ether.

Medical furs (free of metals)

BENEFITS

► *ENVIRONMENTAL*
- *Development of new products;*
- *Partial replacement of potentially toxic components with environmentally friendly materials (sheep furs free of metals, treated with a products based on essential oils with therapeutic properties);*
- *Environmental protection;*

► *SOCIAL*
- *The products based on essential oils consisting of ecological components, are used to treat the medical fur surface (free of metals);*
- *Protection of health;*

► *ECONOMIC*
- *Increasing the quality of natural furs and medical fur articles used to prevent, relieve and treat rheumatic, muscular, circulatory disorders;*
- *Assortment diversification – medical furs and fur articles (lumbar belts, knee pads, knee elbow).*

ACKNOWLEDGEMENTS

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QUATERNARY HYDROPHILIC NANOHYBRID COMPOSITION FOR RESISTIVE HUMIDITY SENSORS

EUROPEAN PATENT APPLICATION 20 465 580.7 /3.11.2020

ASSIGNEE: National Institute for Research and Development in Microtechnologies - IMT Bucharest

Inventors: BOGDAN- CATALIN SERBAN, OCTAVIAN BUIU, CORNEL COBIANU, VIOREL AVRAMESCU, NICULAE DUMBRAVESCU

INTRODUCTION

• Many principles and methods were described in literature for measuring relative humidity (RH) and several types of materials were employed as RH sensing layers. The present invention relates to the RH sensing response of a resistive sensor employing a sensing layer based on a quaternary nanohybrid composition comprising or consisting of CNH_{OX} (**FIG 1**)/GO/SnO_2/PVP at 1/1/1/1 to 0.75/0.75/1/1 w/w ratio. The quaternary hydrophilic nanohybrid compositions exhibit several significant advantages, when employed as RH sensitive layers:

- both oxidized carbon nanohorns (CNH_{OX}) and graphene oxide (GO) are nanocarbonic materials with high specific surface area (SSA)/volume ratio, affinity for water molecules, and exhibit rapid variation of the electrical resistance in contact with water molecules, when varying RH from 0% to 90%;
- nanometric tin (IV) oxide (SnO_2) powder exhibits good RH sensitivity;
- PVP is a hydrophilic polymer with excellent binding properties;
- detection at room temperature;
- low response time;
- low cost, small size, and simplicity in manufacturing

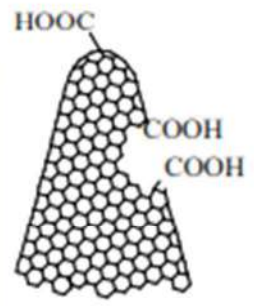


FIG 1 – Structure of oxidized carbon nanohorns (CNH_{OX})

MATERIALS, METHODS, RESULTS

• The interdigitated (IDT) sensing structure (**FIG 2**) was manufactured on a Si substrate (470 µm thickness), covered by a SiO_2 layer (1 µm thickness). The metal stripes of IDT comprised a Cr (10 nm thickness) and Au (100 nm thickness) stack, having 200 µm width. 6 mm was the distance between the electrodes. A dispersion formed in isopropyl alcohol of a quaternary nanohybrid composition described above, at different ratios, was deposited on the IDT structure using the drop casting method (**FIG 3**).

• The RH monitoring capability of the sensitive layers was investigated by applying a current between the two electrodes and measuring the voltage at different RH values

• Measurements were performed in humid nitrogen, at room temperature, and compared with the response of a commercial, industrial grade, capacitive RH Sensirion RH sensor, provided with signal-processing and signal-amplifying electronics (**FIG 4** and **FIG 5**).

• It was demonstrated that the resistance of the sensitive layer this patent proposes varies with RH.

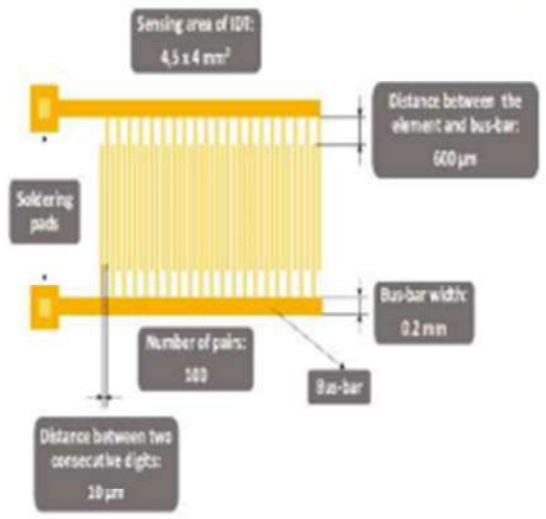


FIG 2 – IDT sensing structure

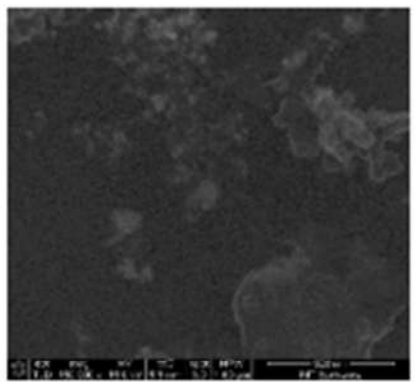


FIG 3 - SEM image for CNH_{OX}/GO/SnO2/PVP (0.75/0.75/1/1) nanohybrid composition

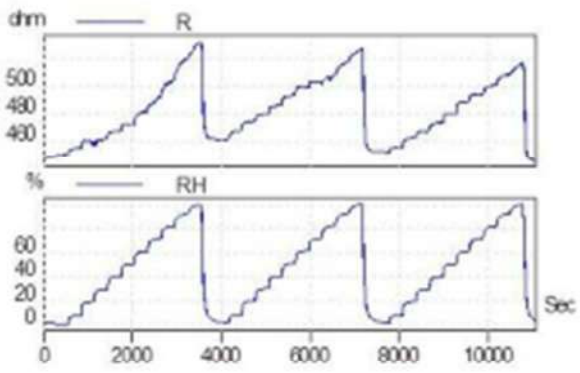


FIG 4 – R Curve: Response of the sensor employing GO/SnO_2/PVP at 0.75/0.75/1/1 as sensing layer
RH Curve: Response of Sensirion RH sensor

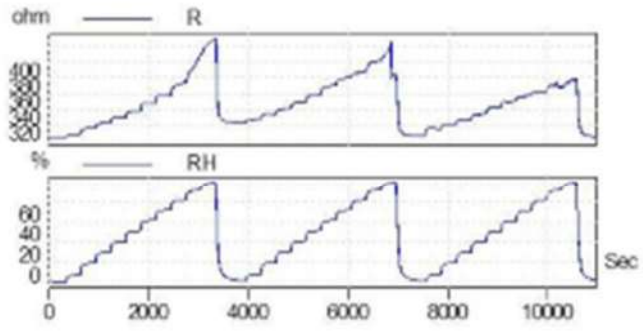


FIG 5 – R Curve: Response of the sensor employing GO/SnO_2/PVP at 1/1/1/1 as sensing layer
RH Curve: Response of Sensirion RH sensor

CONCLUSIONS

- The IDT sensing structure presented in this work exhibits a linear response and good RH sensitivity when varying RH from 0% up to 90% in humid N2 environment.
- The sensor response time and stability are comparable to that exhibited by a commercially available Sensirion RH sensor.

ACKNOWDLEGMENT

- This work was funded by the Romanian Ministry for Research and Innovation, through the PN 1916/2019 - MICRO-NANO-SIS PLUS / 08.02.2019 Program

QUATERNARY OXIDIZED CARBON NANOHORNS - BASED NANOHYBRID FOR RESISTIVE HUMIDITY SENSOR

EUROPEAN PATENT APPLICATION 20 465 581.5 /3.11.2020

ASSIGNEE: National Institute for Research and Development in Microtechnologies - IMT Bucharest

Inventors: BOGDAN- CATALIN SERBAN, OCTAVIAN BUIU, CORNEL COBIANU, VIOREL AVRAMESCU, NICULAE DUMBRAVESCU

INTRODUCTION

• The present invention relates to the RH sensing response of a resistive sensor employing a sensing layer based on quaternary nanohybrid composition comprising or consisting of $CNH_{OX}/SnO_2/ZnO/PVP$ at 1.5/1/1/1 w/w ratio to 3/1/1/1 w/w ratio. When employed as RH sensing layers, these quaternary nanohybrid compositions exhibit several significant advantages:

• Oxidized carbon nanohorns (CNH_{OX}) (**FIG 1**) have high specific surface area/volume ratio, water molecules affinity and show rapid electrical resistance variation when RH varies from 0% to 90%.

• The nanometric tin (IV) oxide (SnO_2) nanopowder exhibits good RH sensitivity. CNH_{OX} have p-type electrical conduction (through holes), while SnO_2 is a n-type metallic oxide semiconductor (through electrons). By adding SnO_2 to CNH_{OX}, one will obtain islands of p-n semiconductor heterojunctions embedded in PVP (a dielectric material) that increase the sensitivity of the sensitive layer.

• Zinc oxide (ZnO) nanopowder exhibits good RH sensitivity. Both ZnO and SnO2 are n-type electrical conductors. The ZnO – SnO2 nanocomposite has sensing properties superior to each of the single oxides, because each of the oxides interacts differently with the oxidized carbon nanohorn material, leading to alterations in the pore distribution, which increase the specific surface area;

• Polyvinylpyrrolidone (PVP) is a hydrophilic polymer with excellent binding properties, which enables its employment in sensing structures with either flexible or rigid substrate;

• Detection at room temperature, low response time, low cost, small size, simplicity in manufacture.

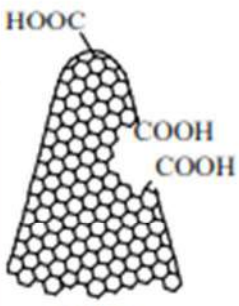


FIG 1 – Structure of oxidized carbon nanohorns (CNH_{OX})

MATERIALS, METHODS, RESULTS

• The interdigitated (IDT) sensing structure (**FIG 2**) can be manufactured on Lexan, Kapton, or glass. The dielectric substrate may have a thickness from 5 to 50 μm. The electrodes can be made from the same material or can be formed of different materials. The electrodes can be made from conductive materials such as gold and chromium. A dispersion formed in isopropyl alcohol of a nanohybrid sensing layer described above, at different w/w ratios, was deposited on the IDT structure using the drop casting method (**FIG 3**).

• The RH sensing capability of the proposed sensitive layers was investigated by applying a current between the two electrodes and measuring the voltage at different RH values.

• Measurements were performed in humid nitrogen at RT and compared with the response of a commercial capacitive RH humidity sensor, provided with signal-processing and signal-amplifying electronics (**FIG 4** and **FIG 5**). From the detection principle point of view, the resistance of the sensitive layer varies with the RH level.

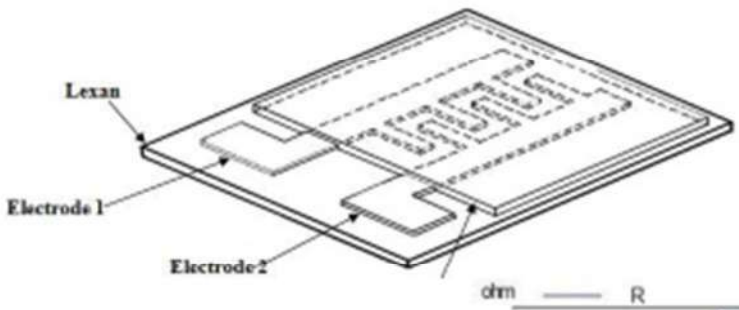


FIG 2 – IDT sensing structure

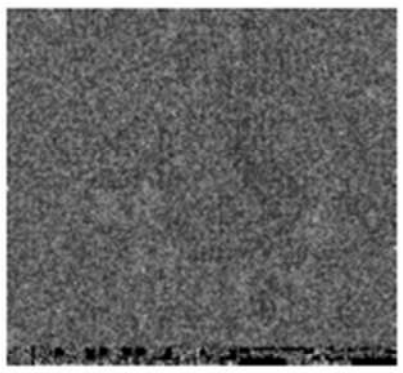


FIG 3 - SEM image for $CNH_{OX}/SnO_2/ZnO/PVP$ at 1.5/1/1/1 nanohybrid composition

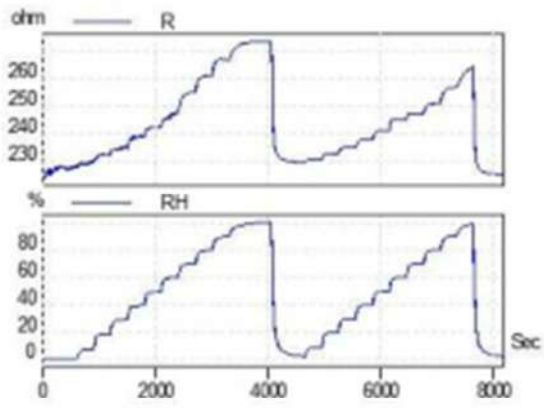


FIG 4 – R Curve: Response of the sensor employing $CNH_{OX}/SnO_2/ZnO/PVP$ at 1.5/1/1/1 as sensing layer
RH Curve: Response of Sensirion RH sensor

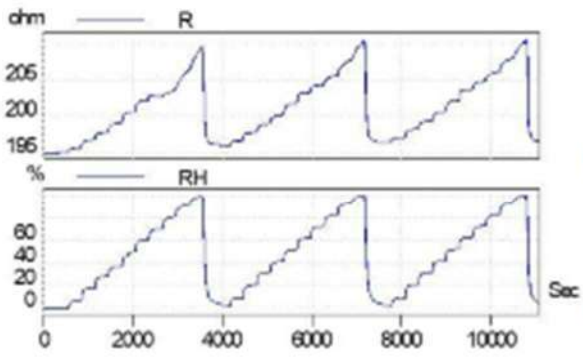


FIG 5 – R Curve: Response of the sensor employing $CNH_{OX}/SnO_2/ZnO/PVP$ at 3/1/1/1 as sensing layer
RH Curve: Response of Sensirion RH sensor

CONCLUSIONS

- The IDT sensing structure presented in this work exhibits a linear response and good RH sensitivity when varying RH from 0% up to 90% in humid N2 environment. The sensor response time and stability are comparable to that of a commercially available RH sensor.

ACKNOWDLEGMENT

- This work was funded by the Romanian Ministry for Research and Innovation, through the PN 1916/2019 - MICRO-NANO-SIS PLUS / 08.02.2019 Program

TERNARY SENSITIVE LAYER FOR ETHANOL RESISTIVE SENSOR

ROMANIAN PATENT APPLICATION A/00477, 31.07.2020

ASSIGNEE: National Institute for Research and Development in Microtechnologies - IMT Bucharest

Inventors: BOGDAN-CATALIN SERBAN, OCTAVIAN BUIU, CORNEL COBIANU, NICULAE DUMBRAVESCU, VIOREL MARIAN AVRAMESCU

INTRODUCTION

• The technical problem solved by the present invention consists of designing new sensitive layers for low concentration levels of ethanol vapor, employed in the design of resistive sensor. The sensitive layers are ternary nanocomposites comprising oxidized carbon nanohorns (CNH_{OX}) / SnO_2 / polyvinylpyrrolidone (PVP) with stoichiometry 1/1/1 and 2/1/1 w/w ratios. The use of ternary nanocomposites for ethanol vapors detection has several significant advantages:

• Both CNH_{OX} (**FIG 1**) and SnO_2 have high specific area / volume and affinity ratio for ethanol molecules;

• The two semiconducting materials, p-type (CNH_{OX}) and n-type(SnO_2), ensure a variation of the resistance of the sensitive layer to contact with ethanol vapors;

• PVP is hydrophilic polymer with excellent film forming properties;

• RT detection, low power consumption (below 2 mW), high sensitivity.

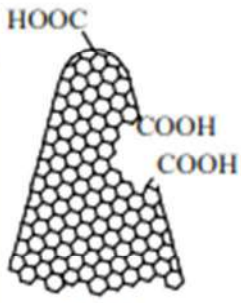


FIG 1 – Structure of oxidized carbon nanohorns (CNH_{OX})

MATERIALS, METHODS, RESULTS

• The test structure consisted of a dual-comb interdigitated transducer (IDT) structure with 100 pairs of Au/Cr fingers, each with a width of 10 μm and 10 μm spacing between two consecutive fingers (**FIG 2**).

• A dispersion formed in isopropyl alcohol of the sensing layer described above, at different w/w ratios, was deposited on the IDT structure by the drop casting method (**FIG 3**)

• The monitoring capacity of ethanol vapours was investigated by applying a constant current between the two electrodes and measuring the voltage at different values of ethanol vapor concentration (in the range 0-50 mg/L in dry air – **FIG 4**)

• The sensing mechanism is explained in terms of the overall response of the p-type semiconductor (CNH_{OX} percolated between electrodes of the sensor) shunting the heterojunction between n-type SnO_2 and p-type CNH_{OX}. The HSAB principle is also involved in the sensing mechanism.

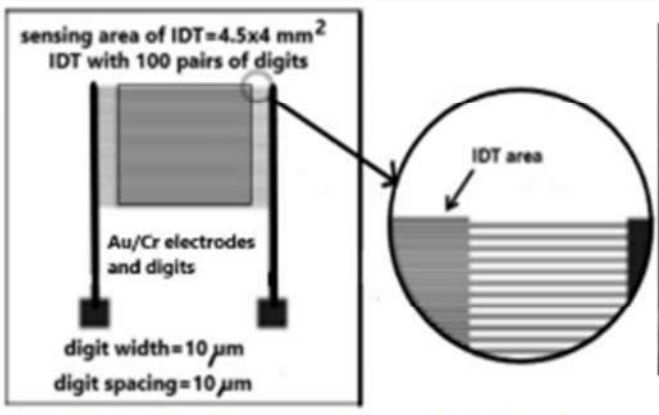


FIG 2 – Schematic layout of the Si chip containing dual-comb IDT transducer. The sensing layer is deposited on the rectangle area of 4.5 x 4 mm²

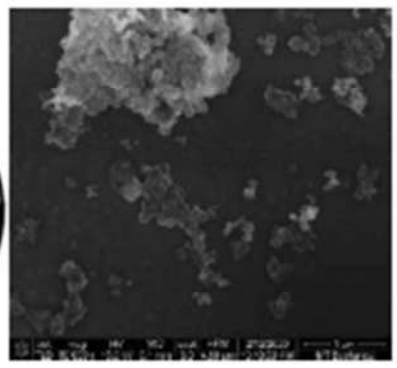


FIG 3 - SEM image for CNH_{OX}/SnO_2PVP at 2/1/1 nanohybrid composition

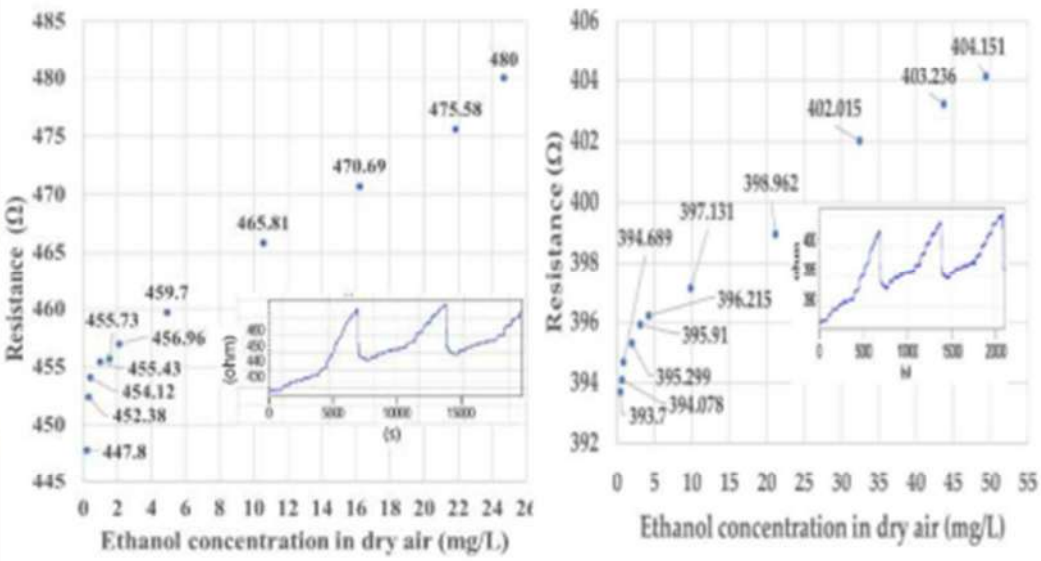


FIG 4 – RT transfer functions of the chemiresistive ethanol sensors employing as sensing layers (left) ox-SWCNH/SnO2/PVP=1/1/1 (mass ratio) and (right) ox-SWCNH/SnO2/PVP=2/1/1. For both cases, the flow rate of air passing through liquid ethanol was varied, while the total flow rate was kept at 1 L/min. The inset shows the automatic recording of the sensor resistance as a function of time and ethanol vapor concentration

CONCLUSIONS

- Both types of sensing film investigate showed increased RT sensitivy for ethanol vapor concentrations in dry air below 1 mg/L, as well as in the range of 25-50 mg/L, power consumption < 2 mW (> 300 x smaller than that of commercial sensors), response time = 30 s, recovery time = 50 s, and a good reversibility/reusability.
- These impressive performance open new pathways for future VOC monitoring applications related to wireless sensor networks, where data can be collected from static samplers every minute and can accurately determine the ethanol concentration changes in the ambient air.

ACKNOWDLEGMENT

- This work was funded by the Romanian Ministry for Research and Innovation, through the PN 1916/2019 - MICRO-NANO-SIS PLUS / 08.02.2019 Program

CARBON DIOXIDE SENSOR WITH SURFACE ACOUSTIC WAVES

APPLICATION PATENT OSIM, ROMANIA, A/00474, 31.07.2020

ASSIGNEE: National Institute for Research and Development in Microtechnologies - IMT Bucharest
Inventors: Bogdan-Catalin Serban, Octavian Buiu, Cornel Cobianu, Roxana Marinescu

FIELD OF INVENTION

- Carbon dioxide (CO_2) detection is important in various sectors of domestic and industrial activity, such as indoor air quality control (air conditioning and ventilation systems), healthcare (monitoring of respiration, anaesthesia), agriculture (monitoring of CO_2 flow in soil), food technology (packaging processes, transport), alcoholic beverage industry.
- Along with optical, electrochemical and resistive sensors, gravimetric sensors are a solution for CO_2 monitoring.
- Drawback: Non-dispersive infrared (NDIR) structures, the most commonly used commercial devices used for CO_2 monitoring, have disadvantages, such as high cost, spectral interference and high detection limit.

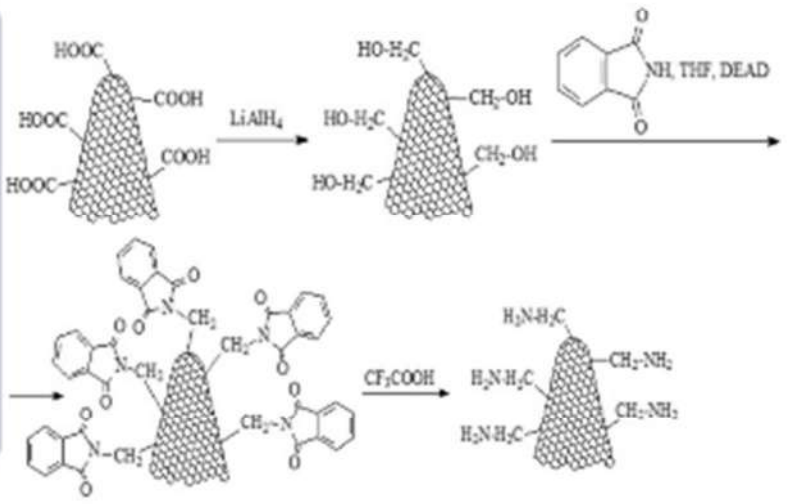


FIG 1 – Structure of CNH-CH_2-NH_2

ORIGINAL APPROACH

- The invention includes the design and manufacturing processes for a new gravimetric CO_2 sensor, employing carbon nanohorns functionalized with aminomethyl groups (abbreviated as CNH-CH_2-NH_2 – **FIG 1**) as sensing layer, deposited by spin coating, a quartz piezoelectric substrate and interdigital transducers.
- This type of functionalization confers selectivity to the nanohorn nanocarbon material by grafting aliphatic primary amine groups. Aliphatic amines, according to the HSAB theory, are hard bases and can interact reversibly, at RT, with CO_2 (hard acid) to form carbamates. The sensing structure used is of the "delay line" type, having a a double delay line in order to compensate the thermal drift.
- One of the delay lines is coated with CNH-CH2-NH2, the second delay line being the piezoelectric substrate without a sensitive layer. To obtain a signal due exclusively to the chemical interaction between CNH-CH2-NH2 and CO_2, the signal associated with the second delay line can be subtracted from the signal of the first delay line (**FIG 2**).

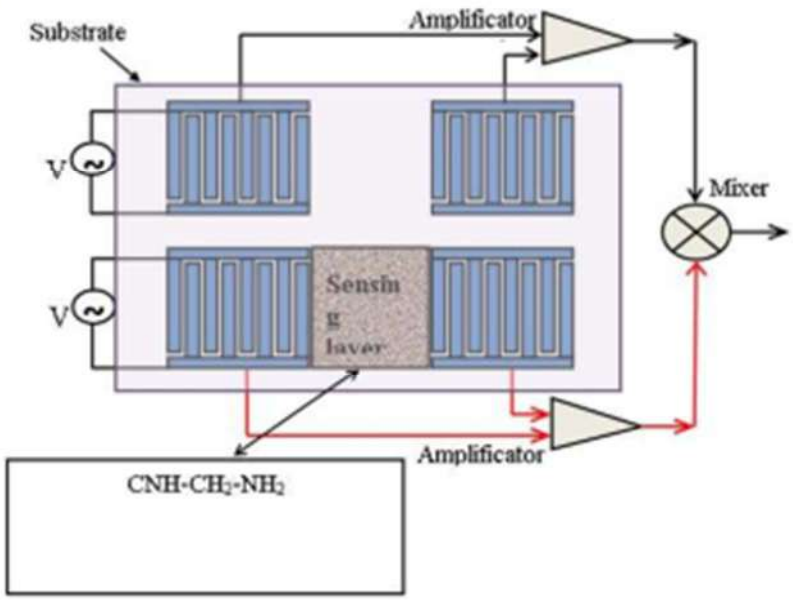


FIG 2 – Structure of the CO_2 sensor

SYNTHESIS OF THE SENSING LAYER

- Oxidized carbon nanoborns (40 mg), purchased from Sigma Aldrich, are dispersed in anhydrous tetrahydrofuran and subjected to ultra sonication for 90 minutes. 4 mg of $LiAlH_4$ are then added, the new mixture being ultrasonicated for two hours. The reaction mixture is dispersed in 250 ml of ethanol and filtered. The solid product is dried in the oven at 70°C for three hours.
- The reduced nanohorns are dispersed in tetrahydrofuran and ultrasonicated for 60 mins. 20 mg phthalimide and 4 mg ethyl azodicarboxylate (DEAD) are added. The solution is ultrasonicated for 4 hours, then the mixture is diluted with 300 ml of methanol and filtered. The solid product is dried in the oven at 90°C for three hours. The product obtained is treated with 20 mL trifluoroacetic acid, ultrasonicated for 3 hours and filtered.
- The CNH-CH2-NH2 is dried at 100°C under vacuum for 2 hours and then washed with ethanol, acetone and deionized water. A solution of CNH-CH2-NH2 (5 mg) in 50 mL dimethylformamide is ultrasonicated at RT for 10 hours. The obtained solution is deposited by the spin coating method on the quartz substrate (3000 rpm, for 60 s). The film is heated to 100^0C for 90 mins. The obtained film is subject to a final heat treatment, at 200^0C, for 10 mins.

ADVANTAGES OF THE PROPOSED SENSING LAYERS

- Improved mechanical properties, better processability, fast response, detection at RT, fast response, increased selectivity
- High specific area / volume ratio, affinity for CO_2 molecules through HSAB-type interactions ("mass loading"), as well as a variation of its resistance in contact with CO_2 molecules ("electric loading")

HYDROGEN SULPHIDE SENSOR WITH SURFACE ACOUSTIC WAVES

APPLICATION PATENT OSIM, ROMANIA, A/00469, 31.07.2020

ASSIGNEE: National Institute for Research and Development in Microtechnologies - IMT Bucharest
Inventors: Bogdan-Catalin Serban, Octavian Buiu, Cornel Cobianu, Roxana Marinescu

FIELD OF INVENTION

• The invention includes the design and manufacturing processes for a new gravimetric hydrogen sulphide (H_2S) sensor, employing carbon nanohorns functionalized with mercapto groups (-SH) and carbonothioyl (-C=S) groups (abbreviated as CNH-SH, **FIG 1**).

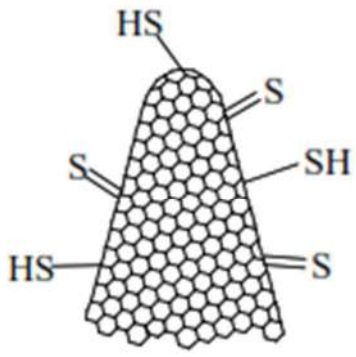


FIG 1 – Structure of CNH-SH

ORIGINAL APPROACH

•The H_2S sensor includes a quartz piezoelectric substrate, interdigital transducers and a sensing layer deposited via spin coating (**FIG 2**).

• The sensing layers described in this invention are based on carbon nanohorns subjected to H_2S / He plasma treatment. This type of functionalization ensures the selectivity of nanohorns towards H_2S molecules by grafting sulphur-based groups, such as SH and C = S. At the same time, the optimal degree of derivatization of carbon nanohorns, in order to obtain high sensitivities, can be tuned by changing the plasma power, as well as the exposure time.

• Sensitive layers of the H_2S / He plasma-functionalized nanohorns type interact with the H_2S molecules. The adsorption of the H_2S molecules alter the mechanical and electrical properties of the sensing layer, leading to changes of the propagation rate and frequency of the surface acoustic wave.

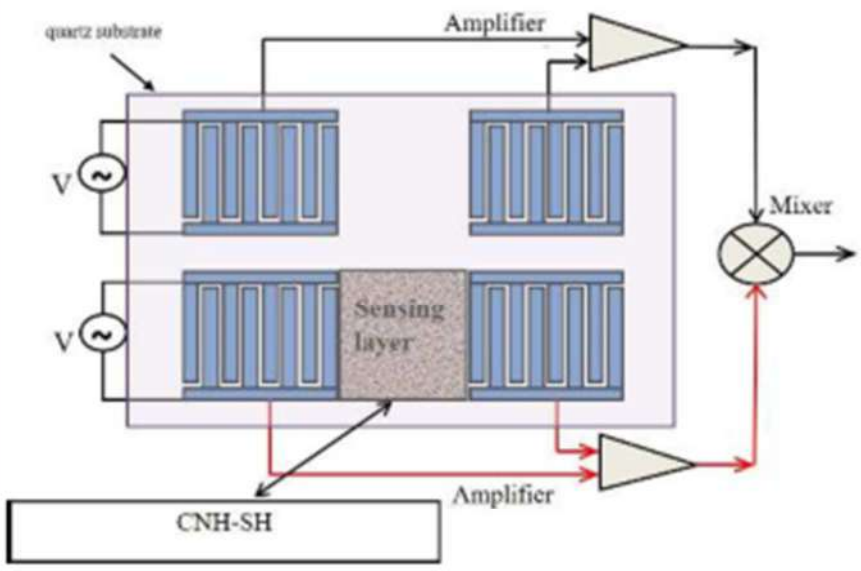


FIG 2 – Structure of the H_2S sensor

SYNTHESIS OF THE SENSING LAYER

The process steps for synthesising the solid-state sensing films based on CNH-SH are shown below:

• Carbon nanohorns, purchased from Sigma Aldrich, are functionalized in H_2S / He plasma (60-40 v/v), with a plasma power of 30 W, at an exposure time of 5 minutes.
• The synthesized CNH-SH is washed with ethanol, acetone and deionized water.
• A dispersion of CNH-SH (10 mg) in 100 mL dimethylformamide is subjected to ultrasonication RT for 12 hours.
• The obtained dispersion is deposited by the spin coating method on the quartz substrate (2000 rpm, for 60 s).
• The obtained film is heated at 120^0C for 30 minutes.
• Steps 4 and 5 are repeated.
• The obtained film is subjected to a final heat treatment, at 200^0C, for 10 minutes.

ADVANTAGES OF THE PROPOSED SENSING LAYERS

• Improved mechanical properties and better processability
• High specific area / volume ratio, affinity for H_2S molecules through van der Waals-type interactions ("mass loading"), as well as a variation of its resistance in contact with H_2S molecules ("electric loading")

RESISTIVE OXYGEN SENSOR AND METHOD OF MANUFACTURING IT

APPLICATION PATENT OSIM, ROMANIA, A/00470, 31.07.2020

ASSIGNEE: National Institute for Research and Development in Microtechnologies - IMT Bucharest
Inventors: Bogdan-Catalin Serban, Octavian Buiu, Cornel Cobianu, Roxana Marinescu

FIELD OF INVENTION

• Oxygen concentration monitoring is a process of cardinal importance in various sectors, such as indoor air quality control (air conditioning and ventilation systems), combustion monitoring in industrial boilers, healthcare (breathing monitoring, incubators), automotive (lambda probe), food technology, etc..

• Along with electrochemical, optical and paramagnetic structures, resistive structures O_2 are a viable solution for O_2 monitoring. Drawback: chemiresistive sensors typically require high operating temperature.

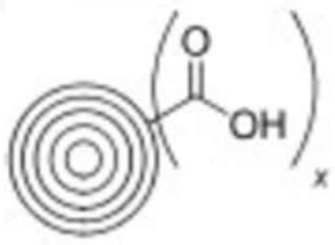


FIG 1 – Structure of oxidized carbon nano-onions (CNOs-ox)

ORIGINAL APPROACH

• The invention includes the design and manufacturing process for a new resistive, RT O_2 sensor, employing as sensing layer organic - inorganic halide perovskites (CH3NH3PbI3−xClx) - oxidized carbon nano-onions (CNOs-ox, **FIG 1**). The O_2 sensor includes a Si/SiO_2 substrate, interdigitated (IDT) electrodes and the sensing layer, deposited via spin coating (**FIG 2**).

• The O_2 monitoring capability was investigated by applying a current between the two electrodes and measuring the voltage at different O_2 concentration levels. The resistance of the sensitive layer varies with O_2 concentration.

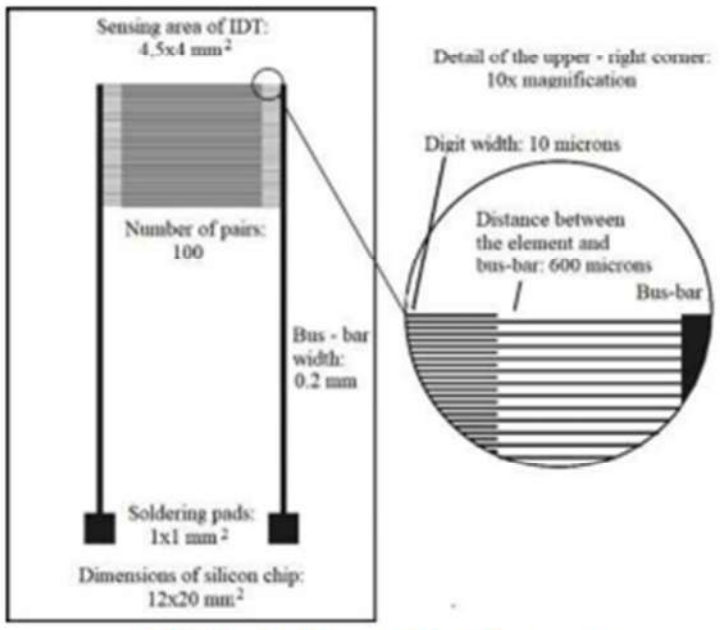


FIG 2 – Structure of the O_2 sensor

SYNTHESIS OF THE SENSING LAYER

• The Si / SiO_2 substrate is cleaned for 10 minutes in the ultrasonic bath using sequentially equal volumes of acetone, ethanol and finally deionized water.

• Carbon nano-onions (CNOs) are synthesized from nanodiamonds, by heating at 1650^{0}C, in a helium atmosphere. The synthesis of CNOs-ox is performed by reaction with nitric acid, 3 M, at reflux, for 48 h. The product obtained is washed with deionized water, acetone and deionized water.

• A dispersion of CNOs-ox (0.15 mg / mL) in isopropyl alcohol is prepared and subjected to ultrasonication for 2 h. The obtained dispersion is deposited by the "spin coating" method (1000 rpm for 20 seconds) on the Si / SiO_2 substrate employing liner or interdigitated electrodes (after previously masking the contact area).

• A solution of 0.8425 g of methylammonium iodide and 485 mg PbCl2 in 10 mL dimethylformamide is prepared, to which 20 µL of HCl (concentration 36.5%) are added. The obtained solution is deposited by the "spin coating" method (1000 rpm for 15 sec; 3000 rpm for 40 sec) over the initially deposited CNOs-ox film.

• The obtained layer is heated at 100^{0}C for 30 minutes. Halogenated perovskite penetrates the nanocarbon structure, forming a hybrid structure: CH3NH3PbI3 − xClx / CNOs-ox.

ADVANTAGES OF THE PROPOSED SENSING LAYERS

• The presence of CNOs-ox ensures a high specific surface area / volume ratio, as well as a pronounced affinity for O_2 molecules;

• Detection over a wide temperature range;

• Fast response;

• Reversibility.

BENZENE SENSORS AND ASSOCIATED METHODS

U S 10,254,217 B2, Publication date: 9.04.2019
Inventors: B.-C. Serban, O. Buiu, M. Brezeanu, C. Cobianu, C. Bostan, C. Diaconu
Assignee: Honeywell International Inc.

FIELD OF INVENTION

• Benzene (C_6H_6) is a highly flammable, toxic, human carcinogen, organic hydrocarbon, used as an intermediate in processes leading to plastics, nylon, lubricants, coke, fertilizers, detergents, etc.
• Monitoring C_6H_6 concentration is a vital requirement for the personal safety of people working in fields such as oil & gas storage & transportation, oil refineries, petrochemical industry.
• C_6H_6 detection can be performed via: multi-gas monitors, metal-oxides (MOx) and nano-metal-oxide semiconductor (NTMOx) sensors, electrochemical detectors, fixed and portable gas chromatographs, single gas (colorimetric) detection tubes, photoionization detectors (PIDs).

ORIGINAL APPROACH

• This invention introduces a novel, environmental friendly, gas-phase benzene sensing solution based on the supramolecular chemistry principles and on Ultra-Violet Visible (UV-VIS) detection.
•The low-cost, easy-to-manufacture solution has the potential to go beyond the state-of- the-art in terms of specificity, being able to discriminate between several flammable aromatic hydrocarbons.

TECHNOLOGY NUGGET

• C_6H_6 can be easily identified due to its specific UV absorption band. This band is attributed to a partial intermolecular charge transfer occurring between an electron-acceptor (iodine) and an electron–donor (benzene): $C_6H_6 + I_2 = C_6H_6 \ldots I_2$
• Hard Soft Acid Base (HSAB) rule: hard acids prefer to react with hard bases, while soft acids prefer to interact with soft base
• C_6H_6 is soft base, iodine is soft acid, thus they will have strong interaction.
• Drawback: iodine is highly volatile → iodine can sublimate even at room temperature.
• Solution: in order to be stabilized, iodine can be encapsulated in the cavity of either α -, β-, γ-cyclodextrines (CDs) or their derivatives (**Fig 1**).
• The supramolecular cyclodextrine-iodine assembly is stable due to the van der Waals forces which exist between the hydrophobic interior of the cyclodextrin as host molecule and iodine as guest molecule. C_6H_6 has a significantly larger affinity for iodine than for cyclodextrine.

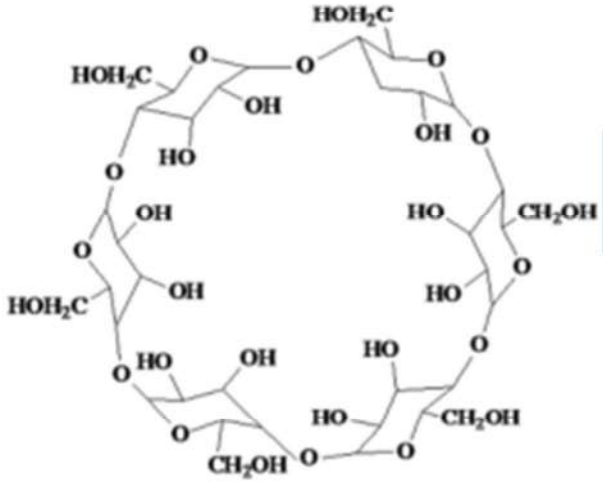


FIG 1 - The structure of α - cyclodextrine

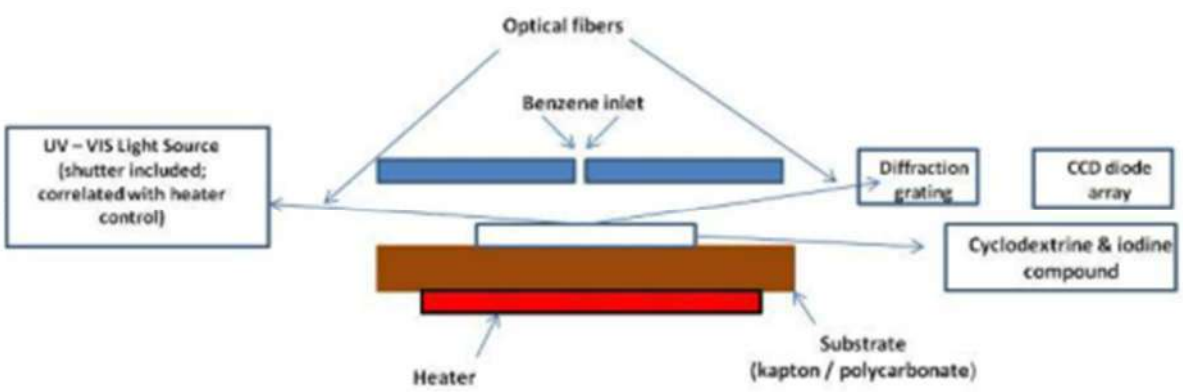


FIG 2 - Optical system for C_6H_6 detection based on the cyclodextrine – iodine complex

SENSOR MANUFACTURING

• Preparation of the cyclodextrine-iodine complexes
• Deposition of the sensing solution on polycarbonate or Kapton substrates
• Design and manufacturing of the optical reading system

FLUORESCENT POLYMER FOR OXYGEN SENSING

US 8,778,501 B2, Issued July 15, 2014; EP 2 461 155 B1, Issued 17.10.2012

Bogdan-Catalin Serban, Mihai Mihaila, Octavian Buiu

FIELD OF INVENTION

- O_2 is an efficient quencher of fluorescence due its unusual triplet ground state.
- Fluorophores used for O_2 sensing: pyrene, quinoline, phenantrene, decacyclene, etc.
- Fluorophores **drawback**: Reduced adhesion to the substrate → unstable, non-reliable sensors
- Typical **solution to drawback**: Employ immobilization of fluorophore in polymeric matrix
- Typical **drawback of solution**: Covalent bonding of the fluorescent molecule in the polymeric substrate might alter the fluorescence properties of the fluorophore

ORIGINAL APPROACH

- Novel pathway for the immobilization of fluorescent pyrene derivatives: **employment of doped polyanilines (PANIs)**
- Avoids crystallization of the fluorophore in the polymer matrix
- Leads to minimum change in dopant molecular structure → Preserves fluorescence

SYNTHESIS OF THE FLUORESCENT POLYMERIC MATRIX

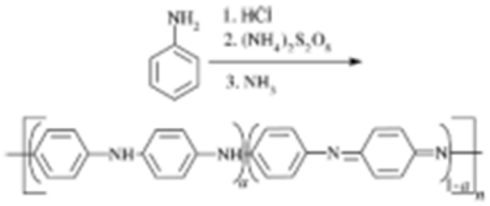


FIG 1 - Synthesis of PANI as a free base (emeraldine)

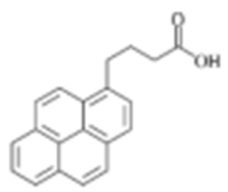


FIG 2 - Structure of pyrene butyric acic (PBA)

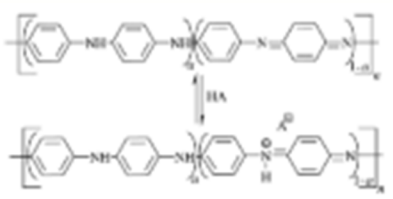


FIG 3 - Synthesis of doped PANI Doping agent (HA): PBA

MATERIAL CHARACTERIZATION

- Emeraldine FTIR spectrum (**FIG. 4**) features two distinctive lines: at 1303 cm^{-1} (for C-N bond in secondary aromatic amines), at 827 cm^{-1} (for aromatic C-H bond)
- 1589 cm^{-1} and 1495 cm^{-1} vibration modes from undoped PANI (**FIG. 4**) show small shift (8-10 cm^{-1}) in doped PANI (**FIG. 5**)
- PBA-doped PANI shows typical bands for PBA at1687cm^{-1} and at 2942 cm^{-1} (**FIG. 5**)

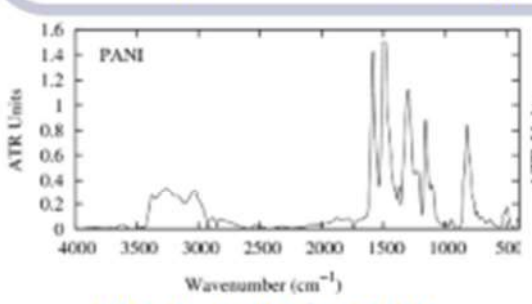


FIG 4 - FTIR for PANI

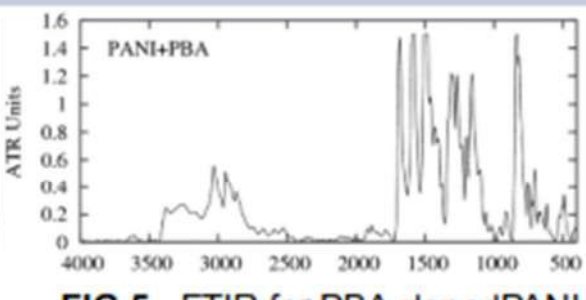


FIG 5 - FTIR for PBA-dopedPANI

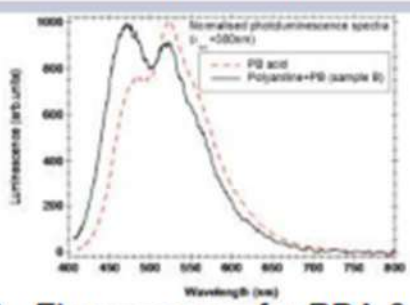


FIG 6 - Fluorescence for PBA & doped PANI

MEASUREMENTS & CONCLUSIONS

- Measurements: excitation wavelength of 380 nm; fluorescence recorded between 400nm and 800nm
- Linear dependence between oxygen concentration and fluorescence yield
- **A novel sensing material, to be employed in fluorescence quenching O_2 detector, was shown**

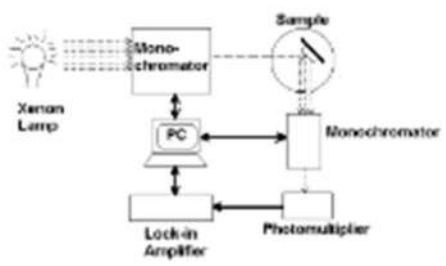


FIG 7 - Experimental set-up

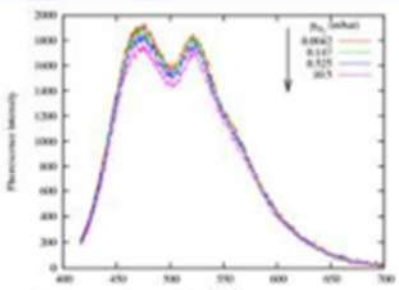
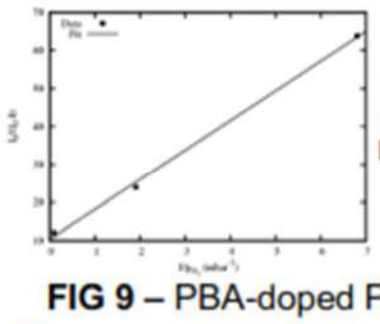


FIG 8 - Photoluminescence spectra for PBA-doped PANI at various air pressure values



Ref:
B. Serban et al.
IEEE CAS 2012
Proceed., pp. 265

FIG 9 – PBA-doped PANI Fluorescence vs O_2 Pressure

RELATIVE HUMIDITY SENSOR AND METHOD

EP 3,078,964 B1, Issued May 24, 2017
Proprietor: Honeywell International Inc. Morris Plains, NJ 07950 (US)
Inventors: Bogdan-Catalin Serban, Cornel Cobianu, Mihai Brezeanu, Octavian Buiu, Cazimir Bostan, Alisa Stratulat

FIELD OF INVENTION

• Among the various RH sensing structures reported in literature, capacitive sensors are an attractive solution due to their highly linear response.
• The main drawback of capacitive RH sensors is the fact that they exhibit hysteresis.
• A way to reduce the hysteresis is by increasing the sensor hydrophobicity. This can be done by the impregnation of the polymeric film with either a hydrophobic and dense inorganic material (such as carbon black) or with an organic material (such as lignin).

ORIGINAL APPROACH

• Novel pathway for reducing the hysteresis of polyimide–based capacitive RH sensor: impregnating its polymeric sensing layer (polyimide) with talc → the number and size of the voids in the polymeric sensing film decreases
• A direct and simple mean to evaluate the hysteresis of the polymeric sensing layer employed by a capacitive RH sensor is by depositing it on a quartz crystal microbalance (QCM) substrate.

MATERIAL SYNTHESIS AND CHARACTERIZATION

• Talc slurry (1%) was prepared from talc powder (average particle size < 10 μm) and DMF, ultrasonically stirred (at RT, for 6 hours), then mixed with simple polyimide and again ultrasonically stirred (at RT, for 24 hours) for full dispersion.
• The sensing solution was spin-coated (6.000 rpm) on QCMs and placed in an oven, for the curing process: at 85°C for 30 mins, at 150°C for 30 mins, at 300°C for 30 mins, at 400°C for 30 mins.
• AFM analysis performed on the sensing layers (**Figs. 1-2**) show that the talc-impregnated polyimide layer has increased roughness.
• Microscopy (SEM) image (**Fig. 3**) indicates that, while some talc particles are incorporated in the polyimide layer, others are to be found at its surface.

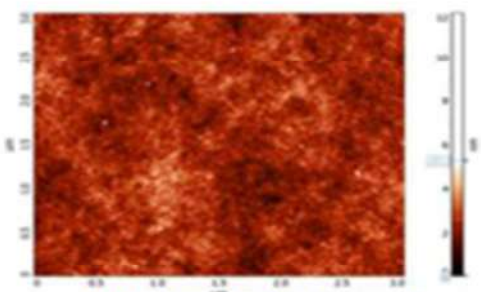


FIG 1 - AFM of simple polyimide layer

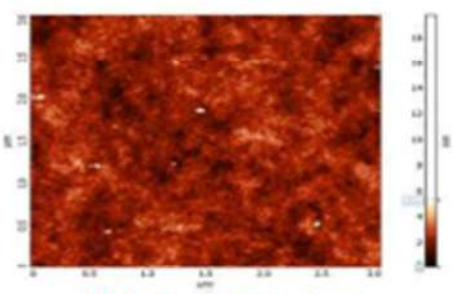


FIG 2 - AFM of talc-impregnated polyimide layer

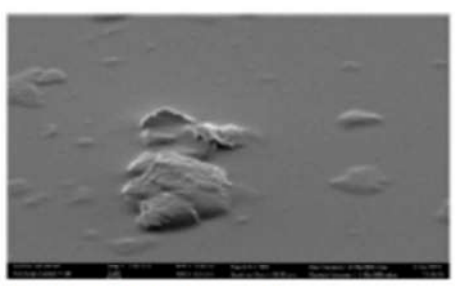


FIG 3 - SEM of talc-impregnated polyimide layer

Ref:
B Serban et al, IEEE CAS 2015, Proceeding pp 109-112

MEASUREMENTS & CONCLUSIONS

• Employing the experimental set-up in **Fig 4**, hysteresis was measured for 7 RH values between 0% and 75% (**Figs. 5-6**), improvement up to 38% was obtained with talc-impregnated polyimide sensing layers compared to simple polyimide-based ones (**Fig. 7**).

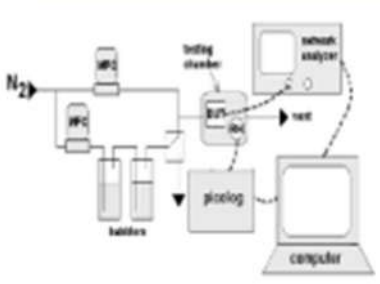


FIG 4 - Experimental set-up

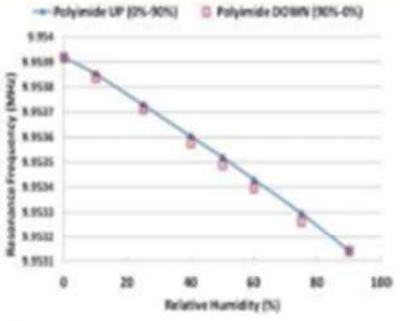


FIG 5 - Simple polyimide-based QCM response

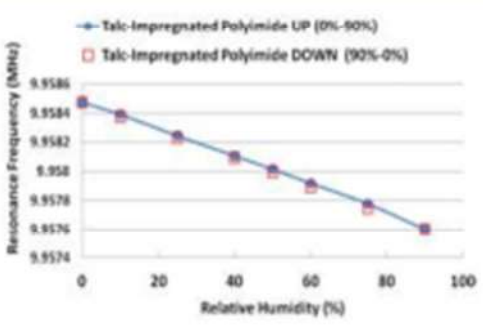


FIG 6 – Talc-polyimide-based QCM response

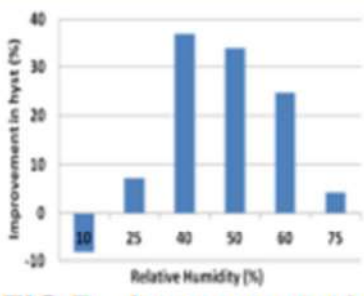


FIG 7 – Improvement in RH hysteresis obtained with talc-impregnated polyimide

Relative humidity sensor and method of forming relative humidity sensor

EP 3,150,999 B1, Issued December 13, 2017

Proprietor: Honeywell International Inc. Morris Plains, NJ 07950 (US)

Inventors: Bogdan-Catalin Serban, Viorel-Georgel Dumitru, Octavian Buiu, Mihai Brezeanu

FIELD OF INVENTION

• Relative humidity (RH) sensing, control and monitoring are of paramount importance in many domestic and industrial applications

• Doped polyaniline-based chemiresistive RH sensors are an attractive option due to their excellent linear response and simplicity

• Drawbacks: de-doping risk and poor mechanical stability of polyanilines, hydrophobic properties of the sensing layer

ORIGINAL APPROACH

• The invention relates to the design and manufacturing process of a new chemiresistive RH sensor employing conductive polyanilines nanofibers as sensing layer. The RH sensor includes a dielectric substrate, two electrodes disposed above a dielectric substrate and a sensing layer

• By doping emeraldine (**FIG. 1**) with calconcarboxylic acid (HA) (**FIG. 2**), the synthesis of new conductive polyanilines nanofibers, sensitive to RH variation, is performed (**FIG. 3**).

• The selected dopants lead to important benefits: the mechanical properties and processability of the sensing layer are improved, polyanilines are less susceptible to de-doping process, the response of the sensor improves.

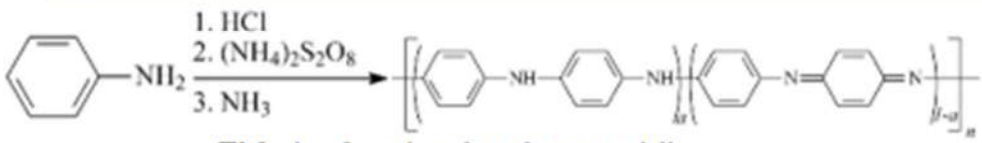


FIG 1 - Synthesis of emeraldine

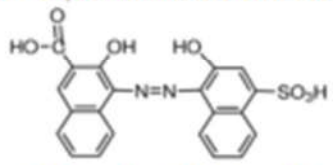


FIG 2 - structure of calconcarboxylic acid (HA)

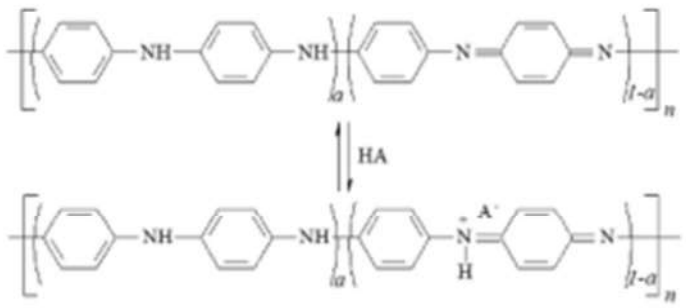


FIG 3 - Doping of emeraldine wit HA

SENSING STRUCTURE & EXPERIMENTAL RESULTS

• The dielectric substrate (50μm – 5 mm thick) can be formed from plastic (Ex: polyethylene terephthalate), glass, or composite materials (Ex: FR4 employed for PCB)

• Electrodes (Al, Cu, Ch) can be deposited onto the surface of the dielectric substrate by using different methods, such as sputtering, direct printing and evaporation. Electrodes can be linear, planar (**FIG 4**) or can have interdigitated configuration (**FIG 5**)

• Sensing layer can be deposited by electrospinning

• RH detection capability is investigated by applying a voltage between the two electrodes and measuring the electrical current flowing through the sensitive layer at various RH levels. The calconcarboxylic acid doped polyaniline polymer absorbs water and the changed geometry of the polymer increases the charge transfer across the polymer chain. RH response is very fast, the current through the sensor changing almost simultaneously with the RH variation (**FIG 6**)

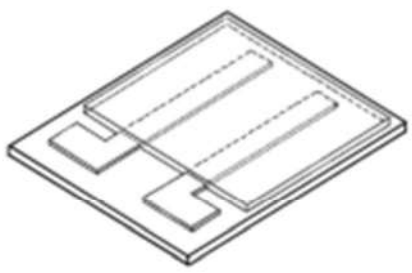


FIG 4 – Sensor with planar electrodes

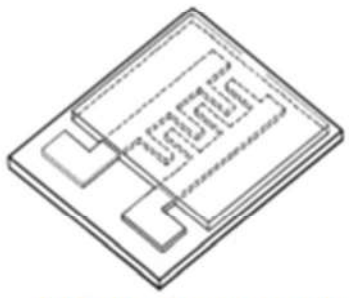


FIG 5 - Sensor with inderdigitated electrodes

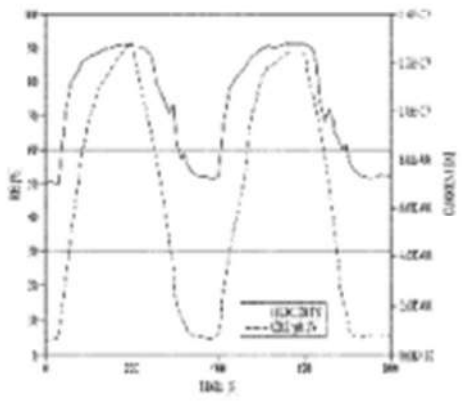


FIG 6 – Sensor RH response

SENSING LAYER FOR OXYGEN DETECTION

EP 2,848,927 B1, Granted September 9, 2015

Proprietor: Honeywell Romania S.R.L. 014459 Bucharest (RO)
Inventors: Bogdan-Catalin Serban, Cornel Cobianu, Mihai Brezeanu, Viorel Avramescu, Octavian Buiu, Viorel-Georgel Dumitru, Mihai Mihaila, Cazimir Bostan

FIELD OF INVENTION

• In harsh environment applications, especially at high RH and high ambient temperature, metal oxide-based resistive oxygen sensors are an inexpensive alternative to the well-known potentiometric zirconia oxygen detectors.
• Drawbacks of the solution: selectivity issues, high power consumption, drift, material degradation, slow response time.

ORIGINAL APPROACH

• This study employs a novel nanocomposite sensing layer based on Sono-STFO40 & CNTs (sono-chemically synthesized $SrTi_{0.6}Fe_{0.4}O_{2.8}$ mixed with carbon nanotubes) exhibiting high sensitivity, fast response time, small drift and improved thermal and mechanical stability

NOVEL SENSING LAYER SYNTHESIS AND CHARACTERIZATION

• A Sono-STFO40 & SWCNTs matrix nanocomposite slurry was synthesized by mixing sono-STFO40 (powder, 50% w/w), single-wall CNTs (5%), terpineol (solvent, 35% w/w), hydroxypropyl cellulose (HPC)(binder, 5% w/w) and capric acid / caprylic acid (equimolecular mixture, surfactant, 5% w/w).
• Sono-STFO40 and sono-STFO40 & SWCNTs matrix nanocomposite were deposited on SOI-based micro-hotplate membranes using a dip pen nanolithography (DPN) system

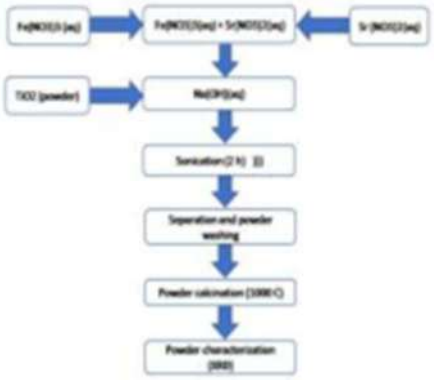


FIG 1 – Route for the synthesis of sono-STFO40

FIG 2 - Argon set-up for sono-STFO40 synthesis

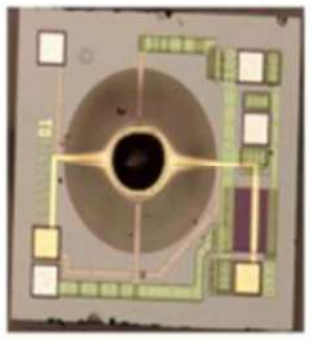


FIG 3 - Top-view of the resistive SOI micro-hotplate-(sono-STFO40 as O_2 sensing layer)

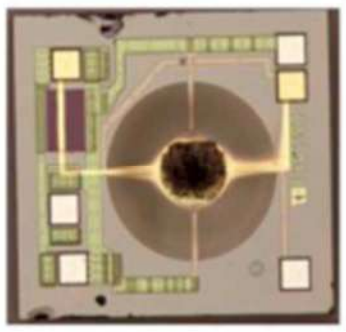


FIG 4 - Top-view of the SOI micro-hotplate (sono-STFO40 & SWCNTs as O_2 sensing layer)

MEASUREMENTS & CONCLUSIONS

• O_2 detection tests (**Figs. 6-7**) on SOI-based micro-hotplates (**Fig. 5**) showed that the presence of the SWCNTs enhances the O_2 response up to 35% for O_2 concentration levels lower than 4% (**Fig. 8**).

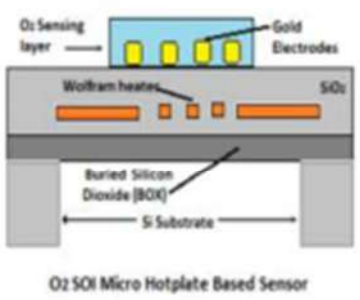


FIG 5 – Tungsten was employed as heater within the SOI micro-hotplate (temperature set at 650^{0}C)

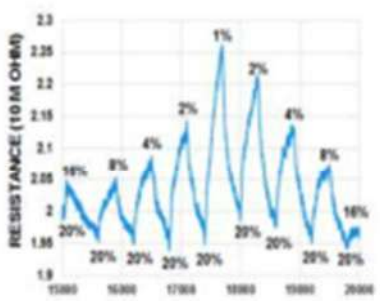


FIG 6 – SOI micro-hotplate-based O_2 resistive sensor response (sono-STFO40 as sensing layer)

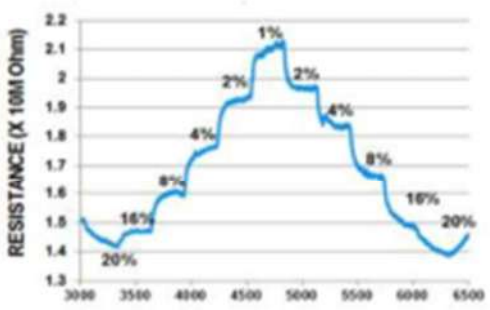


FIG 7 – SOI micro-hotplate-based O_2 resistive sensor response (SWCNTs as sensing layer)

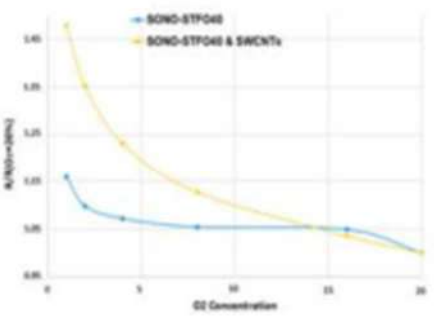


FIG 8 – Comparison of the O_2 response of the 2 sensing layers discussed in this study

DYE-SENSITIZED SOLAR CELLS AND METHOD OF MAKING SAME

EP 2,838,128 B1, Issued 06 01 2016
Bogdan-Catalin Serban, Cristian Diaconu, Mihai Mihaila, Octavian Buiu

FIELD OF INVENTION

- Dye-sensitized solar cells (DSSCs) are alternative to p-n junction photovoltaic cells
- In DSSCs, light is absorbed by a sensitizer (anchored to a semiconductor surface)
- Charge separation takes place at the interface via photo-induced electron injection from dye into solid conduction band → Carriers are transported in semicond. conduction band to charge collector
- Employment of sensitizers with broad absorption band in conjunction with oxide films of nanocrystalline morphology permits harvesting a large fraction of sunlight

ORIGINAL APPROACH

- This invention is focused on synthesis, design and application to the DSSC of new 10H-phenoxazine- or triphenylamine-based dyes
- Dye design (push–pull concept) comprises substituted phenoxazine/triphenylamine as electron donor and cyanoacrylic acid as anchoring group and electron acceptor connected by a p-conjugated spacer

DESIGN OF MOLECULES

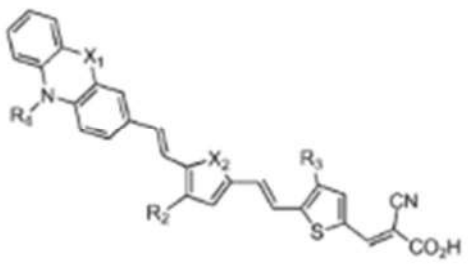


FIG 1 - Molecular structure of the dye1, wherein X_1 is oxygen or sulfur, R_4 is alkoxyaryl or C_3-C_{18} alkyl, R_3 is hydrogen or C_3-C_{18} alkyl, X_2 is oxygen or sulfur

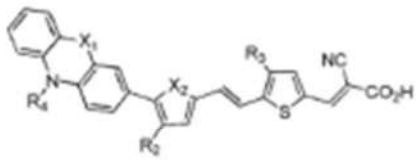


FIG 2 - Molecular structure of dye wherein X_1 is oxygen or sulfur, R_4 is alkoxyaryl or C_3-C_{18} alkyl, R_3 is hydrogen or C_3-C_{18} alkyl and X_2 is oxygen or sulfur

- In collaboration with M.D Damaceanu, C.-P. Constantin, S. Chisca (Petru Poni Institute of Macromolecular Chemistry), **molecule BCS-1**, designed and claimed in this patent, was synthesized for the first time (Fig. 3)

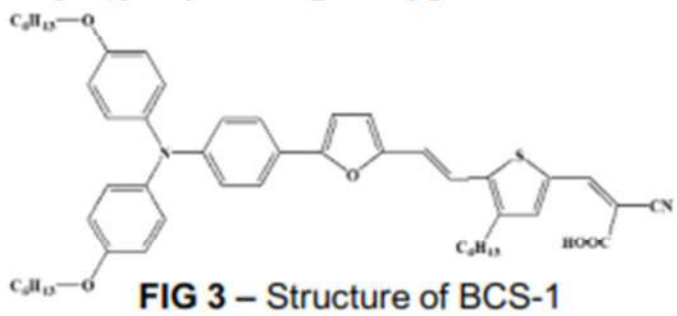
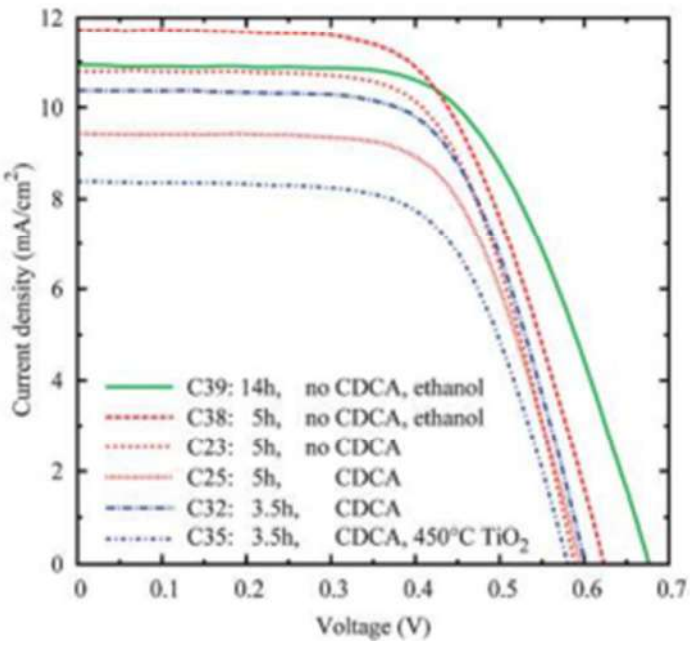


FIG 3 – Structure of BCS-1

CELL CHARACTERISTICS

- 4 cells (C35, C32, C25, C23) were prepared by immersing the TiO_2 film in a dye solution of acetonitrile and tetrahydrofuran (6:4; v/v)
- For 2 cells (C38, C39), the TiO_2 film was functionalized in acetonitrile:THF: ethanol (6:2:2, v/v/v)
- For cell C39, **the yield was 5.41**, with no coadsorbant or optimization

FIG 4 – I–V characteristics of 6 cells realized with different solvent combinations and soaking times, with and without chenodeoxycholic acid (CDCA), with (450^0 C) and without re-firing of the TiO_2 film; I–V characteristics of C38 and C39 were acquired at 0.88 Sun
Ref: M. D. Damaceanu, et al., RSC Adv., 2015, 5, 53687



ACKNOWLEDGMENT

- Honeywell Romania SRL acknowledges the financial support of the Romanian National Agency of Scientific Research through contract 274/2010 (European Union Structural Funds)

Controlled Atmosphere for STOrage facilities of fruits and vegetables: a Low-cost multidisciplinary solution (CASTOL)

Bogdan-Catalin Serban, Octavian Buiu, Cristina Mihaela Nicolescu, Marius Bumbac, Robert Ropotan

Scope:

Development of an innovative low-cost solution to preserve good quality of fresh food and vegetables in controlled atmosphere storage facilities.

Original Approach:

The project aims at contributing to food waste levels decrease by merging multidisciplinary concepts and achievements (Internet of Things & Phytochemistry)

Data provided by the smart sensing platforms from monitoring the controlled atmosphere (CA) environments, together with data provided by the evaluation and monitoring procedures of fresh fruits/vegetables quality will emerge in a low-cost toolbox to be used in various storage spaces

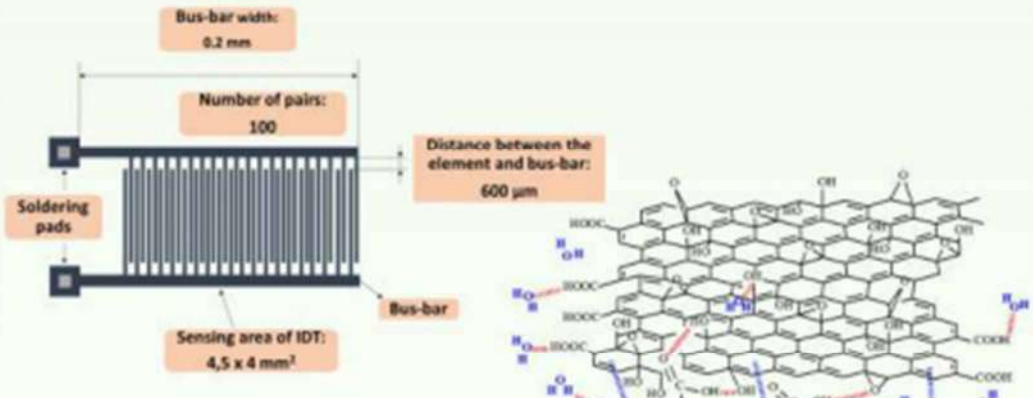
Advantages of the device under development:

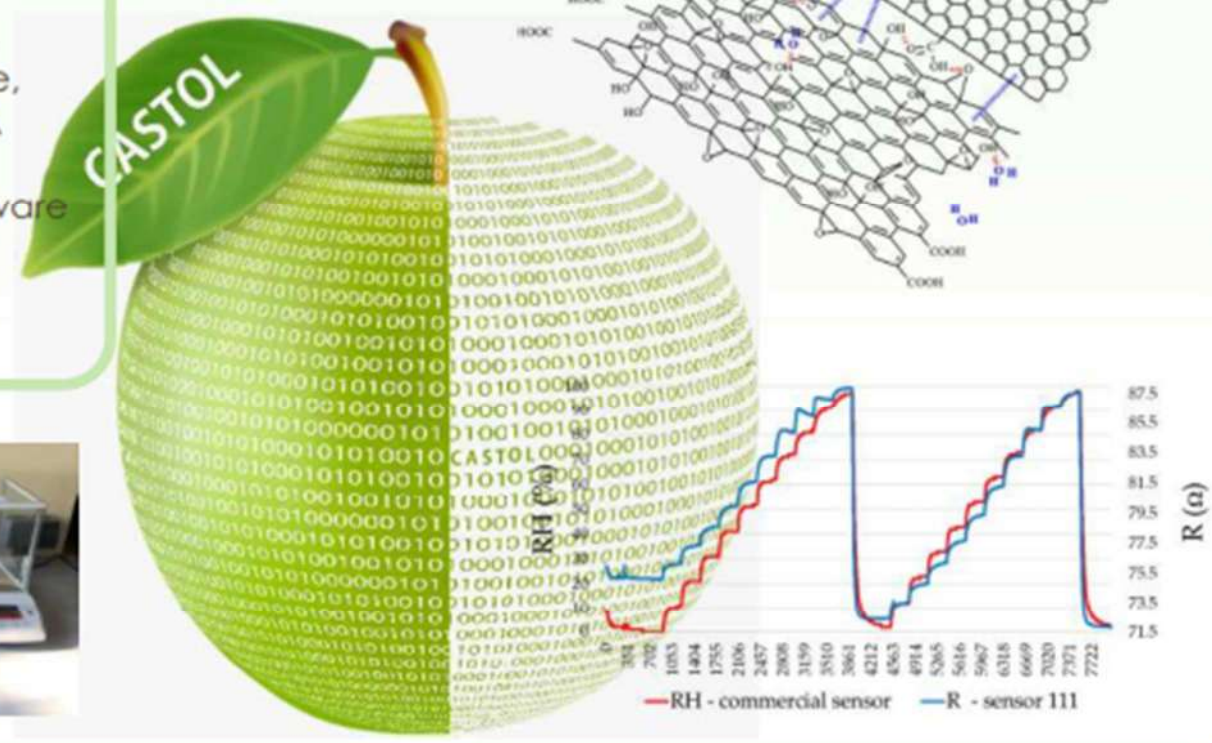
versatility – may be applied in various storage environments along the food distribution chain (production sites, transportation containers, distributors sites, supermarkets, etc)

affordability - the device to be designed and tested is previewed as a low-cost solution, both the hardware (sensors array) for controlled atmosphere monitoring, and also the procedures for quality evaluation of stored fresh fruits & vegetables will be qualified based on a cost-efficiency analysis performed on different technical solutions

Specific Objectives:

- smart sensing platform (RH, O_2, CO_2, VOC, temperature) for low-cost monitoring of CA storage facilities
- cost-efficient quality monitoring procedure for fresh fruits and vegetables (patterns of phytochemical characteristics, degree of ripening, senescence, alteration) during storage in CA facilities
- low-cost toolbox with CA hardware monitoring and decision methodology for fresh fruits/vegetables storage





Partners:

National Institute for Research and Development in Microtechnology IMT-Bucureşti
Valahia University of Târgovişte
SC Con Cub Media SRL

Project PN-III-P2-2.1.-PED-2019-5248, 2020 – 2022.

INCD pentru Fizica Materialelor
National Institute of Materials Physics

Atomistilor street, No. 405A, Magurele 077125, Ilfov, Romania, e-mail : director@infim.ro, web : www.infim.ro

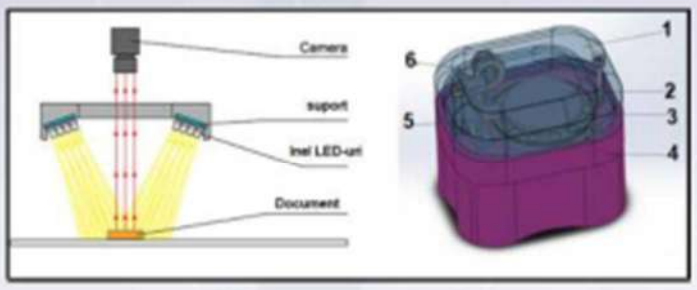
Echipament pentru vizualizarea insemnelor de securizare fluorescente Anti-Stokes de pe documente

M. Secu, A.C. Galca, S. Polosan, G. Alexandru, M. Cioca, G. Dobrescu, A.M. Ighigeanu

Domeniul de aplicabilitate: vizualizarea caracterelor de securizare pe baza de cerneluri fluorescente Anti-Stokes

Echipamentele actuale: cititoare ce folosesc surse de iluminare cu fascicul punctual de tip dioda laser

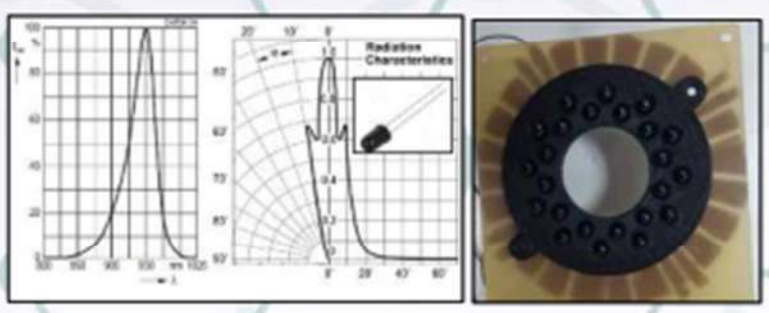
Problema pe care o rezolva inventia este legata de realizarea unui echipament pentru detectarea insemnelor de securizare documente folosind sursa de iluminare IR de tip spot pe baza de LED-uri



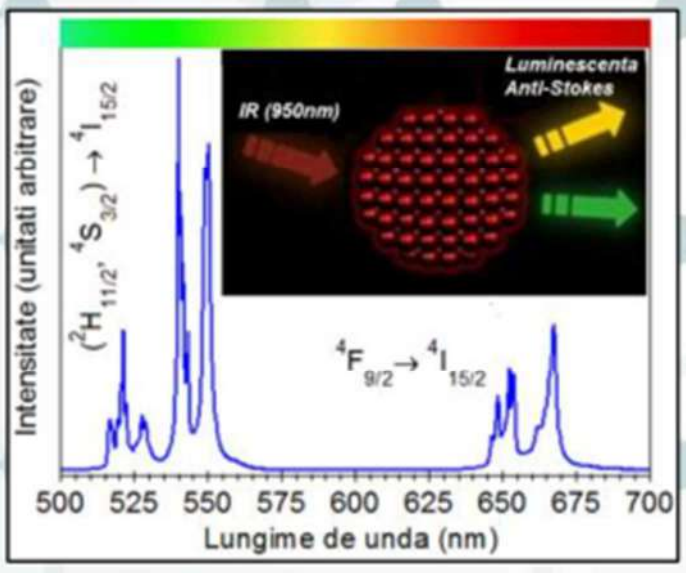
Echipamentul este compus din: sursa de iluminare inelara (3) cu sursa de alimentare (5), o camera CCD web (2) pentru preluarea imaginilor, toate incorporate intr-o incinta optic etansa (1).

Sursa de iluminare inelara, este formata din 24 LED-uri (lungimea de unda 950nm) si asigura o iluminare spot de aprox 1cm diametru si iradianta totala de 248mW/cm^2 la o distanta de 5cm.

Valoarea iradiantei este peste nivelul MINIM de aprox. 272mW/cm^2 necesar pentru vizualizarea (la limita de observare) a fluorescentei datorate cernealii Anti-Stokes.



Fluorescenta Anti-Stokes emisa in domeniul vizibil *("galbe-verde")* de catre caracterele tiparite pe document/inscris este preluata de camera CCD si vizualizata pe monitorul PC.



Testarea la nivel de laborator (INCDFM)

Concluzie: S-a construit si testat un echipament pentru vizualizarea/detectia insemnelor de securizare de pe documente si inscrisuri folosind sursa de iluminare IR (950nm) de tip spot.

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INCD pentru Fizica Materialelor
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Procedeu de procesare rapida pentru fabricarea corpurilor solide supraconductoare de MgB_2

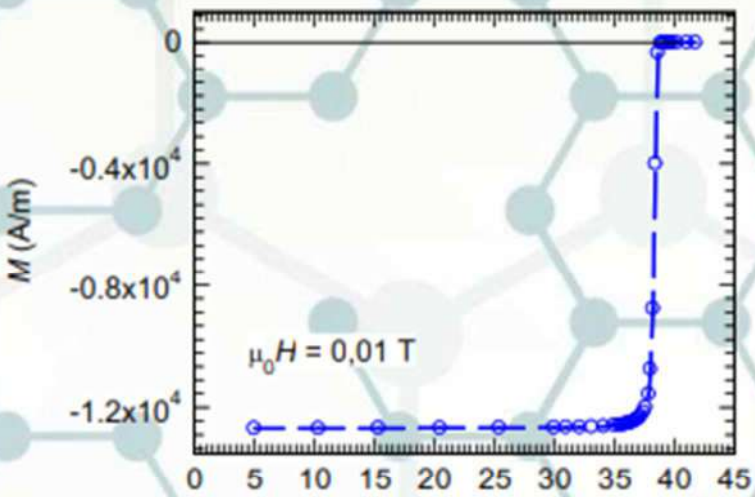
Fast processing technology for the fabrication of superconducting MgB_2 bulks

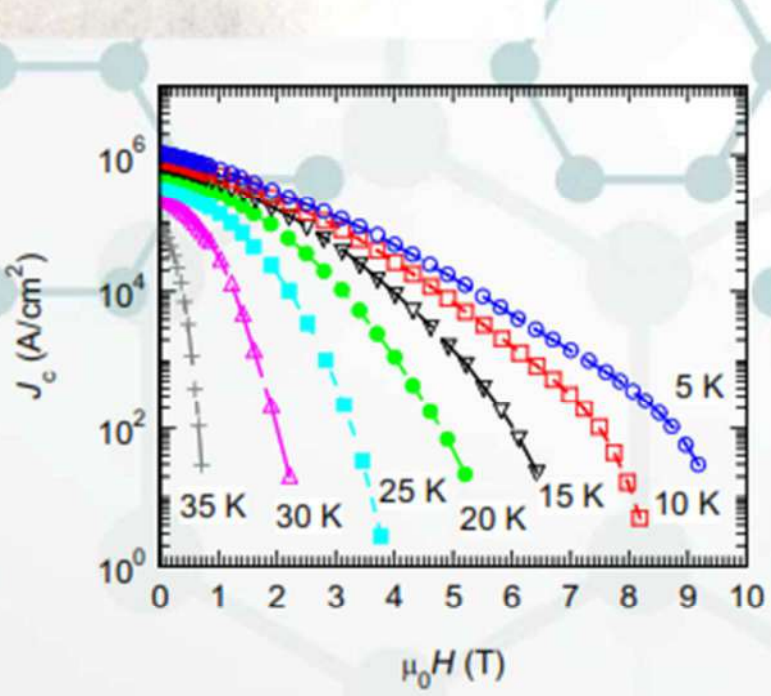
Petre BĂDICĂ, Mihail BURDUŞEL, Mihai Alexandru GRIGOROŞCUŢĂ, Gheorghe Virgil ALDICA

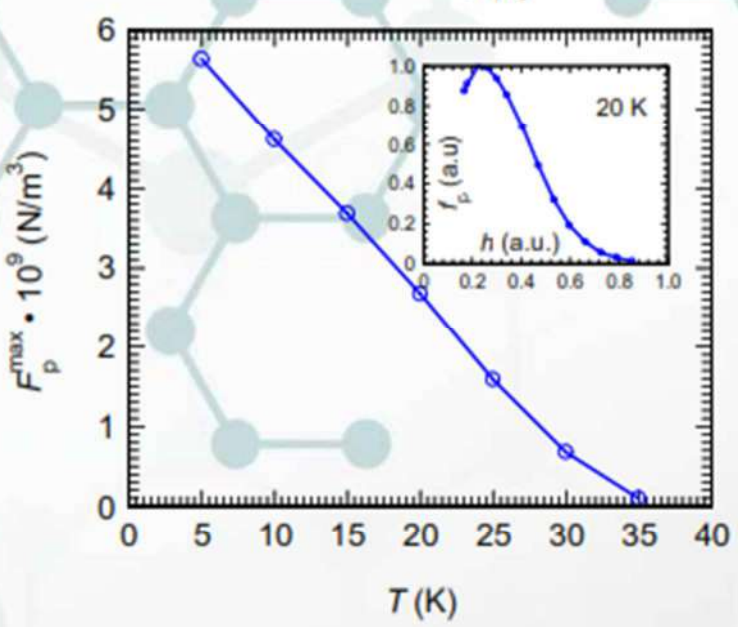
Institutul National de Cercetare si Dezvoltare pentru Fizica Materialelor, 077125, Magurele, Ilfov, Romania

Corpuri supraconductoare dense pe baza de MgB_2 pur sau aditivat cu diferite adaosuri, caracterizate prin aceea ca sunt supuse unei sinterizari asistata de un camp electric intens (SPS/FAST), folosind o incalzire rapida cu o viteza de 1000 °C/ min si folosind matrite modificate cu cilindrii izolatori. Supraconductorii masivi pe baza de MgB_2 pot fi utilizati in limitatoarele de curent, echipamente si motoare electrice de putere, stocare, tranfer si generare de energie, separare/purificare magnetica, aplicatii medicale, transport, spatiale, instrumente stiintifice, etc.

Dense superconducting bulks based on pure MgB_2 or with different additions, are obtained by Spark Plasma Sintering technique (SPS/FAST), using a fast heating with a speed of 1000 °C/ min and a modified graphite mold containing cylindrical insulating ceramic inserts. Superconductor bulks based on MgB_2 can be used in current limiters, electrical equipments and motors, storage, transfer and power generation, magnetic separation / purification, medical devices, transport, space, scientific instruments and others.







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Memcomputing in Ferroelectric Heterostructures/ Memcomputing in heterostructuri ferroelectrice

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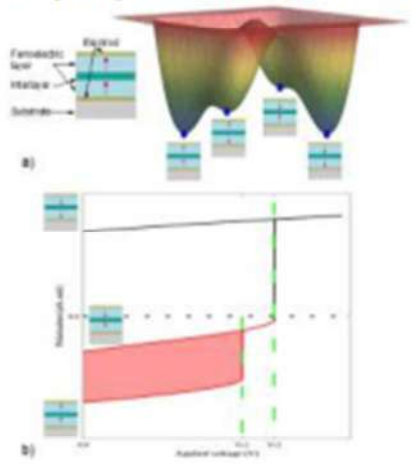
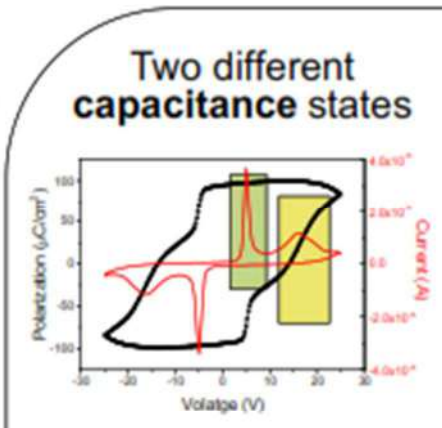
Motivation

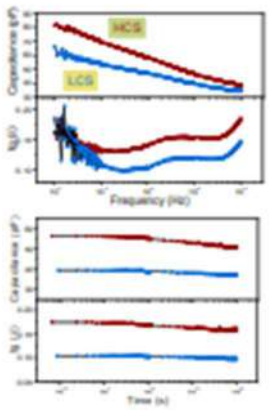
Ferroelectric structures are important for technology due to their wide spectrum of properties and considerable potential for applications, one of the most known being ferroelectric random-access memory (FeRAM). A recent challenge for the research in the field of ferroelectric materials is the manufacturing of simple, two terminal electronic elements for memcomputing (memorizing and computing on the same physical platform), which are obtained so far from a resistive switching phenomena. Here we experimentally and theoretically demonstrate a novel property of ferroelectric structures: capacitive switching in two terminal multilayered structures. We examine both digital and analog storing schemes and the possibility of operating simple binary logic functions. The results are obtained by the fine control of polarization switching process in ferroelectric multilayers as Pb(Zr,Ti)O3 (PZT)/SrTiO3 (STO)/ Pb(Zr,Ti)O3 (PZT) or Pb(Zr,Ti)O3 (PZT)/BaTiO3 (BTO)/ Pb(Zr,Ti)O3 (PZT). New applications can be imagined based on these properties as non-destructive reading, memcomputing, building neuromorphic circuits or chaotic circuits.



The theoretical description of stable ferroelectric states and the switching between them based on the LGD model. a) The free-energy landscape (energy vs polarization of each ferroelectric layer) of an *F-I-F* structure in equilibrium. (b) The positive polarization hysteresis branch of an *F-I-F* heterostructure and the schematic representation of the polarization orientation in each ferroelectric layer for different states.

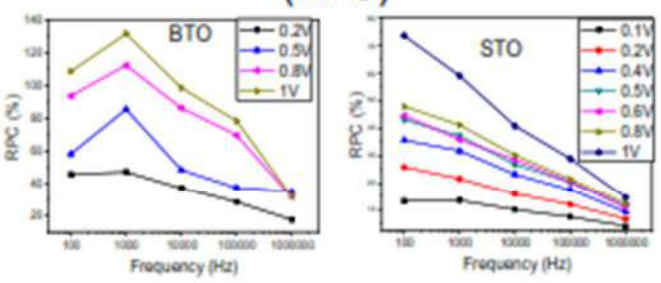
Two different **capacitance** states





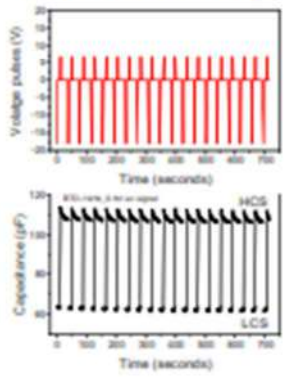
The capacitive measurement is a non-destructive reading operation

The relative variation of capacitance between the two polarization states (RPC)

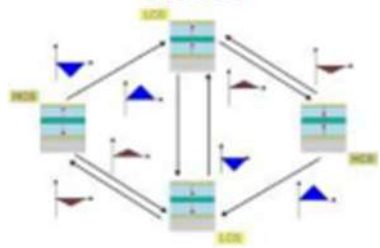


$$RPC(\%) = \frac{C_{HC} - C_{LC}}{C_{LC}} * 100$$

Stability in time and reproducibility

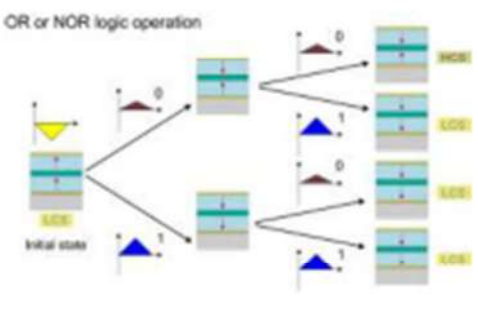


The switching possibilities between the four polarization states

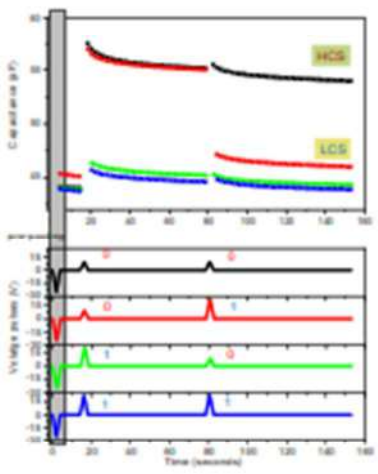


OPERATING LOGIC FUNCTIONS

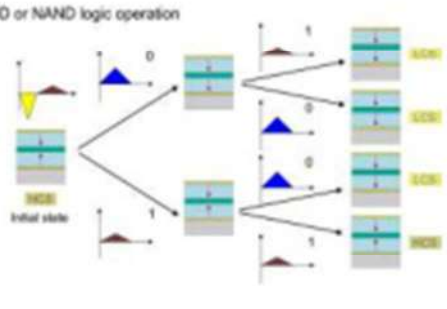
OR or NOR logic operation



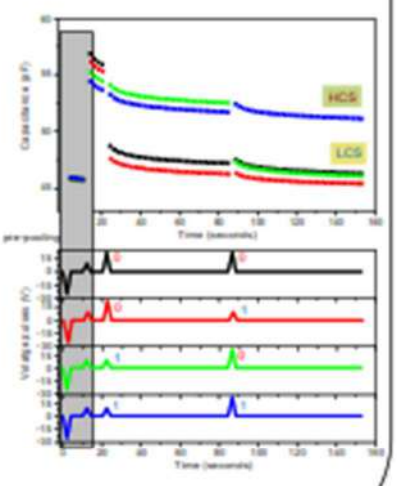
Input 1	Input 2	Final state	OR output	NOR output
0	0	Hc	0	1
0	1	Lc	1	0
1	0	Lc	1	0
1	1	Lc	1	0



AND or NAND logic operation



Input 1	Input 2	Final state	AND output	NAND output
0	0	Lc	0	1
0	1	Lc	0	1
1	0	Lc	0	1
1	1	Hc	1	0



Conclusions

- Multiple polarization states are obtained by the sequential polarization switching in the component ferroelectric layers. Also this study evidenced that **different capacitive states** characterize a state of partially switched polarization and a state of totally reversed polarization.
- Different capacitive states: **non-volatile memory** with **non-destructive reading** and the ability to perform binary logic operations on the same chip-**memcomputing**.
- **Boolean logic operation on a capacitor structure-** the current circuit architecture based on classic logic gates can be simplified and optimized, leading also to significantly reduced power consumption and reduced cost of manufacturing.

References

1) Titlu: Memorie capacitiva si metoda de operare/ Capacitive memory and operation method
Nr. CBI: A/2018/00363 din 23.05.2018
Autori: Boni Georgia Andra, Chirila Cristina, Hrib Luminita, Viorel Dumitru, Pintilie Ioana, Pintilie Lucian
2) Titlu: Circuite logice cu memorii capacitive/ Logic circuits with capacitive memory
Nr. CBI: A/2018/00560 din 31.07.2018
Autori: Boni Georgia Andra, Chirila Cristina, Hrib Luminita, Viorel Dumitru, Pintilie Ioana, Pintilie Lucian
3) G.A. Boni et all., Memcomputing and Nondestructive Reading in Functional Ferroelectric Heterostructures, PHYSICAL REVIEW APPLIED 12, 024053 (2019)

Acknowledgement:

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Metoda de caracterizare dielectrica a structurilor ferroelectrice in relatie cu reversarea polarizarii/ A new method of dielectric characterization in relation with polarization reversal for ferroelectric structures

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Motivation

A new measurement method is proposed for dynamically characterizing the dielectric properties of the ferroelectric structures or for structures with nonlinear response in applied electric field. The proposed method is based on the analyzation of the current during a trapezoidal voltage pulse. The results are based on considering an equivalent parallel RpCp circuit for the ferroelectric structure and analyzation of the current for different temporal moments. Thus the results is the evaluation of the Rp and Cp values in relation with different polarization degrees of the ferroelectric structure.

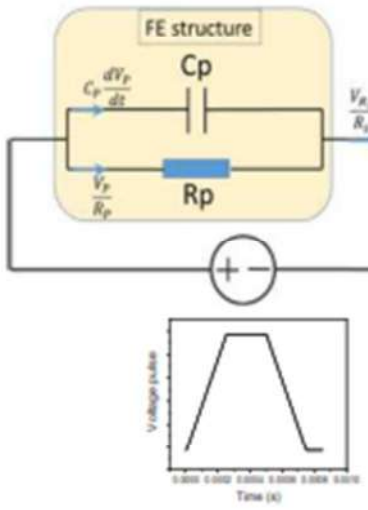

Figure 1 (a) The equivalent circuit of a ferroelectric capacitor; main current components are depicted

Theoretical considerations

The current through the circuit is given by:

$$I = \frac{V_{Rs}}{R_s} = \frac{V_R}{R_p} + C_p \frac{dV_p}{dt} = C_{Total} \frac{dV_p}{dt}$$

The applied voltage V_{app} is given by:

$$V_{app} = V_p + V_{R_s}$$

If $R_s \ll R_p$, then $V_{app} \approx V_p$ and:

$$I = \frac{V_{app}}{R_p} + C_p \frac{dV_{app}}{dt}$$

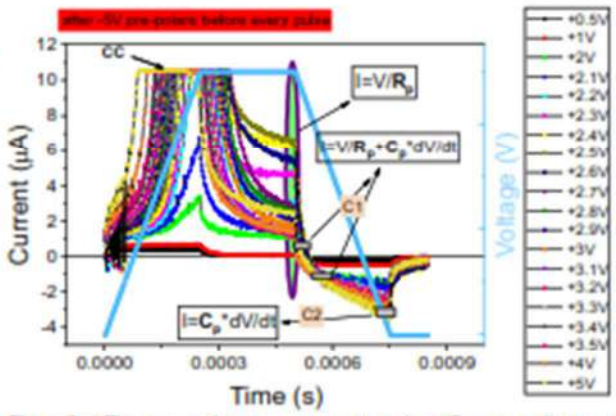

Figure 2 a) The current-time measurements during different amplitudes of unipolar trapezoidal pulses for an upward pre-polarization of the structure; In this figure temporal point from which C1, C2 and Rp are evaluated from the current values during the trapezoidal pulse are market.

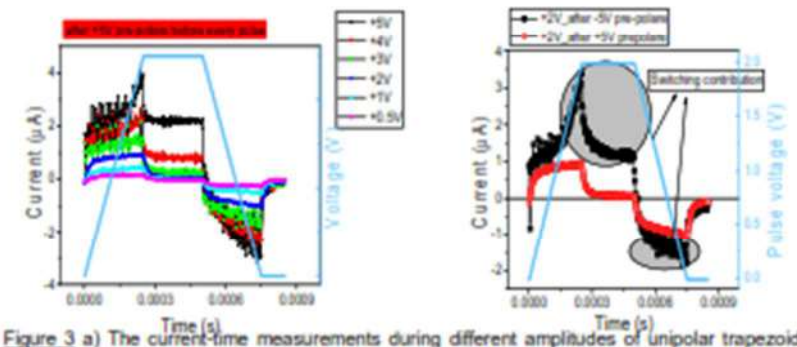

Figure 3 a) The current-time measurements during different amplitudes of unipolar trapezoidal pulses for a downward pre-polarization of the structure. b) Comparison between two current-time measurements for the same amplitude of the pulse around coercive voltage, but for different initial polarization states.

The dielectric characterization obtained on a simple PZT based thin film capacitor

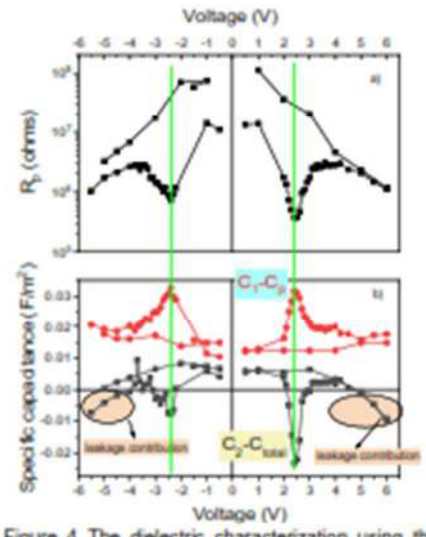

Figure 4 The dielectric characterization using the new method (a) the Rp values obtained for different amplitudes of trapezoidal pulses (b) the C1 (Cp) and C2 (Ctotal) values obtained for different amplitudes of the trapezoidal pulses.

- **C1 (or Cp)** behaves like in "static" C-V characteristic
- **C2 (Ctotal)** shows **negative capacitance (NC)** at switching
- **Rp** drops at switching
- **Rp** dominates the impedance of the ferroelectric capacitor at switching inducing the NC effect
- NC can occur at large voltages also due to significant increase of leakage current
- analogy with parallel R_p-C_p equivalent circuit, the total a.c. capacitance/ complex capacitance is defined by:

$$C_{total}(\omega) = C_p - \frac{i}{\omega R_p} = C' + iC''$$

$$D = \frac{|C''|}{|C'|}$$

- C_p increases during switching, while R_p decreases and its contribution to the C_{total} becomes significant. There is a moment when $C'' \gg C'(D = tan\delta = \frac{C''}{C'} > 1)$ (δ is the loss angle) and C_{total} is determine predominantly by the resistive component.

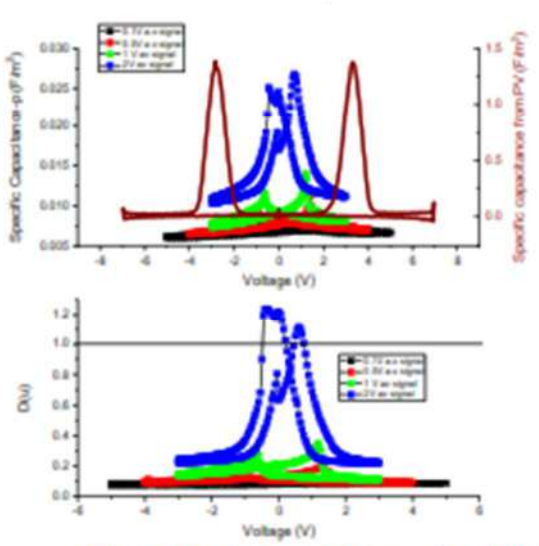

Figure 5 The classic quasi-static capacitance/dielectric losses measurement as function of voltage, for different voltage amplitudes of the a.c. signal by using a LRC bridge

Conclusions

- The evaluation of the Cp and Rp equivalent circuit characteristics for a FE capacitor during switching results in a two orders of magnitude decreasing of the Rp and doubling the Cp values at the coercive voltage.
- The total capacitance has a minima with negative values and suggest that a NC during switching is associated also with a modification of the conductivity as for other NC semiconductor systems. In the case of the ferroelectrics, modification of the resistivity could be associated with a charge flow for polarization compensation after reversal of the direction.
- A good equivalence with classic dielectric characterization.

References

Metoda de caracterizare dielectrica a structurilor ferroelectrice in relatie cu reversarea polarizarii
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Autori: Boni Georgia Andra, Chirila Cristina, Pintilie Lucian

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Procedeu de reducere fotocatalitică a apei în prezență de fotocatalizatori eterogeni oxizi micști de nichel, zinc și titan

Process for photocatalytic reduction of water in the presence of heterogeneous photocatalysts mixed oxides of nickel, zinc and titanium

Ștefan Neațu, Florentina Neațu, Mihaela Florea, Mihaela-Mirela Trandafir

REZUMAT

Pentru prima dată, demonstrăm în România, realizarea unui procedeu de reducere fotocatalitică a apei în prezența fotocatalizatorilor eterogeni oxizi micști pe bază de nichel, zinc și titan preparați prin metoda de depunere-precipitare. Procedeul constă în reducerea fotocatalitică a apei în absența/prezența unor agenți de sacrificiu la temperaturi cuprinse între 35 și 45 °C, presiuni cuprinse între 2 și 3 atm și sub iradiere cu lumină UV folosind fotocatalizatori oxizi micști pe bază de Ni, Zn și Ti sintetizați prin metoda de depunere-precipitare. Procedeul de preparare a fotocatalizatorilor este caracterizat prin aceea că se realizează prin metoda de depunere-precipitare a precursorilor de Ni și Zn aflați în diverse rapoarte molare pe suprafața TiO_2 prin utilizarea hidrazinei monohidrat, uscare efectuată la temperaturi între 90 și 110 °C sub vid, stabilizare termică la temperaturi cuprinse între 300 și 500 °C, un timp cuprins între 3 și 7 ore și reduse sub un flux constant de H_2 la o temperatură cuprinsă între 250 și 450 °C, un timp cuprins între 1 și 3 ore.

ABSTRACT

For the first time, we demonstrate in Romania, the realization of a process for photocatalytic reduction of water in the presence of heterogeneous photocatalysts mixed oxides of nickel, zinc and titanium prepared by deposition-precipitation method. The process consists in the photocatalytic reduction of water in the absence/presence of some sacrificial agents at temperatures between 35 and 45 °C, pressures between 2 and 3 atm and under iradiation with UV light using photocatalysts mixed oxides of Ni, Zn and Ti synthesized by deposition-precipitation method. The preparation procedure is characterized by the fact that it is carried out by the deposition-precipitation of Ni and Zn precursors in various molar ratios on the surface of TiO_2 by using hydrazine monohydrate, drying at temperatures between 90 and 110 °C under vacuum, thermal stabilization at temperatures between 300 and 500 °C for a time between 3 and 7 h and reduced under a constant flow of H_2 at a temperature between 250 and 450 °C for a time between 1 and 3 h.

***Figure 1**. The XRD patterns of the TiO_2 Evonik P25 (black line) and the Ni-Zn/TiO_2 (9:1) photocatalyst (red line) and their corresponding phase assignments (A−anatase and R−rutile). The Ni metallic crystallographic phases (PDF card no. 01-070-0989) are presented as *.*

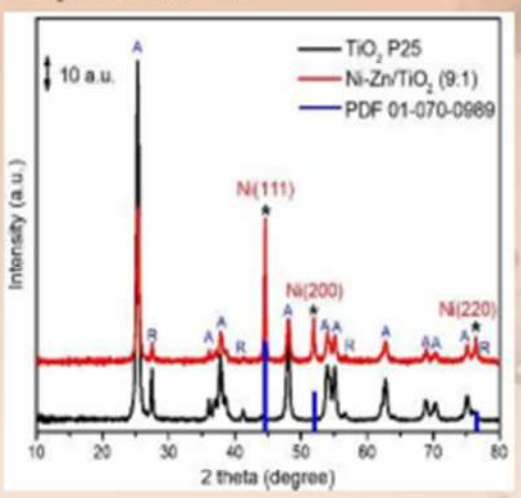

***Figura 1**. Difractogramele XRD ale TiO_2 Evonik P25 (linia neagră) și ale fotocatalizatorului Ni-Zn/TiO_2 (9:1) (linia roșie) și pozițile corespunzătoare fazelor de TiO_2 (A−anatas și R−rutil). Fazele cristaline ale Ni metalic (PDF card nr. 01-070-0989) sunt reprezentate ca *.*

Mulțumiri (Acknowledgements):
PN-III-P1-1.1-TE-2016-1924

***Figure 2**. The XP spectrum of the Ni-Zn/TiO_2 (9:1) photocatalysts in the (a) Ti 2p, (b) Ni 2p, (c) Zn 2p and (d) O 1s region, respectively.*

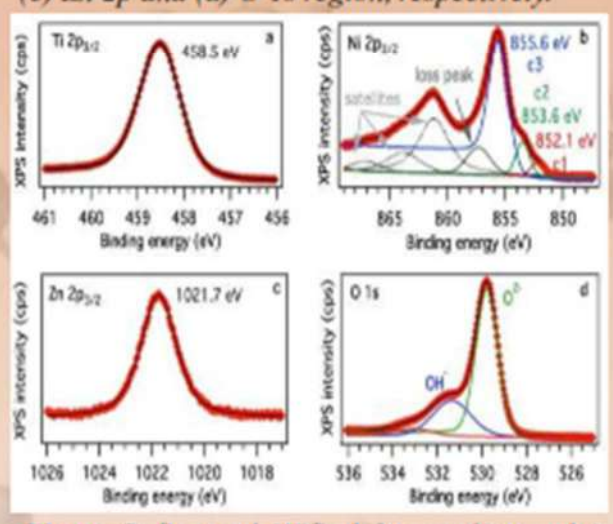

***Figura 2**. Spectrul XPS al fotocatalizatorului Ni-Zn/TiO_2 (9:1) în regiunea (a) Ti 2p, (b) Ni 2p, (c) Zn 2p și respectiv (d) O 1s.*

Set-up-ul fotocatalitic utilizat în acest studiu
(The photocatalytic set-up used in this study)

***Figure 3**. The time course of overall water splitting reaction on Ni-Zn/TiO_2 (9:1) photocatalyst. Reaction conditions: 0.025 g of photocatalyst dispersed in 25 mL of deionized water; irradiation with a MAX-303 illuminator (Asahi Spectra) with UV mirror module (250-385 nm).*

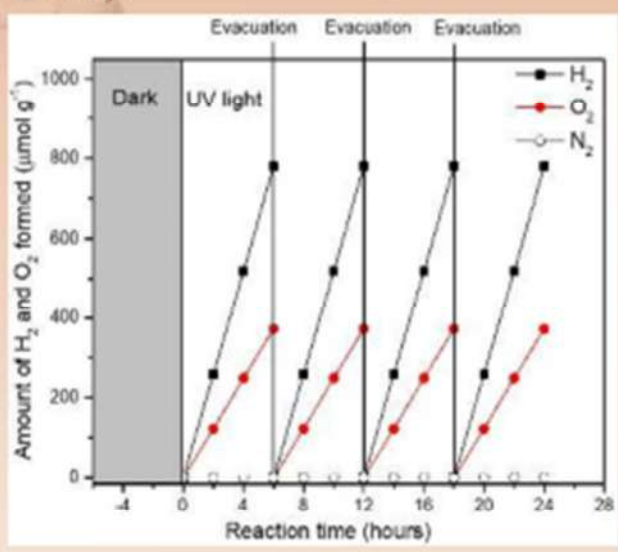

***Figura 3**. Evoluția temporală a reacției globale de descompunere a apei pe fotocatalizatorul Ni-Zn/TiO_2 (9:1). Condiții de reacție: 0.025 g fotocatalizator dispersat în 25 mL apă deionizată; iradiere cu un iluminator MAX-303 (Asahi Spectra) dotat cu modul UV (250-385 nm).*

F. Neatu, L.E. Abramiuc, M.M. Trandafir, R.F. Negrea, M. Florea, C.M. Teodorescu, S. Neatu, *ChemCatChem*, **2020**, *12*, 4642–4651;
DOI: 10.1002/cctc.202000691

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Procedeu de oxidare selectivă a *p*-cimenului din surse regenerabile în prezență de catalizatori eterogeni oxizi micști pe bază de cobalt

Selective oxidation process of *p*-cymene from regenarable sources in presence of Co-based catalysts

Florentina Neațu, Ștefan Neațu, Mihaela Florea

REZUMAT

Pentru prima dată, demonstrăm în România, realizarea unui procedeu de oxidare selectivă a *p*-cimenului, obținut din surse regenerabile, în prezența catalizatorilor eterogeni oxizi micști pe bază de Co. Procedeul constă în oxidarea selectivă a *p*-cimenului în fază lichidă în prezență de diferiți agenți oxidanți (H_2O_2, O_2 sau aer) la temperaturi cuprinse între 80 și 150 °C și presiuni cuprinse între 8 și 40 atm folosind catalizatori oxizi micști pe bază de Co sintetizați, prin diferite metode. Utilizarea acestor catalizatori înlătură dezavantajele procesului clasic de sinteză a acidului tereftalic, fiind ușor de manipulat, pot fi separați din mediul de reacție și reutilizați, produc conversii și selectivități ridicate, astfel fiind respectate prevederile pentru respectarea mediului înconjurător, iar costurile procedeului la nivel industrial scad.

ABSTRACT

For the first time, we demonstrate in Romania, the realization of a selective oxidation process of *p*-cymene, obtained from renewable sources, in the presence of Co-based mixed oxides heterogeneous catalysts. The process consists in the selective oxidation of *p*-cymene in liquid phase in the presence of different oxidizing agents (H_2O_2, O_2 or air) at temperatures between 80 and 150 °C and pressures between 8 and 40 atm using Co-based mixed oxide catalysts synthesized by various methods. By using these catalysts, the disadvantages of the classical process of terephthalic acid synthesis are limited, being more easy to handle, can be separated from the reaction medium and reused, produce high conversions and selectivities, being more environmental friendly, and the process costs at the industrial level are reduced.

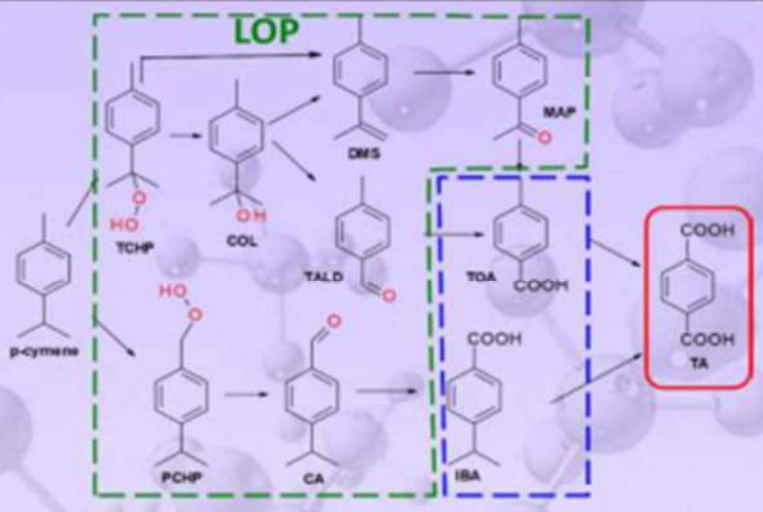

***Figura 1**. Produșii de reacție puși în evidență în reacția de oxidare selectivă a p-cimenului în prezență de oxizi micști pe bază de Co. (TCHP – terț-cimen hidroperoxid; p-DMS – p-dimetil stiren; p-MAP – p-metil acetofenona; p-TAld – p-tolualdehida; p-TA – acid p-toluic; PCHP – hidroperoxid primar de cimen; CA– cuminaldehidă; p-IBA – acid p-izopropilbenzoic; TPA –acid tereftalic).*

***Figure 1**. Reaction products evidenced in selective oxidation reaction of p-cymene, in presence of Co-based mixed oxides. (TCHP – tertiary cymene hydroperoxide; p-DMS – p-dimetil stiren; p-MAP – p-methylacetophenone; p-TAld – p-tolualdehyde ; p-TA – p-toluic acid; PCHP – primary cymene hydroperoxide; CA– cuminaldehyde; p-IBA – p-isopropylbenzoic acid ; TPA – terephthalic acid)*

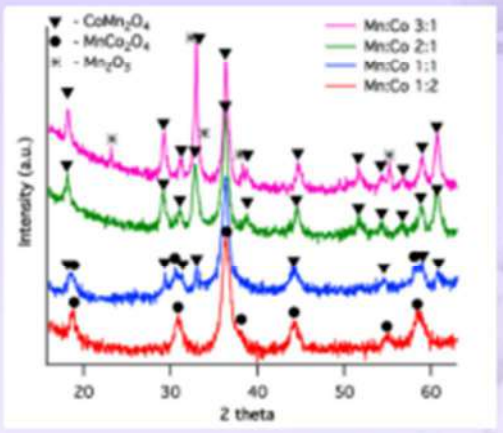

***Figura 2**. Difractogramele XRD pentru probele Mn-Co preparate prin metoda citrat arată că s-au format una sau ambele structuri de spinel $MnCo_2O_4$ și $CoMn_2O_4$ în funcție de raportul Mn:Co.*

***Figure 2**. XRD diffractograms for Mn-Co samples prepared by the citrate method show depending on the Mn:Co ratio, one or both spinel structures $MnCo_2O_4$ and $CoMn_2O_4$.*

Cristale de acid tereftalic obținute în urma transformării p-cimenului

Terephthalic acid crystals obtained dyring p-cymene transformation

Parametrii de operare:
6÷10 mmoli *p*-cimen,
8÷40 atm O_2,
50÷100 mg catalizator,
temperatura 80÷150 °C.

Operational parameters:
6÷10 mmols *p*-cymene,
8÷40 atm O_2,
50÷100 mg catalyst,
temperature 80÷150 °C.

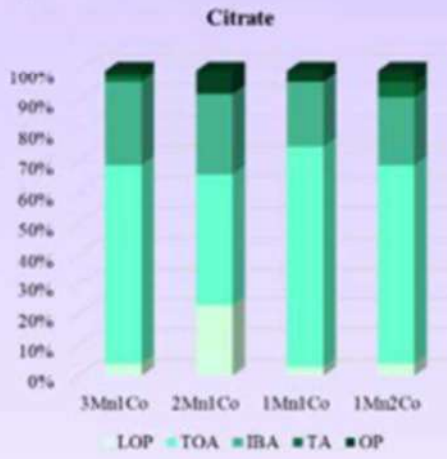

***Figure 3**. Performanțele catalitice ale oxizilor micști Mn-Co, în termeni de distribuție ai produșilor, obținuți în timpul oxidării parțiale a p-cimenului, pentru o conversie de 100% a precursorului.*

***Figure 3**. Catalytic performance of Mn-Co mixed oxides, in terms of product distribution, obtained during the partial oxidation of p-cymene, at 100% conversion of the precursor.*

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SISTEM INTEGRAT DE RECUPERARE A ENERGIEI TERMICE SOLARE ȘI DIN PROCESUL DE COMPOSTARE

INTEGRATED SYSTEM FOR THE RECOVERY OF THERMAL ENERGY BOTH SOLAR AND FROM THE COMPOSTING PROCESS

Patent Application No. A-00722 / 2020

Authors: CIUPERCĂ Radu, ZAICA Ana, NEDELCU Ancuța

Invention Classification:
6. Mechanical Engineering - Metallurgy

DESCRIERE:

Invenția se referă la un sistem integrat de recuperare a energiei termice solare și din procesul de compostare a deșeurilor biodegradabile, pe care o transferă unei instalații pentru producerea de apă caldă menajeră, destinat fermelor mici și gospodăriilor individuale.

DESCRIPTION:

The invention relates to an integrated system for the recovery of thermal energy both solar and from the composting process of biodegradable waste, which it transfers to an installation for the production of domestic hot water, intended for small farms and private households.

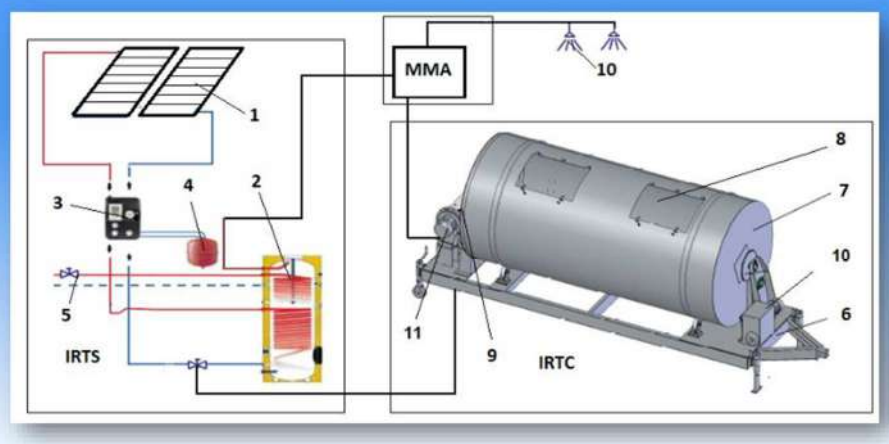
COMPONENȚĂ:

Sistemul integrat de recuperare a energiei temice solare şi din procesul de compostare, conform invenţiei, este alcătuit dintr-o ***Instalaţie de Recuperare a energiei Termice Solare (IRTS)***, compusă în principal din colectoare solare **(1)**, un tanc de acumulare (boiler) **(2)**, echipamentul hidraulic **(3)**, vasul de expansiune **(4)**, circuite apă **(5)**, o ***Instalaţie de Recuperare a energiei Termice rezultate în procesul de Compostare (IRTC)***, alcătuită dintr-un cadru **(6)**, prevăzut cu patru role pe care se sprijină cilindrul de compostare **(7)** cu două uşi **(8)** pentru încărcarea-descărcarea deşeurilor / compostului, un capac spate **(9),** prevăzut cu gurile de absorbţie / refulare a aerului cu vapori montat prin şuruburi pe cadru, o transmisie cu motoreductor şi roţi de lanţ **(10)** pentru rotirea cilindrului de compostare în procesul de amestecare, aerare şi descărcare a compostului, o instalaţie de recuperare a energiei termice şi transfer pentru producerea de apă caldă menajeră **(11)**, alcătuită dintr-un rezervor metalic, un ventilator prevăzut cu convertizor de frecvenţă, pentru reglarea debitului de aer, o serpentină de încălzire din cupru, fitinguri şi conducte de legătură între circuite, dop pentru eliminarea condensului, un termometru pentru măsurarea temperaturii din compost şi patru picioare de sprijin, două spate - cu roţi de rulare pentru deplasarea containerului pe distanţe limitate - şi două faţă, cu talpă de sprijin pentru stabilizarea la staţionar şi un ***Modul de Monitorizare şi Automatizare*** a întregului proces de recuperare a căldurii ***(MMA).***

CONCLUZII:

Sistemul integrat de recuperare a energiei temice solare și din procesul de compostare, prezintă următoarele <u>avantaje</u>:

- este o construcție simplă constructiv și funcțional;
- permite alimentarea cu deșeuri atât mecanic cât și manual;
- este adecvată și accesibilă ca preț fermelor mici și gospodăriilor individuale;
- utilizare și întreținere facilă, fără a fi necesar personal instruit sau de specialitate;
- permite reglarea debitului de aer cu vapori absorbit, cu impact asupra temperaturii apei calde menajere produsă;
- sistemul integrat asigură recuperarea energiei termice și reutilizarea acesteia pentru producerea de apă caldă, pe tot parcursul zilei și în orice condiții de vreme, pe toată perioada anului.



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STRUCTURĂ PORTANTĂ MODULATĂ PENTRU UTILAJE AGRICOLE / MODULATED LOADING STRUCTURE FOR AGRICULTURAL MACHINERY

Autori: MURARU Vergil Marian, CÂRDEI Petru, MURARU Sebastian Lucian, MURARU-IONEL Cornelia, CONDRUZ Paula

Invention Classification:
6. Mechanical Engineering - Metallurgy

INTRODUCERE

Invenţia se referă la o structură portantă modulată cu aplicaţii multiple destinată maşinilor de lucrat solul pe care se montează organe active în diferite variante de lucru, în vederea extinderii perioadei de utilizare în funcţie de mărimea exploataţiilor agricole şi puterea tractorului.

INTRODUCTION

The invention relates to a load-bearing structure modulated with multiple applications for tillage machines on which active parts are mounted in different working variants, in order to extend the period of use depending on the size of agricultural holdings and the power of the tractor.

MATERIALE ŞI METODA FOLOSITE

Problema tehnică pe care o rezolvă invenţia este realizarea unei structuri portante modulate pentru variaţia lăţimii de lucru a structurii de bază în vederea creşterii gradului de utilitate a echipamentului şi a extinderii perioadei de utilizare în funcţie de mărimea exploataţiilor agricole şi puterea tractorului.

Structura portantă modulată pentru utilaje agricole, conform invenţiei are în componenţă un cadru central susţinut de roţi de limitare a adâncimii de lucru, dotat cu triunghi central de cuplare, la care se pot ataşa, printr-un sistem de balamale şi cilindri hidraulici de rabatere cuplaţi la instalaţia hidraulică a tractorului, alte două cadre laterale stânga – dreapta prevăzute de asemenea cu triunghi suplimentar de cuplare, cadre pe care se montează organele active în diferite scheme de lucru.

REZULTATE

Structura portantă modulată pentru utilaje agricole are în componenţă cadrul central **(Cc)** susţinut de roţi de limitare a adâncimii de lucru, dotat cu triunghiul central **(Tc)** de cuplare, la care se pot ataşa, printr-un sistem de balamale **(B)** şi cilindri hidraulici de rabatere cuplaţi la instalaţia hidraulică a tractorului, alte două cadre laterale stânga **(Cs)**, respectiv dreapta **(Cd)** prevăzute de asemenea cu triunghi suplimentar de cuplare **(Ts)**, cadre pe care se montează organele active în diferite scheme de lucru.

În timpul lucrului, în funcţie de varianta de lucru, se pot monta cu uşurinţă prin sistemul de balamale, fie toate cele trei cadre **(Cc)**, **(Cs)** şi **(Cd)** pentru lăţimea maximă, utilizând triunghiul central **(Tc)**, fie cadrul central **(Cc)** pentru lăţimea intermediară, fie numai cadrele laterale **(Cs)** sau **(Cd)** utilizând triunghiul suplimentar **(Ts)** pentru lăţimea minimă, fie ambele cadre laterale **(Cs)** şi **(Cd)** utilizând triunghiul suplimentar **(Ts)** pentru o altă lăţime de lucru intermediară.

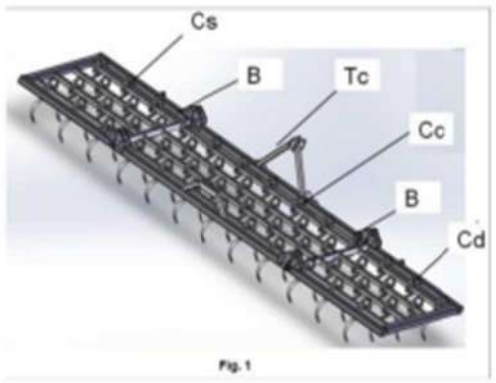

Fig. 1

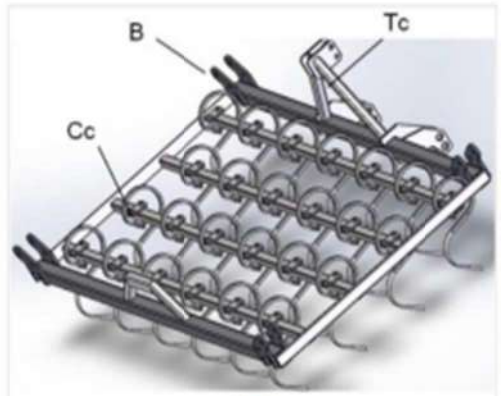

Fig. 2

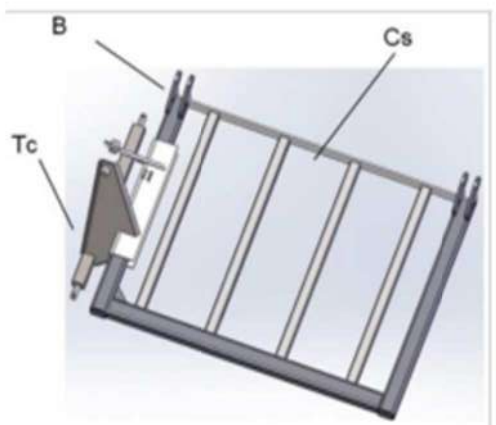

Fig. 3

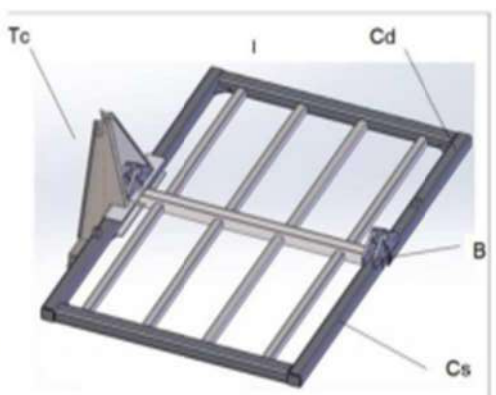

Fig. 4

CONCLUZII

Din cercetările efectuate în literatura de specialitate asupra unor elemente brevetate, prospecte etc. rezultă că există echipamente agricole care au structuri portante pe care se montează organe de active de lucrat solul cu diferite lăţimi lucru (ex. model SANDOKAN sau GRATOR ai firmei Maschio Gaspardo ; model KOMPACTOR sau ZIRKON ai firmei Lemken ; model C3.9 sau C6.5 fabricaţie România etc).

Dezavantajele acestor echipamente constau în faptul că structurile portante nu sunt modulate şi nu permit obţinerea altor lăţimi de lucru (inferioare celei de bază).

Alt dezavantaj constă în limitarea perioadei de lucru fiind legate de mărimea puterii tractoarelor şi a exploataţiilor agricole pe care se utilizează.

Invenţia prezintă următoarele avantaje:

- posibilitatea de lucru cu lăţime maximă având în componenţă structura portantă cu cele trei cadre;
- posibilitatea de lucru cu lăţime intermediară având în componenţă structura portantă cu cadrul central;
- posibilitatea de lucru cu lăţime minimă având în componenţă structura portantă cu cadrul lateral ;
- posibilitatea de lucru cu lăţime intermediară având în componenţă structura portantă cu două cadre laterale reunite prin balamalele structurii de bază şi tractate cu triunghiul suplimentar.

REFERINŢE

Proiect ***PN 19 10 01 02*** Cercetari privind Dezvoltarea de Instrumente Digitale Inteligente pentru Interactiunea dintre Sol si Organele de Lucru ale Maşinilor Agricole si pentru Conceptul "Open Innovation Ecosystem", **Contract 5N/07.02.2019-AA NR. 2/2019-AA NR. 4/2020**

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PLATFORMĂ MOBILĂ CU STRUCTURĂ REGLABILĂ PENTRU PANOURI FOTOVOLTAICE

MOBILE PLATFORM WITH ADJUSTABLE STRUCTURE FOR PHOTOVOLTAIC PANELS

Patent Application No. A-00626 / 07.10.2020

Authors:
MARIN Eugen, PĂUN Anişoara, MANEA Dragoș, MATEESCU Marinela

Invention Classification:
6. Mechanical Engineering - Metallurgy

DESCRIERE:

Invenţia se referă la platformă mobilă cu structură reglabilă pentru panouri fotovoltaice destinată obținerii de energie electrică prin captarea optimă a radiației solare, în locurile în care nu există altă sursă de curent electric necesară în aplicații agricole sau de șantier temporar.

DESCRIPTION:

The invention relates to a mobile platform with an adjustable structure for photovoltaic panels designed for obtaining electricity by capturing solar radiation, in places where there is no other source of electricity required in agricultural or temporary construction applications.

COMPONENȚĂ:

Platforma este compusă din platforma **P** alcătuită dintr-un cadru tractabil dispus pe o osie cu două roți, structura **SP** formată din stâlpii verticali nepoziționați pe care sunt articulate ramele metalice pentru panouri fotovoltaice, sistemul de reglare **SR** al unghiului **α** de poziționare în plan orizontal, construit din actuatoare electrice liniare de sarcină medie, de 12 Vcc, discul **D** de tip cadran de ceas prevăzut cu o fantă sector de cerc practicată în dreptul orelor 11,00-13,00, releul fotoelectric **R** plasat sub discul **D** în dreptul fantei și unitatea de comandă **UC**.

CONCLUZII:

Platforma mobilă cu structură reglabilă pentru panouri fotovoltaice, conform invenţiei, prezintă următoarele **avantaje**:
- simplitate constructivă;
- siguranță în funcționare;
- randament optim al conversiei energiei solare în energie electrică;
- posibilitatea montării pe structura reglabilă a panourilor termice;
- nu este poluantă.

Fig. 1

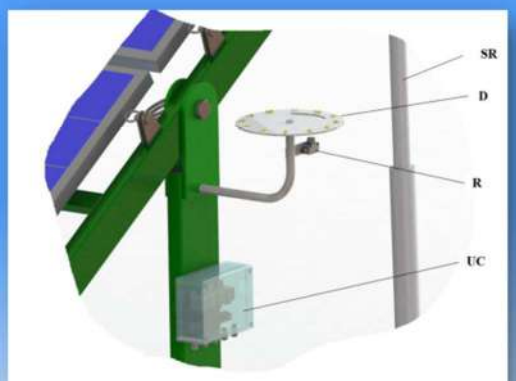

Fig. 2


Fig. 3

REFERINȚE:

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INSTALAȚIE PENTRU AFÂNARE BIOCOMPOST

INSTALLATION FOR BIOCOMPOST LOOSENING

Patent Application No. A-00402 / 2020

Authors:
PĂUN Anişoara, GANEA-CHRISTU Ioan, MATACHE Mihai, CABA Ioan, LAZA Evelin

Invention Classification:
6. Mechanical Engineering - Metallurgy

DESCRIERE:

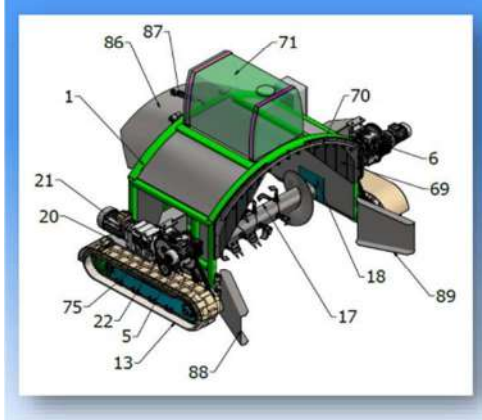
Invenția se referă la un echipament mobil cu acționare electromecanică destinat aerării și amestecării biocompostului în unități agricole, pentru valorificarea acestuia ca îngrășământ pentru legumicultură și alte sectoare agricole.

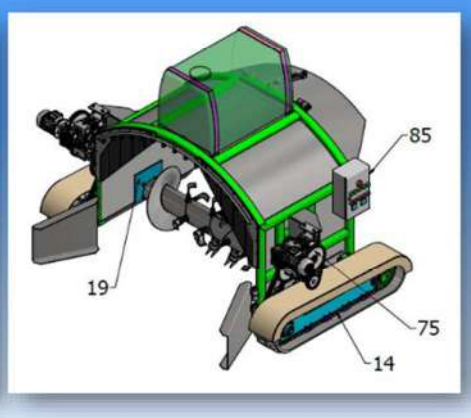
DESCRIPTION:

The invention relates to a mobile equipment with electromechanical actuation intended for biocompost aeration and mixing in agricultural units to capitalize it as fertilizer for vegetable growing and other sectors.

COMPONENȚĂ:

Instalația pentru afânare biocompost, conform invenției, este formată din suportul central (**1**) construit din țeavă cu secțiune rectangulară și placat cu tablă zincată (**2**) pe care sunt montate două plăci (**3** și **4**) pentru motoreductoarele dublu melcate (**5** și **6**) care prin intermediul a două transmisii cu lanț (**7** și **8**) vor antrena roțile de lanț (**9** și **10**) montate pe axele (**11** și **12**) a două subansamble de deplasare cu șenile din cauciuc (**13** și **14**). Pe suportul central (**1**) se află montați doi suporți cu găuri de prindere și canale deschise (**15** și **16**) în care se montează tamburul central cu cuțite (**17**) cu ajutorul a două lagăre (**18** și **19**). Tot pe suportul central (**1**) se află montat un suport special (**20**) pentru un motoreductor conico-cilindric (**21**), care prin intermediul unei transmisii cu lanț Gall (**22**) va antrena tamburul central cu cuțite (**17**).

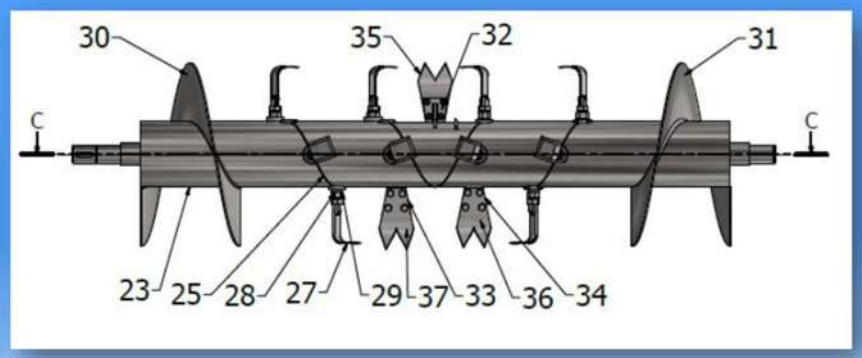




CONCLUZII:

Instalația pentru afânare biocompost, conform invenției, prezintă următoarele **avantaje**:

- principalul avantaj este creșterea gradului de afânare, prin faptul că tamburul cu cuțite are montat pe partea centrală trei cuțite de o formă specială care vor arunca materialul, iar pe părțile laterale are montat câte un set de cuțite cotite, montate pe o spirală elicoidală și rotite cu un anumit unghi;
- are un sistem autonom de funcționare;
- realizează viteze diferite de deplasare pentru faza tehnologică de lucru și faza de deplasare și întoarceri.



REFERINȚE:

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2). Patent CA2797506A1 - A Windrow turning apparatus.
3). Patent US 6125622 - A Windrow Turner

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ECHIPAMENT PENTRU DETAȘAREA FRUCTELOR DE CĂTINĂ CONGELATE DE PE CRENGI

EQUIPMENT FOR DETACHING FROZEN SEA-BUCKTHORN FRUIT FROM BRANCHES

Patent Application No. A-00398 / 2020

Authors:
MILEA Dumitru, CIUPERCĂ Radu, VIȘAN Alexandra

Invention Classification:
6. Mechanical Engineering - Metallurgy

DESCRIERE:

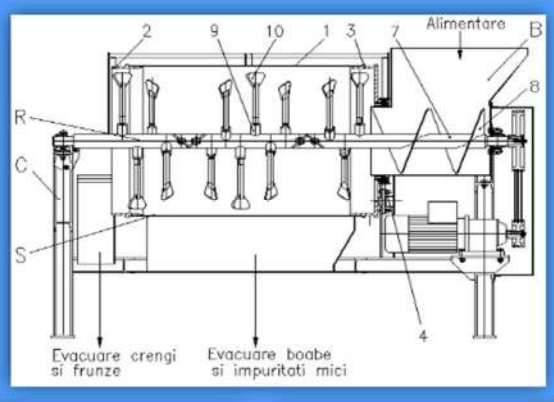
Invenţia se referă la un echipament care poate funcţiona integrat în cadrul unui flux tehnologic de procesare a cătinei, dar şi ca echipament independent destinat detaşării fructelor de cătină de pe crengile recoltate şi congelate în prealabil, separării şi evacuării celor două fracţii rezultate - crengi şi frunze, respectiv fructe şi impurităţi mici.

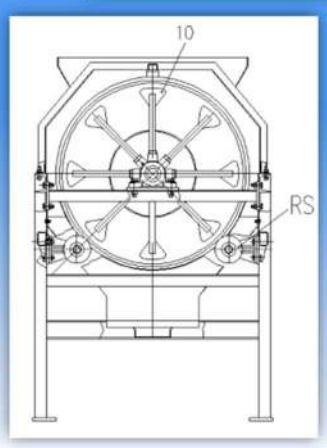
DESCRIPTION:

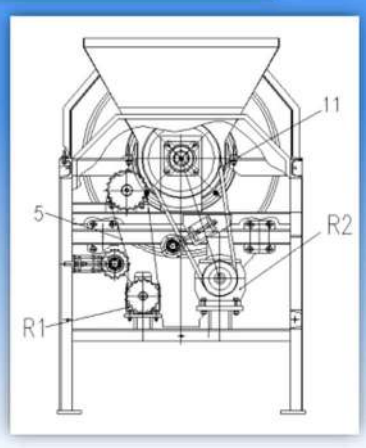
The invention relates to the equipment that can function integrated within a technological flow of sea buckthorn processing, but also as independent equipment for detaching sea buckthorn fruit from previously harvested and frozen branches, separating and evacuating the two resulting fractions - branches and leaves, respectively fruit and small impurities.

COMPONENȚĂ:

Echipamentul, se compune din cadrul **(C)** realizat din profile metalice, buncărul de alimentare **(B)** executat din tablă de inox, sita cilindrică **(S)**, compusă din sita interschimbabilă **(1)** montată pe tamburul de evacuare **(2)** și pe tamburul de alimentare **(3)** prevăzut cu o coroană dințată **(4)** ce angrenează cu un pinion care primește mișcarea printr-o transmisie cu lanț **(5)**, de la un motoreductor **(R1)** cu turație reglabilă realizată de un convertizor de frecvență nepoziționat, din rotorul **(R)**, acționat de un motoreductor **(R2)** prin transmisia cu curele **(11)**, compus dintr-un ax tubular **(7)** pe care se sudează la unul din capete o spiră **(8)** din tablă de inox, montată în interiorul buncărului **(B)**, iar pe cealaltă porțiune a axului **(7)** se sudează un număr de bucșe **(9)** cu filet interior, dispuse pe două rânduri diametral opuse după o curbă elicoidală, în care se montează impactorii reglabili cu paletă **(10)**, impactori care, prin rotirea și blocarea lor într-o poziție dorită cu ajutorul unor contrapiulițe, asigură modificarea diametrului de lucru pentru fiecare impactor precum și a vitezei de deplasare a crengilor în interiorul sitei cilindrice, în funcție de cerințele procesului de lucru, acționarea sitei rotative și a rotorului făcându-se de la o instalație electrică de forță și comandă.







CONCLUZII:

Prin aplicarea invenției în unitățile de procesare a fructelor de cătină se obțin următoarele **avantaje**:

-grad redus de vătămare a fructelor scuturate;

-procent redus de pierderi în procesul de detașare;

-posibilitatea stabilirii regimului optim de lucru ca urmare a reglajelor asigurate de echipament;

-complexitate redusă putând funcționa independent sau integrat în fluxuri tehnologice.

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INSTALAȚIE INDUSTRIALĂ PENTRU SPĂLAREA TOPINAMBURULUI

INDUSTRIAL INSTALLATION FOR JERUSALEM ARTICHOKE WASHING

Patent Application No. A-00891 / 2019

Authors:
OLAN Mihai, VLĂDUȚ Valentin, PĂUN Anișoara, VOICEA Iulian,
PARASCHIV Gigel, POPA Diana, ISTICIOAIA Simona, APOSTOL Livia

Invention Classification:
6. Mechanical Engineering - Metallurgy

DESCRIERE:

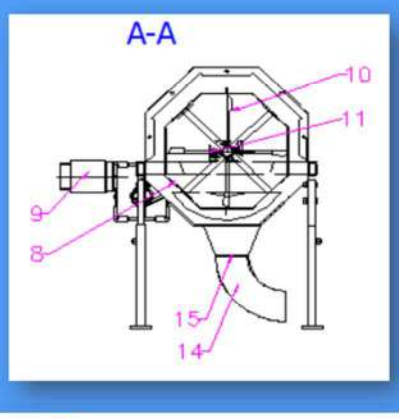
Invenția se referă la o instalație industrială destinată spălării tuberculilor de topinambur în vederea procesării pentru producerea de bioetanol.

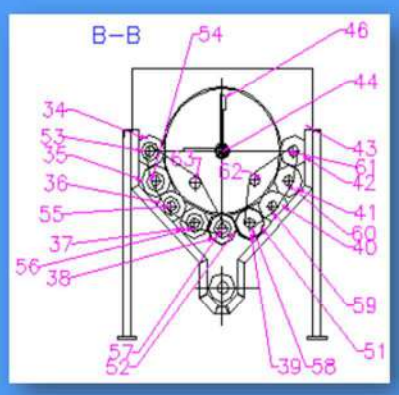
DESCRIPTION:

The invention relates to an industrial installation for washing the Jerusalem artichoke tubers that are further processed for bioethanol production.

COMPONENȚĂ:

Instalația industrială este alcătuită din cuva de alimentare **(1)**, ce este prevăzută cu un grătar vibrant **(2)**, acționat cu un motovibrator **(3)**, susținut pe tampoanele de cauciuc **(4)** și care permite separarea impurităților de pământ de pe tuberculii de topinambur înainte ca aceștia să intre în cuva octogonală **(8)** ce este construită din tablă perforată de inox și placată cu cauciuc alimentar pentru evitarea loviriii produselor în timpul rostogolirii, apoi echipamentul de spălare **(33)** cu perii și echipamentul **(68)** pentru spălare finală și clătire a tuberculilor.

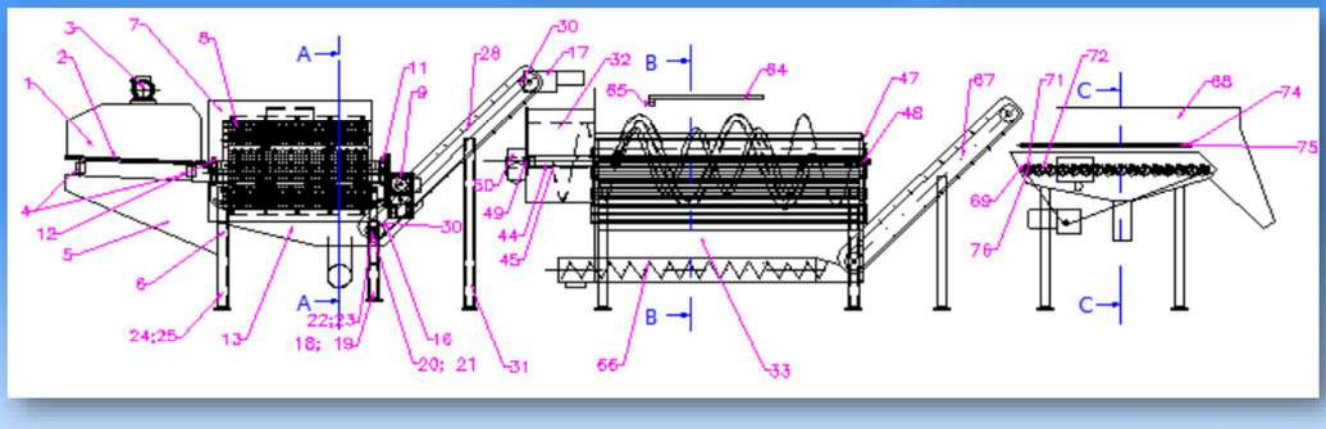




CONCLUZII:

Instalația industrială pentru spălarea topinamburului, conform invenției, prezintă următoarele **avantaje**:

- este ușor de realizat și de asamblat;
- devine operațională în timp scurt;
- are o construcție robustă și sigură ce funcționează fără blocaje;
- permite spălarea la parametrii stabiliți ai tuberculilor de topinambur.



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1). Patent US 4063565A;
2). Patent EPO 343756A1;
3). Patent RU (11) 2 546 182(13) C1

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ECHIPAMENT SEMIPURTAT DE TOCAT RESTURI VEGETALE LEMNOASE, CU SISTEM DE CUPLARE LA TIRANȚII LATERALI AI TRACTORULUI

SEMIMOUNTED EQUIPMENT FOR CHOPPING WOODEN VEGETABLE REMAINS, WITH COUPLING SYSTEM TO THE TRACTOR'S LATERAL COUPLING BARS

Patent Application No. A-00744 / 2019

Authors: POPA Lucreția, ȘTEFAN Vasilica

Invention Classification:
6. Mechanical Engineering - Metallurgy

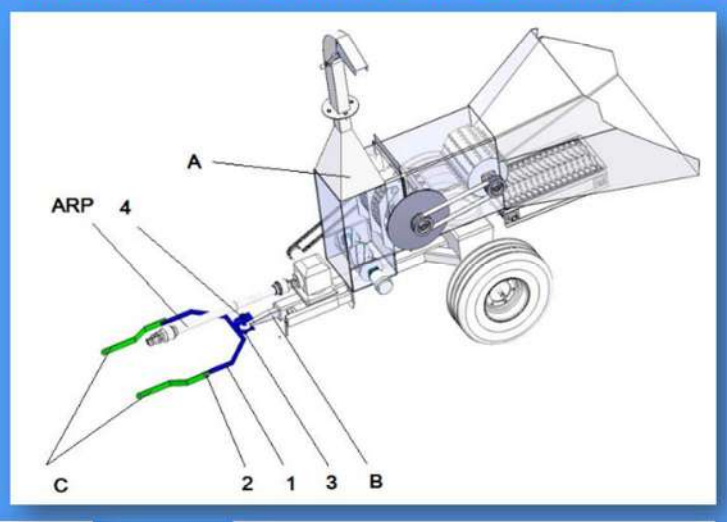
DESCRIERE:

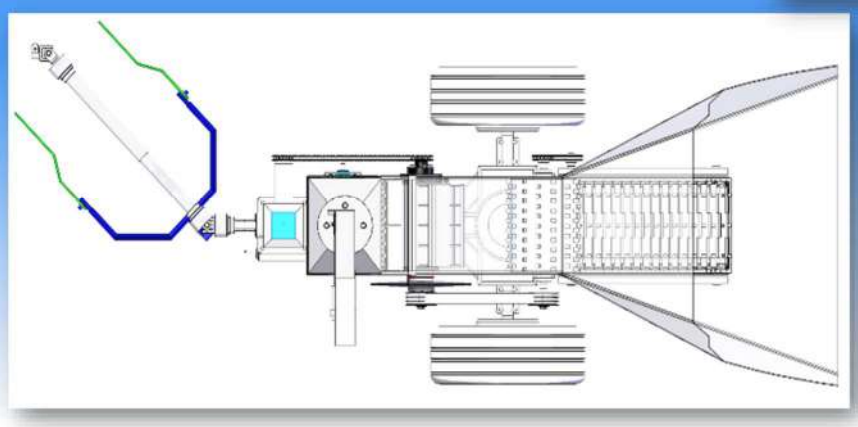
Invenția se referă la un echipament semipurtat, destinat tocării resturilor vegetale lemnoase, prevăzut cu sistem de cuplare la tiranții laterali ai tractorului, în vederea evitării interacțiunii dintre cardan și proțap, în timpul efectuării virajelor la capăt de rând, în timpul lucrului în plantațiile pomicole sau viticole.

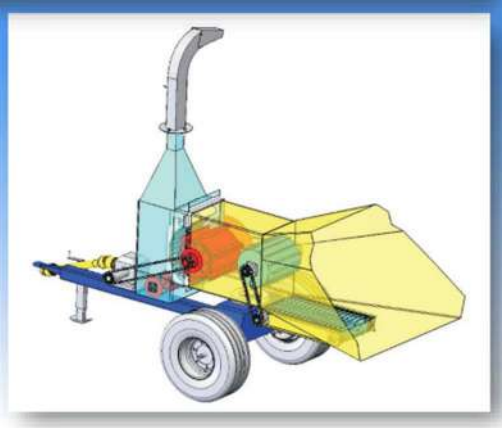
DESCRIPTION:

The invention relates to semi-mounted equipment, intended for chopping wooden vegetable remains, provided with a coupling system to the tractor's lateral coupling bars, in order to avoid the interaction between the cardan shaft and the drawbar, while turning at row end, during the work in orchards or vineyards.

Echipamentul, acționat prin ARP de la priza de putere a tractorului, este format dintr-o cuvă cu bandă transportoare și rotor de preluare și transport a materialului spre buncărul de tocare, prevăzut cu rotor de tocare cu cuțite și contracuțit, și este prevăzut cu sistemul de cuplare la tiranții laterali ai tractorului, compus din jugul **(1)**, ce asigură prinderea la tiranții laterali ai tractorului în cepurile **(2)**, cupla **(3)** și bolțul **(4)**, care se cuplează cu proțapul **(B)** ce are în componență ochiul de cuplare și placa sudată la echipamentul **(A)**.
Echipamentul de tocare se prinde la tiranții laterali ai tractorului, prin intermediul sistemului de cuplare, iar arborele receptor al prizei de putere face legătura între priza de putere și multiplicator, punând în funcțiune organele de lucru ale echipamentului. Articulația cardanică și bolțul cuplei se află în același plan, iar în viraje cardanul și sistemul de cuplare rămân aliniate în planuri paralele, facilitând întoarcerea agregatului.







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DISPOZITIV DE CONDUCERE A PLATFORMELOR DE SCANARE A PROPRIETĂȚILOR SOLULUI / DEVICE FOR DRIVING SOIL PROPERTIES SCANNING PLATFORMS

Autori: MURARU Sebastian Lucian, CONSTANTINESCU Oana-Mihaela

INTRODUCERE

Invenția se referă la un dispozitiv electronic inteligent de comandă și control destinat platformelor optoelectronice de scanare a proprietăților solului (DEC).

INTRODUCTION

The invention relates to an intelligent electronic command and control device designed for optoelectronic soil properties scanning (DEC) platforms.

MATERIALE ȘI METODA FOLOSITĂ

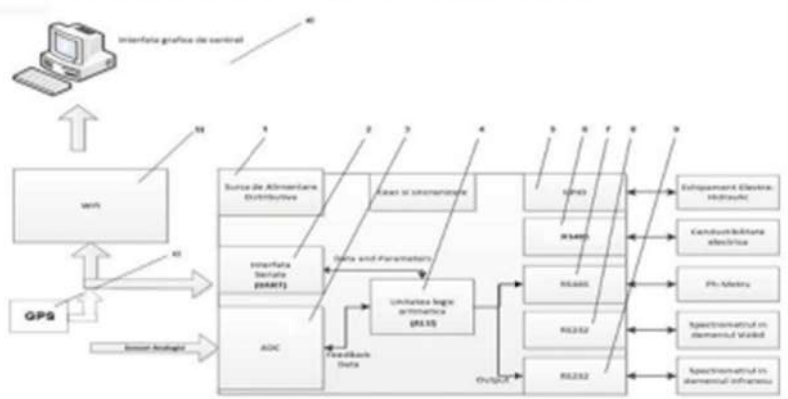
Problema tehnică pe care o rezolvă soluția propusă constă în realizarea unui dispozitiv electronic inteligent de comandă și control a platformelor optoelectronice mobile de scanare a proprietăților solului. Acesta are o structură ce permite realizarea funcțiilor necesare platformei, bazată pe o serie de intrări, ieșiri și porturi de comunicare grupate astfel:

- Intrări și ieșiri analogice și digitale:
  - controlul (analogic) al mișcării pistonului servomecanismului hidraulic ce prelevează eșantionul de sol analizat;
  - controlul circuitului de spălare a senzorului de pH între măsurători.
- Comunicații:

a) interfața RS-232 pentru controlul și preluarea datelor din spectrometrul ce acoperă domeniul infraroșu;
b) interfața RS-232 pentru controlul și preluarea datelor din spectrometrul ce acoperă domeniul vizibil;
c) interfața RS-485 pentru controlul și citirea rezultatelor de la pH-metru;
d) interfața RS-485 pentru citirea măsurătorilor senzorului de electroconductivitate;
e) legătura WiFi cu panoul de control al operatorului (tabletă cu interfață grafică).

REZULTATE

Dispozitiv de conducere a platformelor de scanare a proprietăților solului, caracterizat prin aceea că este compus din un modul sursă de alimentare distributivă **(1)** pentru alimentarea componentelor dispozitivului, o interfață serială (UART) **(2)** pentru comunicarea cu modulul GPS **(c)** și modulul WiFi **(b)** care comunică cu interfața grafică de control (laptop, tabletă, etc.) **(a)**, convertor analog-digital ADC **(3)**, unitatea logică-aritmetică **(4)**, modul de control relee GPIO **(5)** pentru intrări și ieșiri ale echipamentului electrohidraulic, interfața serială RS485 **(6)** pentru citirea măsurătorilor senzorului de electroconductivitate, interfața RS485 **(7)** pentru controlul și citirea rezultatelor de la pH-metru, interfața RS232 **(8)** pentru controlul și preluarea datelor din spectrometrul în domeniul infraroșu, interfața RS232 **(9)** pentru controlul și prelucrarea datelor din spectrometrul în domeniul vizibil.



Dispozitiv de conducere a platformelor de scanare a proprietăților solului - schema generală de principiu -

CONCLUZII

Cu ajutorul dispozitivului se comandă și se controlează circuitul hidraulic de acționare și spălare a sistemului de măsurare a pH-ului, spectrometrele necesare determinării spectrelor de sol, conductibilității electrice a solului și corelării datelor obținute cu poziția platformei, furnizată de un modul GPS. Astfel, datele obținute pot fi prezentate în hărți GIS realizate cu ajutorul programelor specializate (ArcGis, Google Earth etc.).

REFERINȚE

Proiect complex:
"ECO-NANO-TEHNOLOGII ȘI ECHIPAMENTE INTELIGENTE PENTRU CARTOGRAFIEREA PROPRIETĂȚILOR SOLULUI ȘI EVALUAREA ÎN DINAMICA PLANTEI, ÎN VEDEREA EFICIENTIZĂRII PRODUCȚIEI AGRICOLE ȘI PROTECȚIEI MEDIULUI"

contract 41PCCDI/2018

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DEFLECTOR CU DIRIJARE AUTOMATĂ A FLUXULUI DE AER ȘI SOLUȚIE PENTRU MAȘINILE DE STROPIT ÎN VII ȘI LIVEZI

DEFLECTOR WITH AUTOMATIC AIR FLOW DIRECTION FOR SPRAYERS MACHINES IN VINEYARDS AND ORCHARDS

Patent Application No. A – 00708 / 2019

Invention Classification:
6. Mechanical Engineering

Authors:

Manea Dragoș, Matache Mihai, Marin Eugen, Gheorghe Gabriel

DESCRIERE:

Invenția se referă la un deflector cu dirijare automată a fluxului de aer și a particulelor de soluție în funcție de caracteristicile geometrice ale coronamentului, destinat mașinilor pneumatice de stropit în vii și livezi, echipate cu ventilatoare axiale.

DESCRIPTION:

The invention relates to a deflector with automatic direction of the air flow and solution particles according to the geometrical characteristics of the canopy, intended for pneumatic sprayers in vineyards and orchards, equipped with axial fans.

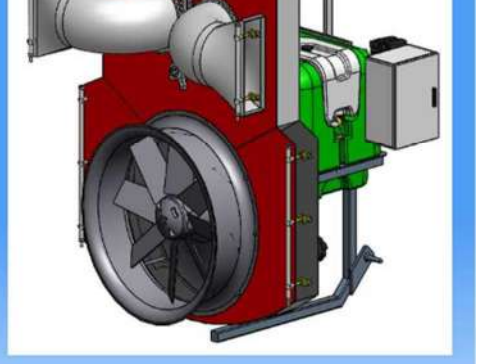
COMPONENȚĂ:

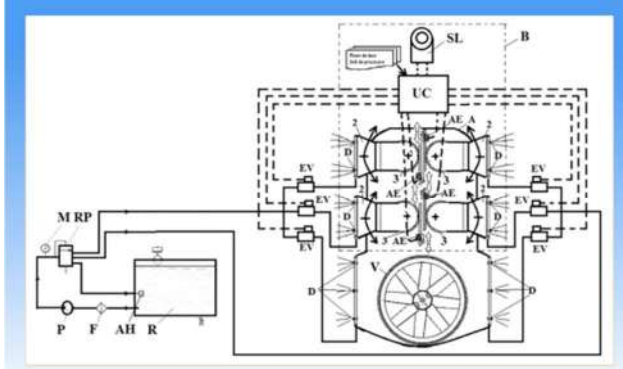
Deflectorul este compus din carcasa A și sistemul automat de dirijare B. Carcasa A este o construcție sudată cu pereți din tablă subțire verticali și paraleli, închisă complet la partea inferioară și la partea superioară și deschisă parțial pe părțile laterale. În zona deschiderilor laterale, pe peretele anterior, sunt fixate rampele cu duze pentru stropitul zonei inferioare a coronamentului. Pereții anterior și posterior au practicată în partea de jos o decupare circulară în care se montează ventilatorul axial al mașinii de stropit. Peretele anterior mai are practicate în plus patru decupări circulare, două în zona mediană și două în zona superioară, dispuse simetric față de axa verticală, decupări în care se sudează bucșele 1 pentru ghidajul conductelor 2. În interiorul bucșelor 1 sunt montate două garnituri din cauciuc în contact și cu conductele 2, cu rol de etanșare. Sistemul automat de dirijare B este alcătuit din senzorul laser SL, unitatea de comandă UC în care rulează un software specializat de procesare date în timp real, actuatorii electrici AE cu cremalieră și conductele 2. O conductă 2 este construită sub forma unui cot la 90°, aplatisat și evazat la unul din capete, iar la celălalt capăt având sudată pe exterior coroana dințată 3 și practicat un canal a în care intră inelul elastic 4 pentru blocarea axială.

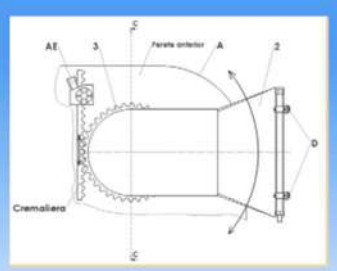
Coroana dințată 3 intră în angrenaj cu cremaliera actuatorului electric AE, al cărui corp este fixat pe peretele anterior al carcasei A. Pe capătul evazat al conductei 2 este montată rampa cu duzele D de pulverizare alimentată cu soluție de la instalația de stropit a mașinii și al cărei flux este controlat prin intermediul electrovalvelor EV.

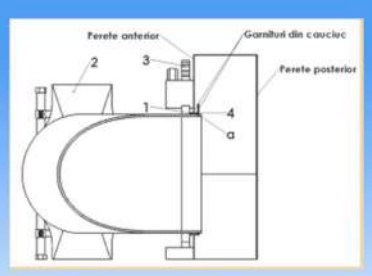
AVANTAJE:

- diminuează pierderile de soluție prin derivă și implicit poluarea aerului și solului;
- sporește eficacitatea tratamentelor fitosanitare, prin dirijarea particulelor de substanță în funcție de caracteristicile geometrice ale coronamentului;
- utilizează informațiile furnizate de senzorul laser, pentru controlul în timp real al pulverizării









ACKNOWLEDGEMENT

This work was supported by a grant of the Romanian Ministry of Research and Innovation CCDI-UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0662, Increasing the institutional capacity of research - development-innovation in the field of ecological fruit growing, Contract no.12 PCCDI/2018, within PNCDI III.

REFERINȚE:

1) US Patent 4823268 - METHOD AND APPARATUS FOR TARGET PLANT FOLIAGE SENSING AND MAPPING AND RELATED MATERIALS APPLICATION CONTROL

2) US Patent 5278423 - OBJECT SENSOR AND METHOD FOR USE IN CONTROLLING AN AGRICULTURAL SPRAYER

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GRUP DE POMPARE MOBIL PENTRU ALIMENTAREA INSTALAȚIILOR DE IRIGARE

MOBILE PUMPING GROUP FOR WATER SUPPLY OF IRRIGATION INSTALLATIONS

Patent Application No. A – 00586 / 2019
Invention Classification:
6. Mechanical Engineering

Authors:
Manea Dragoș, Murgescu Ion, Șovăială Gheorghe, Tociu Carmen, Ungureanu Nicoleta, Manole Emilia Sofia, Gîdea Mihai

DESCRIERE:

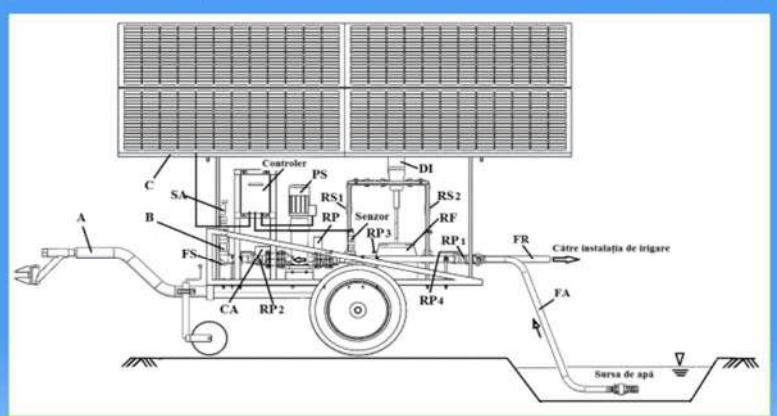
Invenția se referă la un grup de pompare mobil destinat alimentării cu apă sub presiune și fertilizanți lichizi a instalațiilor de irigare și fertirigare a culturilor agricole.

DESCRIPTION:

The invention relates to a mobile pumping group intended for the supply of pressurized water and liquid fertilizers for irrigation and fertilization of agricultural crops.

COMPONENȚĂ:

Grupul de pompare este alcătuit din platforma mobilă A pe care se amplasează sistemul de pompare și fertirigare B și generatorul solar C. Platforma A este de tip remorcă tractată, construită dintr-un cadru cu structură metalică prevăzut cu sistem de cuplare la tractor, sistem de rulare cu punte simplă și roți cu pneuri, roată de sprijin pivotantă la decuplare și conține elemente de fixare pentru componentele sistemului de pompare și fertirigare B și pentru generatorul solar C. Sistemul de pompare și fertirigare B este compus din pompa solară PS, supapa de aerisire SA, filtrul cu sită FS, contorul de apă CA, regulatorul de presiune RP cu manometru, dispozitivul DI pentru injecția fertilizantului lichid, rezervorul de fertilizant lichid RF, patru robineți principali RP1...RP4 amplasați pe diferite tronsoane ale sistemului, țevi și fiting-uri pentru conectarea acestor componente, furtunul de aspirație FA cu sorb la un capăt și cuplă rapidă la celălalt capăt și furtunul de refulare FR cu cuple rapide la ambele capete. Pompa PS cu reglaj electric al vitezei de rotație este conectată la generatorul solar C prin intermediul unui controler. În amonte de pompă este instalat un senzor care furnizează controlerului informații legate de prezența sau absența apei în coloana de aspirație, pentru protecția pompei împotriva mersului în gol. Dispozitivul DI pentru injecția fertilizantului lichid este montat printr-o derivație de tip by-pass pe coloana de refulare și poate fi izolat prin doi robineți secundari RS1 și RS2. Componentele sistemului de pompare și fertirigare sunt dispuse pe platforma A într-o rețea în formă de "U" cu extremitățile de branșare rapidă orientate către spatele platformei, pentru a putea fi ușor accesibile. În timpul deplasării pe teren între instalațiile de irigare, furtunul FA de aspirație și furtunul FR de refulare sunt depozitate pe platformă sub formă de colac. Generatorul solar C constă dintr-un număr de panouri fotovoltaice care sunt montate pe suporți metalici fixați pe platformă, deasupra sistemului de pompare și fertirigare B.



AVANTAJE:

- poate fi deplasat rapid în teren la diferite instalații de irigare amplasate la distanțe mari unele față de altele;
- are autonomie mare de funcționare, pompa sistemului de irigare și fertirigare fiind alimentată cu energie din surse regenerabile;
- în timpul sezonului rece poate fi stocat în spații protejate, ferit de intemperii;
- are o construcție simplă, cu componente cu preț de cost redus și reglaje ușor de efectuat de către un singur operator

ACKNOWLEDGEMENT
This work was supported by a grant of the Romanian Ministry of Research and Innovation CCDI – UEFISCDI, Project INNOVATIVE TECHNOLOGIES FOR IRRIGATION OF AGRICULTURAL CROPS IN ARID, SEMIARID AND SUBHUMID-DRY CLIMATE, project number PN-III-P1-1.2-PCCDI-2017-0254, Contract no. 27PCCDI / 2018, within PNCDI III.

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RAMPĂ DE UDARE MOBILĂ UNIVERSALĂ

UNIVERSAL MOBILE WATERING BOOM

Patent Application No. A -00566 / 2019
Invention Classification:
6. Mechanical Engineering

Authors:
Manea Dragoș, Popescu Marian, Drăghici Iulian, Murgescu Ion, Șovăială Gheorghe

DESCRIERE:

Invenția se referă la o rampă de udare mobilă destinată instalațiilor de irigat cu tambur și furtun, care poate fi utilizată la irigarea tuturor culturilor agricole în câmp deschis, cu talie joasă sau cu talie înaltă, prin diferite metode de irigare: printre rândurile de plante cu flux continuu, prin aspersie, prin picurare.

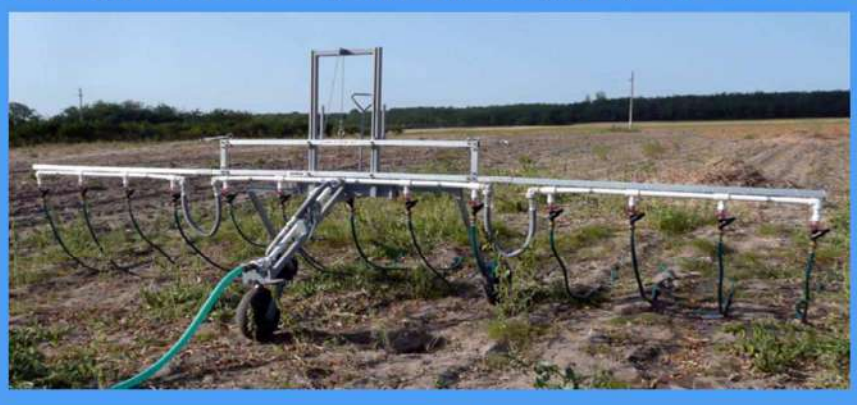
DESCRIPTION:

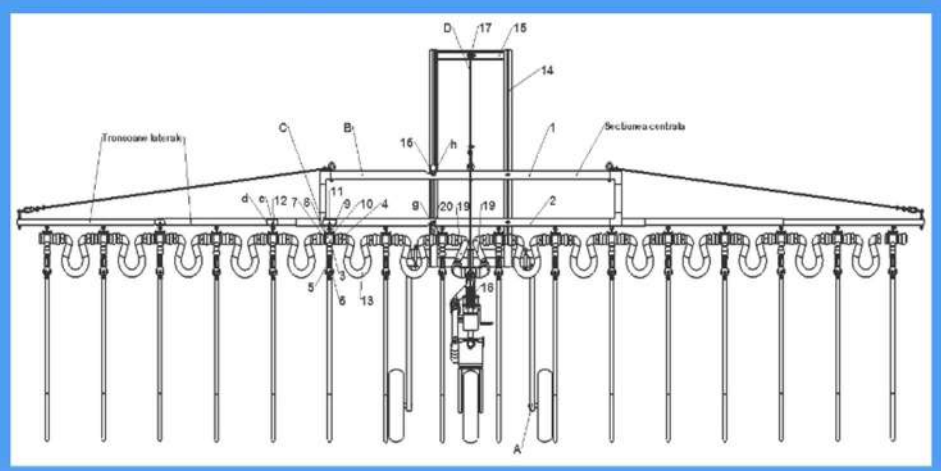
The invention relates to a mobile watering boom for irrigation installations with drum and hose, which can be used to irrigate all agricultural crops in open field, low or high waist, through different irrigation methods: among the rows of plants, with continuous flow, by sprinkling or by dripping.

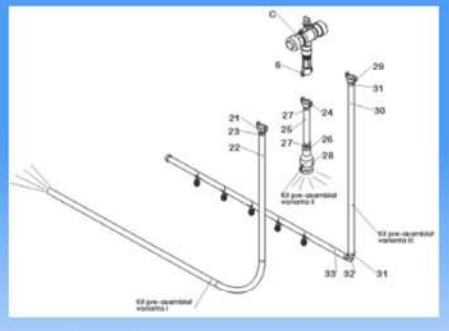
COMPONENȚĂ:

Rampa de udare mobilă universală, conform invenției, este alcătuită din căruciorul A pentru deplasare, structura B de susținere pe care se montează / demontează rapid kit-urile pre-asamblate C, de care se pot atașa rapid alte kit-uri pre-asamblate în trei variante (I, II și III) pentru distribuția apei în teren în funcție de metoda de irigare aleasă, precum și din sistemul D de reglaj al înălțimii de lucru a rampei. În timpul lucrului, rampa de udare este trasă de un furtun care se înfășoară pe un tambur acționat de o turbină hidraulică alimentată cu apă de un sistem de punere sub presiune, sursa de apă putând fi un puț forat, un canal de irigații, un râu sau o rețea subterană cu hidranți. Căruciorul A cu trei roți cu anvelope are posibilitatea reglării ecartamentului dintre roțile laterale în funcție de distanța dintre rândurile de plante și poate fi ghidat și manevrat cu ușurință datorită roții centrale pivotante. Structura B de susținere este o construcție din țevi rectangulare, simetrică față de planul longitudinal central al căruciorului A, formată dintr-o secțiune centrală și câte două tronsoane laterale telescopice. Un kit C este compus din elementul ramificat 3, racordurile 4 cu filet exterior, regulatorul de debit 5 și cupla rapidă cu gheare și filet interior 6.

Sistemul D de reglaj al înălțimii de lucru a rampei este format din doi stâlpi 14, traversa 15, două culise 16, rola 17, troliul manual 18 cu cablu din oțel, poziționat pe cadrul căruciorului A și două racorduri flexibile 19 pentru apă.







AVANTAJE:

- poate fi utilizată la aplicarea mai multor metode de irigare a culturilor (irigarea printre rândurile de plante în flux continuu, irigarea prin aspersie și irigarea mobilă prin picurare);
- distanța dintre liniile de udare sau dintre aspersoare poate fi reglată simplu și rapid, în funcție de distanța dintre rândurile de plante;
- înălțimea de lucru a rampei poate fi reglată cu ușurință de către un singur operator, rampa putându-se utiliza atât la plantele cu talie joasă cât și la plantele cu talie înaltă

REFERINȚE:

1) US Patent 6343749 B1 - MOBILE DRIP IRRIGATION SYSTEM
2) US Patent 7883035 B2 - MOBILE DRIP SYSTEM
3) US Patent 9420752 B2 - MOBILE DRIP IRRIGATION WITH PRECISE AND UNIFORM WATER DISTRIBUTION

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SISTEM DE ATENUARE A IMPACTULUI SEMINȚELOR ÎN ELEVATOARELE CU BANDĂ CU CUPE

SYSTEM FOR ATENUATING THE IMPACT ON SEEDS IN BUCKET BELT ELEVATORS

European Patent Application No. 18020447.1 / 2018

Authors: GĂGEANU Paul, GANEA-CHRISTU Ioan, GĂGEANU Iuliana

Invention Classification:
6. Mechanical Engineering - Metallurgy

DESCRIERE:

Invenţia se referă la sistem de atenuare a impactului seminţelor prin atenuarea loviturilor la contactul cu componentele metalice destinat elevatoarelor cu bandă cu cupe, în timpul încărcării, transportului şi descărcării.

DESCRIPTION:

The invention refers to a system for attenuating the impact on seeds by attenuating hits upon contact with metallic components, destined for bucket belts, during loading, transport and unloading.

COMPONENȚĂ:

Sistemul de atenuare a impactului seminţelor în elevatoarele gravitaţionale cu bandă cu cupe, este compus din subansamblele cunoscute în sine: cap elevator **(a)**, pâlnie de alimentare **(1)**, picior elevator **(b)** cu şibăre **(2)** pentru curăţire, bandă cu cupe **(c)**, tubulatură **(d)** şi sistem de acţionare la viteza periferică de maximum 0,7 m/s, alimentarea făcându-se în contracurent, capota elevatorului fiind placată cu cauciucul **(8)** de mică duritate, caracterizat prin aceea că, la montarea cupelor **(c)** pe bandă sunt prevăzute bucşele de cauciuc **(6)** fixate prin şuruburile **(5)** de banda **(3)** care transportă cupele **(4)** creîndu-se un spaţiu „x" suficient pentru ca seminţele să nu fie prinse şi strivite între cupe şi bandă la întoarcere pe tamburul de acţionare **(7)**, iar tamburul inferior **(T)** este de tip grilă, cu palete echidistante, pentru evacuarea seminţelor nevătămate.

Sistemul este caracterizat prin aceea că, tamburul inferior **(T)** de tip grilă este compus din două tronconuri **(11)**, două discuri **(10)** montate pe axul **(12)** şi paletele **(9)** echidistante, printre care seminţele prinse între bandă şi tambur să poată fi evacuate prin orificiile alungite ale discurilor, fără a fi traumatizate.

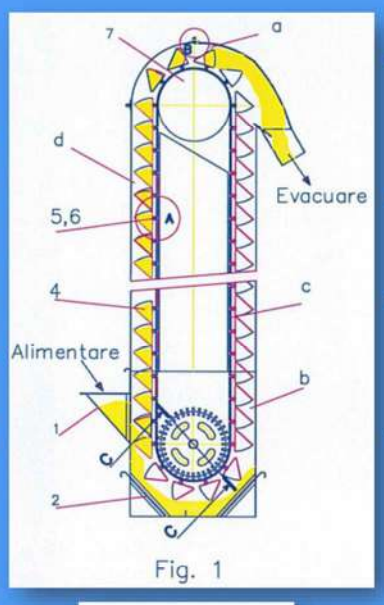

Fig. 1

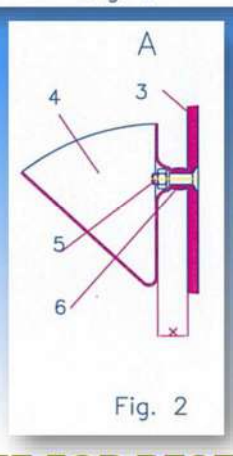

Fig. 2

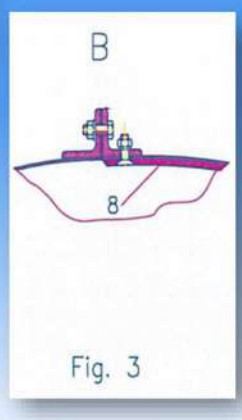

Fig. 3

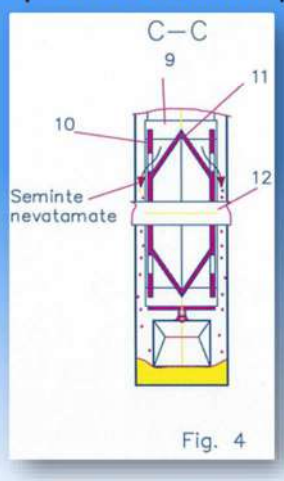

Fig. 4

CONCLUZII:

Avantaje:

- se reduce substanţial cantitatea de seminţe traumatizate la alimentare prin micşorarea vitezei de deplasare a benzii cu cupe şi implicit prin micşorarea impactului dintre seminţe şi cupe;
- se reduce cantitatea de seminţe traumatizate la descărcare prin placarea capotei de la capul elevatorului cu cauciuc moale;
- se elimină pericolul de strivire a seminţelor între cupă şi bandă la descărcare prin prevederea unui sistem de montare a cupelor astfel încât distanţa „x" dintre cupă şi bandă să fie mai mare decât a oricărei seminţe transportată;
- se elimină pericolul de strivire a seminţelor între bandă şi tamburul inferior de la piciorul elevatorului prin prevederea unui tambur tip grilă.

REFERINȚE:

Buhler Germania, GOLFETTO, OCRIM, (Italia), AYBAKAR (Turcia), CARTER-DAY (SUA), EXACTOSIZER, HEID-CIMBRIA (Austria), AEROMEH din LUGANSK (Ukraina)

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SISTEM ȘI METODĂ DE DIRIJARE AUTOMATĂ PENTRU ECHIPAMENTE DE ÎNFIINȚAT PERDELE AGROFORESTIERE

SYSTEM AND METHOD OF AUTOMATIC STEERING AN AGROFORESTRY EQUIPMENT

European Patent Application No. EP 3 656 198 A1 / 2020

Authors:
MARIN Eugen, MATEESCU Marinela, MANEA Dragoș, GHEORGHE Gabriel-Valentin

Invention Classification:
6. Mechanical Engineering - Metallurgy

DESCRIERE:

Invenția se referă la un sistem și metoda aferentă de dirijare automată pentru echipamente de înființat perdele agroforestiere, destinat conducerii automate pe rând a agregatelor, care sunt formate din tractor agricol pe roți și echipament de plantat, la executarea lucrării de plantare a puieţilor forestieri în teren prelucrat, în pătrat, respectiv când distanţele sunt egale atât pe rând cât şi între rânduri, sau în dreptunghi, când între rânduri distanţa este mai mare, iar pe rând distanţele sunt mai mici.

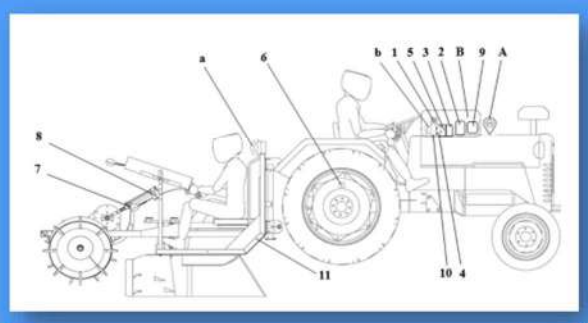
DESCRIPTION:

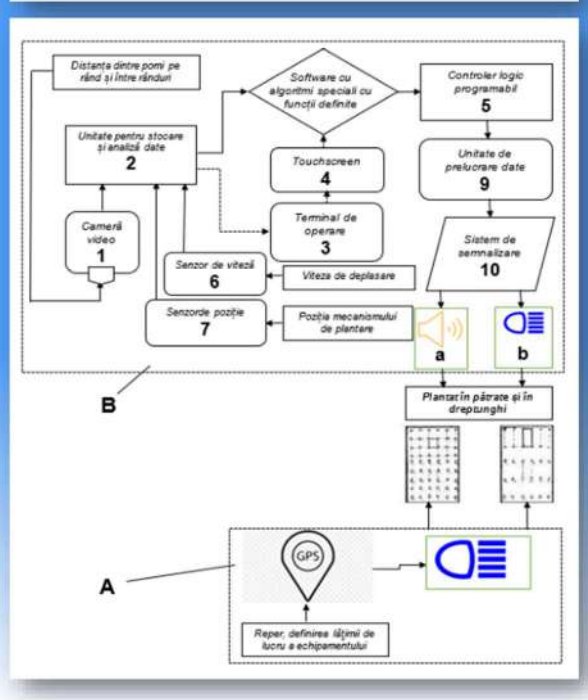
The invention relates to a system and the method of automatic steering for windbreaks establishing agroforestry equipment, intended for the automatic on row driving of the aggregates, which are formed by an wheeled agricultural tractor and a planting equipment, for the execution of the forest seedlings planting in the field in a square (the distances are equal both in the row and between rows), or in a rectangle (between rows the distance is greater and in the row the distances are smaller).

COMPONENȚĂ:

Sistemul de dirijare automată pentru echipamente de înființat perdele agroforestiere este compus din sistemul de ghidare **(A)** bazat pe tehnologia de geolocalizare prin satelit-GPS, sau, când GPS-ul nu este accesibil, din sistemul de ghidare **(B)** alcătuit din camera video **(1)**, unitatea pentru stocare și analiză date **(2)** cu algoritmi speciali cu funcții definite, terminalul de operare **(3)** cu touchscreenul **(4)** și controlerul logic programabil **(5)**, senzorul de viteză **(6)** montat pe tractorul agricol din agregat, senzorul de poziție **(7)** montat pe mecanismul de plantare **(8)**, unitatea de prelucrare date **(9)**, sistemul de semnalizare **(10)** dotat cu avertizarea acustică **(a)** pe echipamentul de plantat **(11)** și luminoasă **(b)** în cabina tractorului din agregat, astfel încât să se poată realiza plantarea puietului forestier în pătrate sau în dreptunghi.

Metoda de dirijare implementată pe sistem are la bază generarea de către sistemul de ghidare **(A)** bazat pe tehnologia de geolocalizare prin satelit-GPS, pornind de la o linie dreaptă de reper şi de la definirea lăţimii de lucru a echipamentului, generarea unor linii virtuale care vor fi urmate de către mecanizator în parcela de lucru. În cazul lipsei unui semnal GPS sau capacităţi limitate de procesare ale sistemului GPS, intervine sistemul de ghidare **(B)**, care permite cunoaşterea poziţiei utilajului şi menţinerea acestuia pe o traiectorie precisă şi repetabilă, chiar şi în condiţii meteo dificile, în funcție de imaginile vizuale preluate de la camera video și celelalte informații primite de la senzori, prelucrate de algoritmii speciali cu funcții definite, stabilește un anumit traseu pe parcela de lucru, orientează echipamentul spre destinația programată și dirijează operatorul pentru a poziționa puietul forestier în mecanismul de plantare, realizând astfel executarea lucrării de plantare a puieţilor forestieri în teren prelucrat în pătrat, situație în care distanţele sunt egale atât pe rând cât şi între rânduri sau în dreptunghi, atunci când între rânduri distanţa este mai mare, iar pe rând distanţele sunt mai mici.





REFERINȚE:
EP1266552A2, EP1520461A1, EP1762129A1, US20110118926A1, US20110231061A1, US9513376B1

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DEZVOLTAREA DE TEHNOLOGII INOVATIVE ÎN CADRUL FERMELOR SMART

DEVELOPMENT OF INNOVATIVE TECHNOLOGIES INSIDE OF SMART FARMS

Authors:
MARIN Eugen, MATEESCU Marinela, MANEA Dragoș, GHEORGHE Gabriel-Valentin

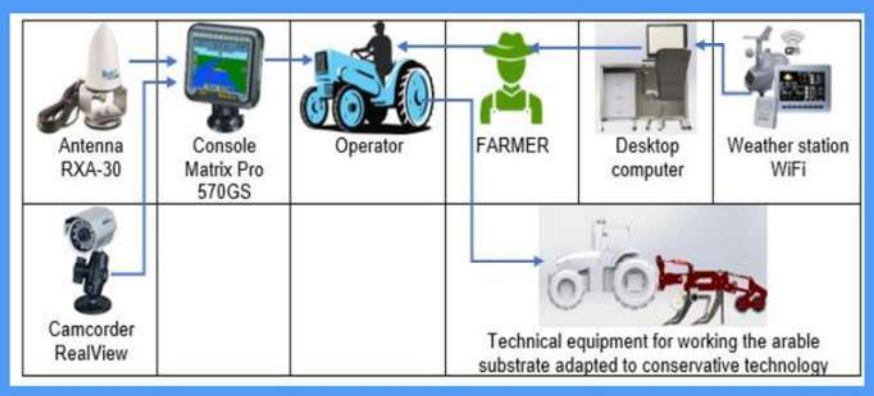
Invention Classification:
3. Agriculture & Food Industry

DESCRIPTION:

In order to capitalize on renewable resources in terms of efficiency, care for the environment and climate action, the project develops the following:

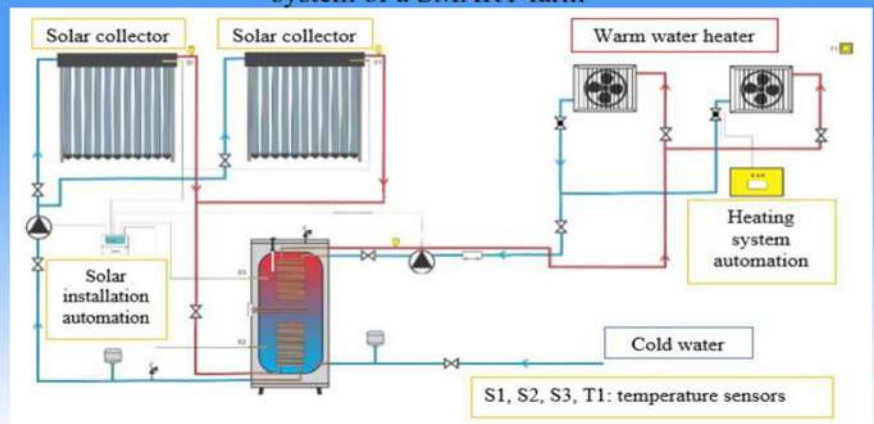
- Innovative system for conservation work of the soil, which uses advanced method management where data is collected and stored on the spot (such as humidity, temperature, soil pH level) through smart sensors, and farmers will receive real-time information using a computer / smartphone, allowing them to make instant decisions, saving time and labor for on-farm inspections.
- Technology for field crop protection according to "Agriculture 4.0", which targeted application of fertilizers and herbicides with an unmanned aerial vehicle (drone) equipped with a high stability system at a fixed point for targeted spraying of crops, to take off / land on a platform located on a general-purpose trailer where the drone's liquid tank can be refilled and the battery can be charge.
- Intelligent system of ecological heating of a farm based on solar energy, which uses a smart thermostat with access, via a mobile device or a PC, to the web control panel to maintain the temperature and reduce the relative humidity in a solarium.
- Innovative system of irrigation to make use of the humidity in the air, which uses warm water from the buffer of the intelligent ecological heating system, warm water is circulated through a battery to two nozzles mounted on top of chamber humidification and spray in a current of hot air, which causes vapors to condense on the surface of the collector walls, the water is drained and stored in a tank from where it can be used to irrigate crops.

Diagram of the innovative soil conservation works system for the SMART farm

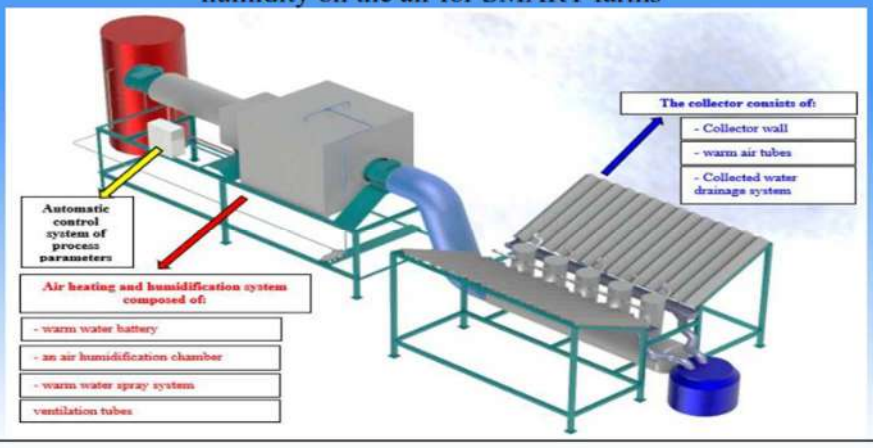


Scheme of the system for the protection of field crops according to "Agriculture 4.0"

Diagram of the intelligent ecological heating system of a SMART farm



Scheme of the innovative irrigation system which makes use of humidity on the air for SMART farms



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NOVEL TECHNOLOGIES USED FOR INCREASING THE PERFORMANCES OF COMPOSTING WASTES AND BY-PRODUCTS RESULTED FROM AGRICULTURE

Project: PN-III-P1-1.2-PCCDI-2017-0566 /Contract nr.: 9PCCDI / 09.03.2018

Authors:

Nenciu Florin [1], Nae Gabriel [1], Vlăduț Valentin [1], Voicea Iulian [1], Vrînceanu Nicoleta [2], Ungureanu Nicoleta [3]

[1] INMA Bucharest / Romania; [2] ICPA Bucharest / Romania; [3] UPB-ISB Bucharest / Romania

Invention Classification:
1. Environment - Pollution Control

DESCRIERE:

Invenția se referă la dezvoltarea unei noi tehnologii care poate fi utilizată pentru compostarea la eficiență ridicată a deșeurilor și a produselor neconforme rezultate din gestionarea serelor. Tehnologia de compostare implică două elemente principale: A. Dezvoltarea și testarea unor rețete de compostare și a unor condiții specifice de degradare și B. Dezvoltarea unui flux tehnologic folosind o instalație inovatoare de compostare, care scade timpul de procesare și crește calitatea compostului.

DESCRIPTION:

The invention refers to the development of a novel technology that may be used for high efficiency composting of agricultural wastes, and non-compliant products resulted from the management of greenhouses. The composting technology involves two main elements: A. Development and testing of various composting recipes, consisting of different vegetable mixtures and degradation conditions and B. Development of a technological flow using an innovative composting installation, which decreases processing time and increases compost quality.

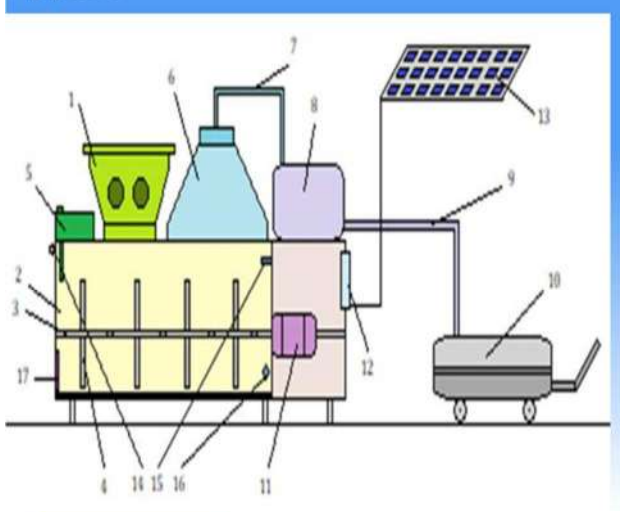
DESCRIPTION:

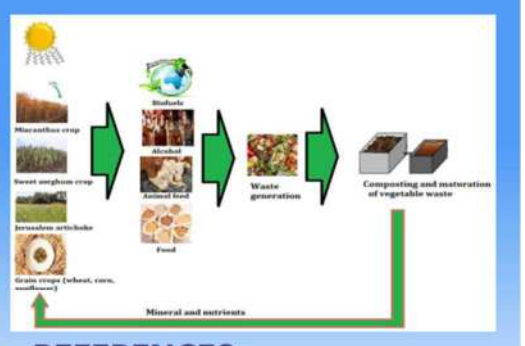
The main components of the innovative composting installation, that help in solving the most common problems identified in the composting technology :

1. Shredder for chopping vegetable mass
2. Composting tank
3. Shaft for blade driving
4. Compost mixing and aeration blades
5. Enzyme / inoculum dispenser
6. Water capture system, in the form of vapors, from the composting tank
7. Vapor transport pipeline
8. Vapor condenser
9. Condensed water transportation pipeline
10. Tank for storage and for transporting the condensed water
11. Compost mixer drive motor
12. Automation and control panel
13. Photovoltaic system
14. Sight sensor
15. Level sensor
16. Temperature and humidity sensors
17. Compost drain flap

CONCLUSIONS:

1. Compost processing using the technology optimized both in terms of recipes and in terms of process, allows obtaining a high quality compost with minimal resources expended;
2. The technology allows us to get closer to European Union goal of reaching the circular economy in agriculture
3. The technology reduces the amount of waste send to the landfill, especially food waste
4. The proposed practices and technology improves the recycling level of recyclable waste, organic waste being the main source of contamination.
5. Increase the amount of raw material that is composted in a batch (up to 10 times) by reducing the volume (using the water vapor capture).
6. Improves a number of environmental factors (reduces olfactory pollution, minimizes the production of greenhouse gases, technology allows the production of quality natural fertilizers, etc.)





REFERENCES:

1). Patent CN203947039 (U) — Rural household garbage composting device

2). Patent CN108341697 (A) — Household waste recovering and composting device

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DETERMINAREA UZURII ORGANELOR ACTIVE ALE UNUI SCARIFICATOR, ÎN REGIM ACCELERAT, FUNCȚIE DE TIPUL DE MATERIAL UTILIZAT

DETERMINATION OF WEAR OF THE ACTIVE ORGAN OF A SCARIFIER, IN ACCELERATED REGIME, DEPENDING ON THE TYPE OF MATERIAL USED

Authors:
VLĂDUȚOIU Laurențiu, TUDOR Andrei, FECHETE-TUTUNARU Lucian, GRIGORE Iulia, SORICĂ Elena

DESCRIERE:

În vederea încercării în condiţii de laborator a cuţitelor de lucrat solul, s-a folosit un stand ce permite încercarea în condiţii de laborator a diferitelor tipuri de cuţite de lucrat solul, prin modificarea parametrilor funcţionali ai acestora, respectiv a adâncimii de lucru, unghiului de aşezare, unghiului lateral faţă de direcţia de înaintare, a vitezei de lucru şi respectiv, după necesităţi, a granulaţiei şi umidităţii mediului de încercare.

DESCRIPTION:

In order to test the soil working tool under laboratory conditions, a test stand was used to test different types of soil working tools by modifying their functional parameters, respectively the working depth, rotative speed and respectively, according to necessities, granulation and moisture of testing environment.

COMPONENȚĂ:

Standul pentru încercarea cuțitelor daltă are în componență următoarele subansambluri principale:
- Bazin cu nisip;
- Reductor melc-roată melcată pentru antrenare;
- Ansamblu brațe suport organe de lucru;

Standul permite modificarea următorilor parametri funcționali ai cuțitelor daltă:
- adâncimea de lucru;
- unghiului lateral față de direcția de înaintare;
- viteza de lucru (prin variația turației motorului de antrenare).

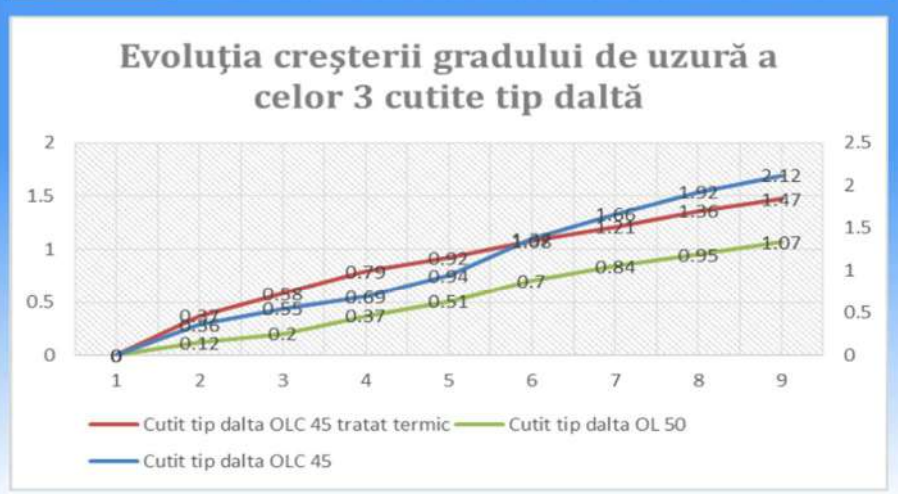
Prin dimensiunile de gabarit și cotele funcționale stabilite, standul permite încercarea cuțitelor tip daltă pe o traiectorie circulară cu diametrul de 1600 mm, la o adâncime maximă de 300 mm.

CONCLUZII:

În tabelele de mai jos se poate observa uzura efectivă pentru fiecare oră de funcționare. În cele 8 ore de funcţionare, cuţitul tip daltă din OL50 a suferit o uzură de 1,07 grame, cel din OLC45 tratat termic a suferit o uzură de 1,47 grame iar cuţitul tip daltă din OLC45 o uzură de 2,12 grame.

Este important să se continue cercetarea pentru a estima timpul mediu de rulare al cuțitelor tip daltă de lucrat solul și pentru a stabili intervalele de întreținere corespunzătoare.

Tip cuțit	Greutatea cuțitului tip daltă, după cântărire, la un interval de timp de încercare pe standul experimental (grame)									
	Inițială	După o ora	După 2 ore	După 3 ore	După 4 ore	După 5 ore	După 6 ore	După 7 ore	După 8 ore	Uzura totală
OLC 45	259.51	259.15	258.96	258.82	258.57	258.14	257.85	257.59	257.39	2.12
OLC 45 tratat termic	254.74	254.37	254.16	253.95	253.82	253.66	253.53	253.38	253.27	1.47
OL 50	236.75	236.63	236.55	236.38	236.24	236.05	235.91	235.8	235.68	1.07



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Process for obtaining superhydrophobic materials by laser ablation

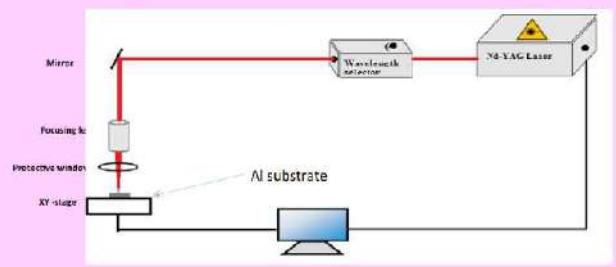
Urzica Iuliana, Simon Agota, Udrea Cristian, Logofatu Petre Catalin, Pascu Mihail Lucian
iuliana.iordache@inflpr.ro
National Institute for Laser Plasma and Radiation Physics, Romania

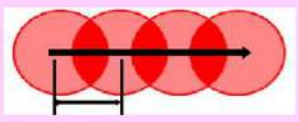
Patent number: A/00475/02.08.2019

Abstract: The invention relates the design and implementation of a flexible, adaptive and low cost innovative system for the production by laser ablation in different environments of materials with "lotus" effect, superhydrophobic materials, using a laser in ultra-short pulses. The lotus leaf, the rice leaf, the butterfly wing and the water-strider spider legs have surfaces that possess several uniquely beneficial properties, such as extreme water repellency, self-healing, self-cleaning, anti-bacterial, anti-corrosion, enhanced heat transfer, drag reduction and improved corrosion resistance.

Recently, superhydrophobic surfaces, for which water contact angle is higher than 150° and sliding angle less than 10°, have received attention due to the many potential applications ranging from biological to industrial processes and usable/ applicable properties, not only scientific but even in daily life.

➢Experimental set-up





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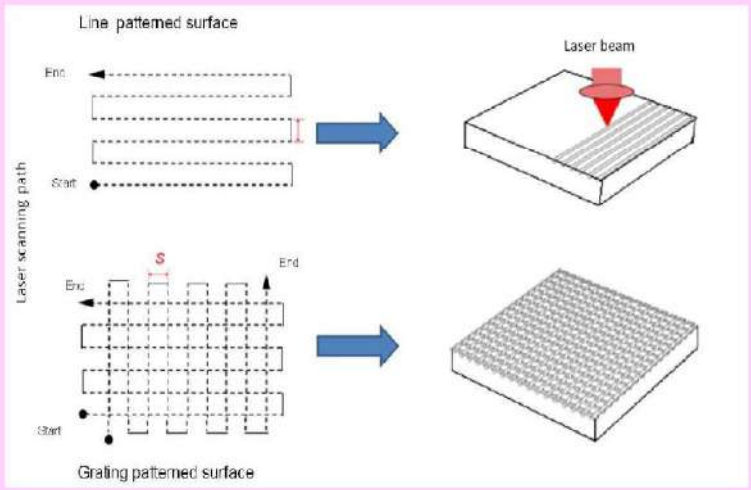
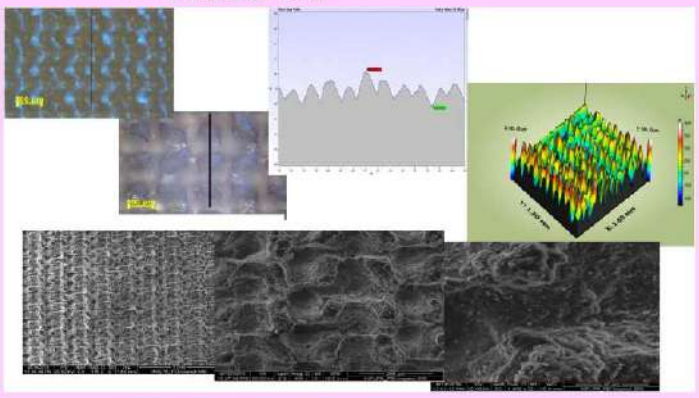
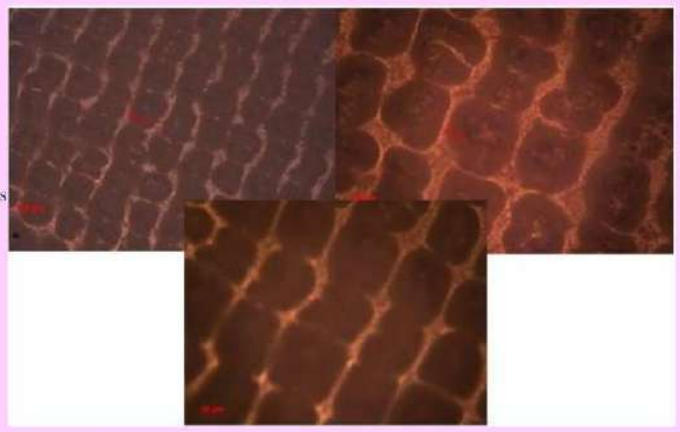


➢Results



Al surface irradiated in the environment

Manufacture fingerprint systems of polymeric materials



The replica of the pattern on the PDMS

Advanges

(1) developing of pattern superhydrophobic metallic surfaces using an innovative, flexible and low costs by nanosecond laser ablation system;
(2) nanosecond laser ablation takes place on the surface of a target with controlled composition whose stoichiometry is reproduced in the ablated material;
(3) the ablation takes place in different environments, whose composition can be chosen so as to represent a chemically inert environment compared to the ablated elements or from a reactive environment;
(4) both roughness and surface morphology can be controlled experimentally by surface variations and laser parameters;
(5) the additional procedures performed on the surfaces after structuring are non-invasive techniques;
(6) obtaining a fingerprint system can be applied universally to a wide class of polymeric materials;

Applications

➢***To create superhydrophobic food packaging!***

We know that the COVID-19 is a highly infectious disease. Everyone is responsible for reducing the spread and must take simple precautions.

➢***To create superhydrophobic surgical gloves!***

➢***To create superhydrophobic metallic surfaces for naval industry, food industry !***

Acknowledgements: The present research was supported by the Ministry of Research and Innovation -Nucleus Programme LAPLAS VI /16N/ 08.02.2019.

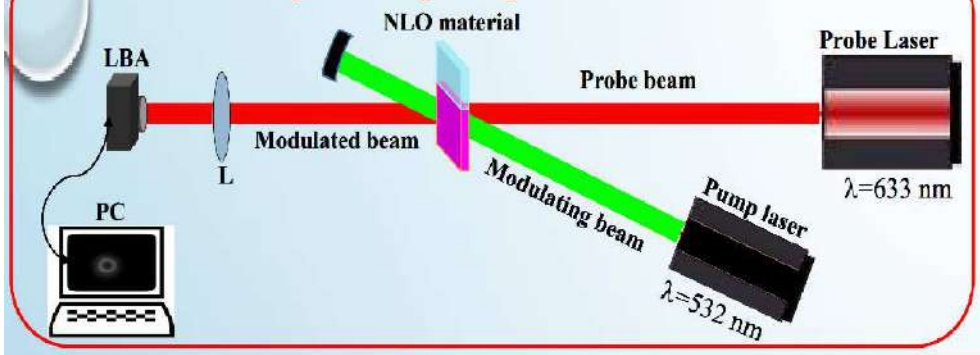
All-optical spatial light modulator based on functionalized DNA

Adrian Petris[1*], Ionel Valentin Vlad[1], Petronela Gheorghe[1],
Ileana Rau[2], Francois Kajzar[2]
*adrian.petris@inflpr.ro
[1]National Institute for Laser, Plasma and Radiation Physics, Bucharest – Magurele, Romania
[2]University POLITEHNICA of Bucharest, Faculty of Applied Chemistry and Materials Science, Bucharest, Romania

Patent application number: A 2016 01038

Abstract: The patent application describes an all-optical spatial light modulator (AOSLM) for applications that require the modulation of the optical phase of a laser beam. The refractive index of DNA nonlinear optical (NLO) material functionalized with the CTMA surfactant and doped with the photoisomerisable cromophores DR1 or DO3 is modified according to the intensity distribution of a modulating laser beam.
A probe laser beam with the wavelength outside of the NLO material spectral sensitivity, superimposed on the modulator beam inside the material, will have the optical phase modulated according to the refractive index distribution induced by the modulator beam in the NLO material.

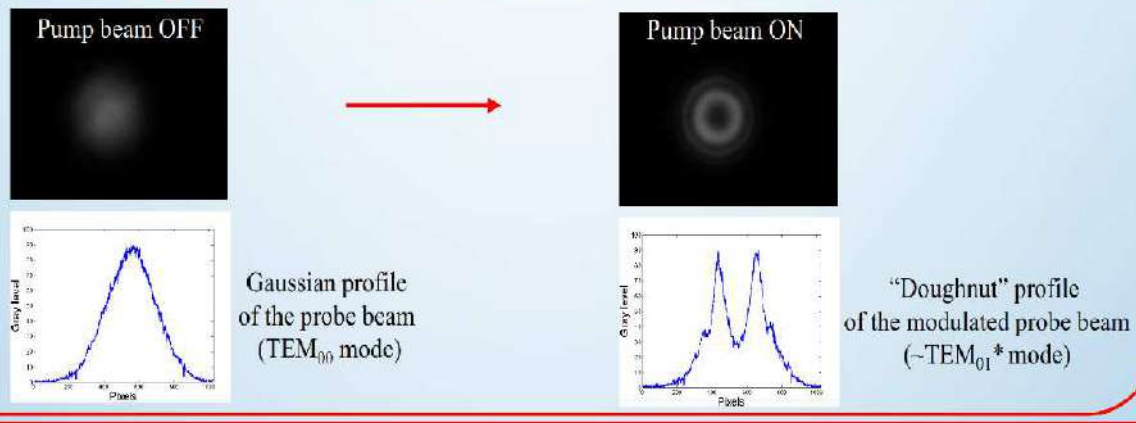
► Operation principle of the AOSLM



► The essential element of the modulator is the nonlinear optical material - DNA biopolymer – dye complex

- **New "green" photonic material** with applications in organic photonics and electronics; low cost; from renewable resources
- Transparent in Vis and NIR
- Good thermal stability
- DNA double stranded helix: large free volume for molecules → fast photo-isomerization of DR1/DO3 dye molecules and their protection.

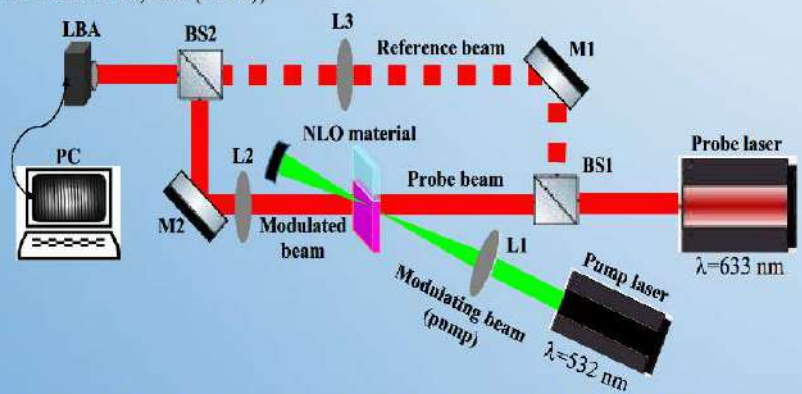
► Application of AOSLM for LASER BEAM SHAPING



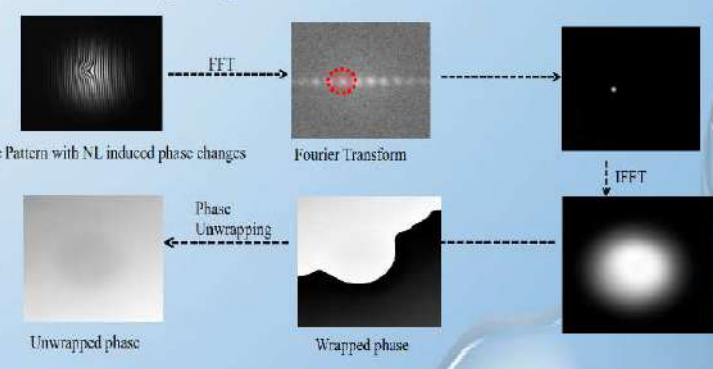
► Magnitude of phase change in AOSLM

► Method of measurement

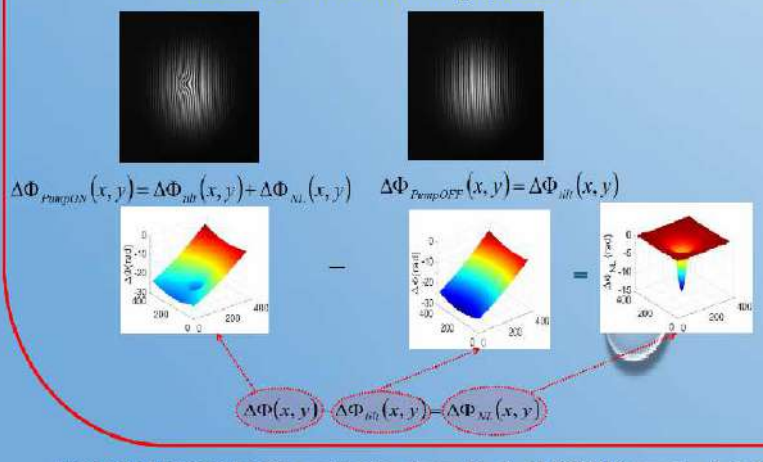
Pump-probe interferometric method with direct spatial reconstruction of optical phase (DSROP) from a single fringe pattern, **introduced by us** (Opt. Express 21, 31303 (2013); Rom. Rep. Phys. 67, 1373 (2015); Eur. Pol. J. 110, 130 (2018))



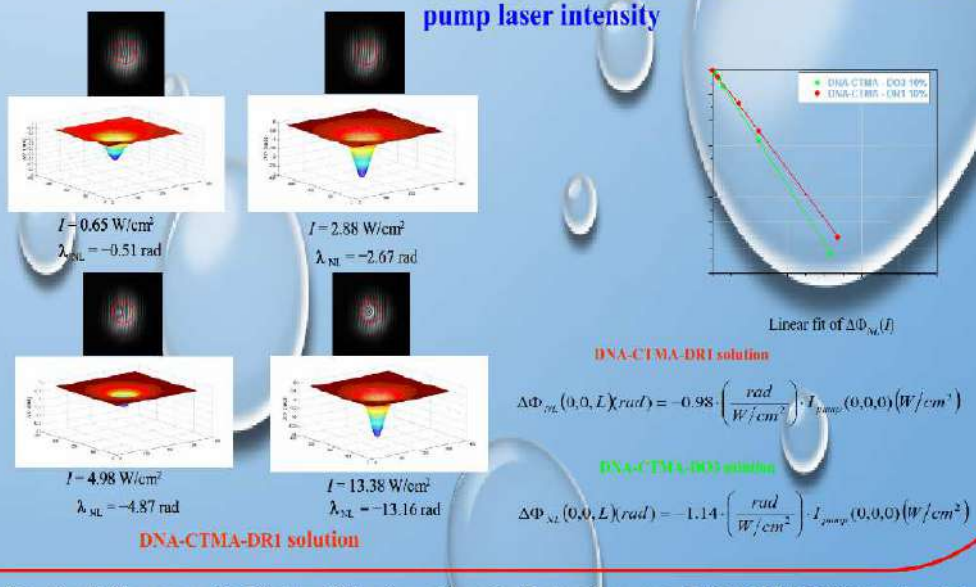
► Extracting the phase information - DSROP method



► 3D map of the light-induced spatial phase modulation $\Delta\Phi_{NL}$ extracted from the fringe patterns



► Experimental dependence of $\Delta\Phi_{NL}$ in DNA-CTMA-DR1/DO3 solution on pump laser intensity



ACKNOWLEDGMENTS: This work has been financed by the UEFISCDI Partnerships Project 3/2012 "Bio-Nano-Photo". The support of the Ministry of Education and Research (Nucleus Programme - LAPLAS VI 16N/2019) is acknowledged.

NATIONAL INSTITUTE FOR LASER, PLASMA AND RADIATION PHYSICS

LOVE WAVE SURFACE ACOUSTIC WAVE SENSOR BASED ON NANOPOROUS GOLD

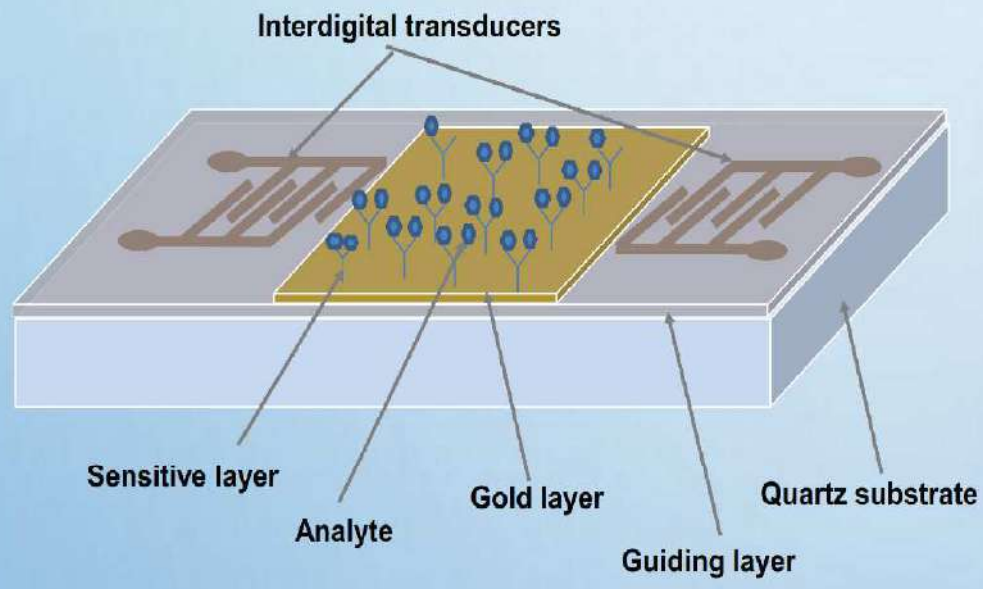
DANA MIU, CRISTIAN VIESPE, IZABELA CONSTANTINOIU

NATIONAL PATENT APPLICATION A00305/02.06.2020

DOMAIN: SAFETY, PROTECTION AND RESCUE OF PEOPLE

ABSTRACT: The invention refers to a Love-Wave Surface Acoustic Wave (LW-SAW) sensor having nanoporous (NP) gold as immobilization layer, which can be used as a biosensor for the detection of biological materials (proteins, nucleic acids, bacteria, viruses, etc). This is the first time that NP gold has been used in LW-SAW.

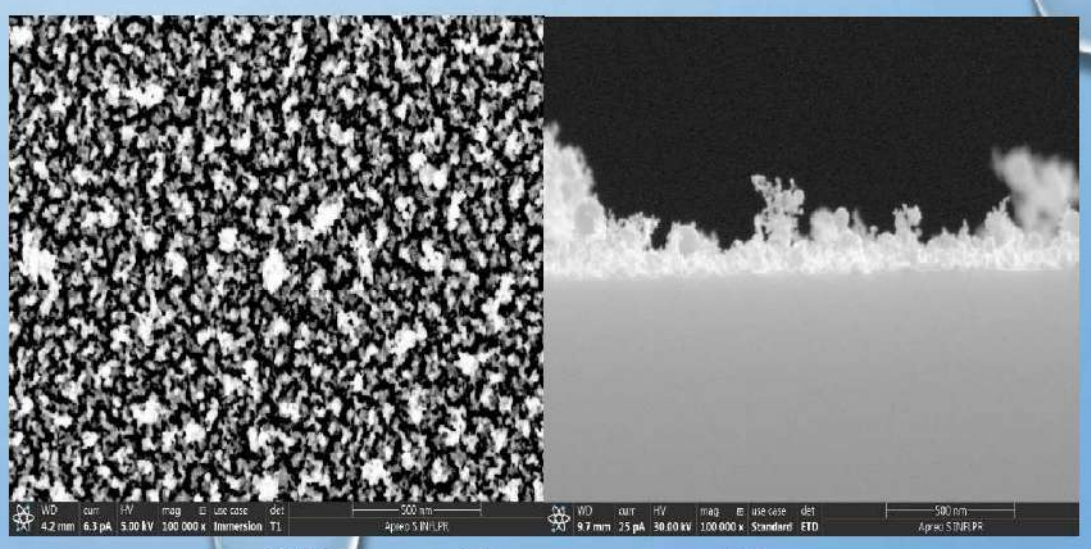
Love-Wave SAWs based on NP gold have improved sensitivity, selectivity, response and recovery time, compared to LW SAWs with a dense gold layer. The novel LW-SAW structure will have considerable impact by allowing sensitive, label-free early detection of various diseases.



Construction of Love-Wave Surface Acoustic Wave Sensor

The structure of LW-SAW consists in a piezoelectric substrate, a guiding layer and an immobilization layer. For the first time, this structure is modified in the invention by replacing the dense gold immobilization layer conventionally used with a nanoporous gold layer, which is placed on top of the guiding layer. The biological material is detected after immobilization by means of a sensitive material deposited over the nanoporous gold layer. The nanoporous gold layer has a much larger specific surface and a greater reactivity towards the analyte, leading to an increased sensor sensibility.

The morphological structure of the nanoporous gold includes open spaces which are accessible to the biological analyte and have dimensions of the same order of as those of the detected materials (enzymes, antigens, antibodies, etc). The open structures favor stable binding of the sensitive layer over large surfaces of the gold immobilization layer at high concentrations, and rapid reactions with the biological analytes. The surfaces of the structures also present greater reactivity than the surface of a dense gold layer.



SEM images of the nanoporous gold layer. left: surface; right: cross-section

ACKNOWLEDGMENTS: THIS WORK WAS SUPPORTED BY A GRANT OF THE ROMANIAN MINISTRY OF RESEARCH AND INNOVATION, CCCDI-UEFISCDI PROJECT NUCLEU PN16N/08.02.2019.

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DR. D. MIU(dana.miu@inflpr.ro) , DR. C. VIESPE (cristian.viespe@inflpr.ro), DRD. IZABELA CONSTANTINOIU (izabela.constantinoiu@inflpr.ro)

NATIONAL INSTITUTE FOR LASER, PLASMA AND RADIATION PHYSICS

PROCEDURE FOR THE DETECTION OF GASES IN REAL TIME BASED ON FOURIER ANALYSIS

IONUT NICOLAE, CRISTIAN VIESPE, DANA-MARIA MIU, AURELIAN MARCU

NATIONAL PATENT APPLICATION NO. A/00295/2020

Invention Classification: 12. Safety, protection and rescue of people

The invention refers to a procedure for the detection of gases using Surface Acoustic Waves sensors (SAWs), based on Fourier spectrum analysis, which leads to increased precision of analyte detection.

The SAW detection method currently used is based on measurement of the frequency variation of the fundamental frequency of the SAW oscillator in the presence of an analyte. The sensitivity of the method is therefore limited by this operating frequency, since the sensitivity is higher when the frequency is higher.

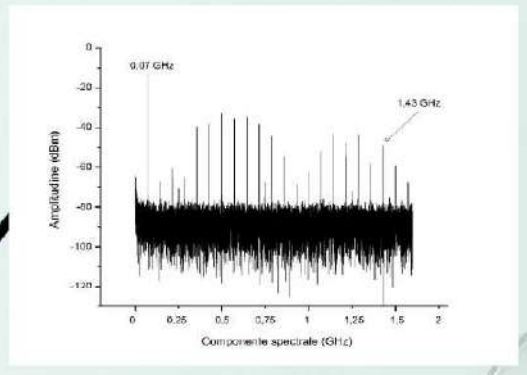
An increase of the operating frequency implies modification of the SAW sensor design, as well as more complex associated electronics (more expensive and complex amplifier and SAW design).

Through the procedure in the present invention, detection is obtained through comparison of the position of one or more of the harmonic components of the Fourier spectrum of the SAW oscillator in the presence of the analyte, with a reference spectrum which is registered in the absence of any analyte. Based on the difference between the actual position of the harmonics and the reference spectrum, the presence of the analyte is deduced.

The detection system includes a SAW sensor, an amplifier and an oscilloscope (see figure).

The procedure of analyte detection is:

- a reference spectrum is acquired in the absence of the analyte using the oscilloscope;
- a harmonic is chosen from the spectrum in the inset of the figure (1.43 GHz, for example);
- the SAW sensor is exposed to the analyte (methanol, for example)
- the spectrum is acquired in the presence of the analyte using the oscilloscope;
- the new position of the harmonic component used (which, for example, is 1.43 GHz in the absence of the analyte) is determined
- the presence of the analyte (methanol, in our example) is detected from the frequency shift of the harmonic component used in the presence of the analyte



The advantage of this procedure consists in the increased sensitivity in comparison to the classical method used in SAWs. The increased sensitivity is obtained through the use of the harmonic frequencies, which are higher than the fundamental frequency, without the need to modify the fundamental frequency itself.

The invention has applications in the domain of detection of gases and Volatile Organic Components

ACKNOWLEDGMENTS: THIS WORK WAS SUPPORTED BY A GRANT OF THE ROMANIAN MINISTRY OF RESEARCH AND INNOVATION, CCCDI-UEFISCDI PROJECT NUCLEU PN16N/08.02.2019.

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A process for the analysis of ethylene from gas mixtures

20-22 MAY 2021
13th Edition of

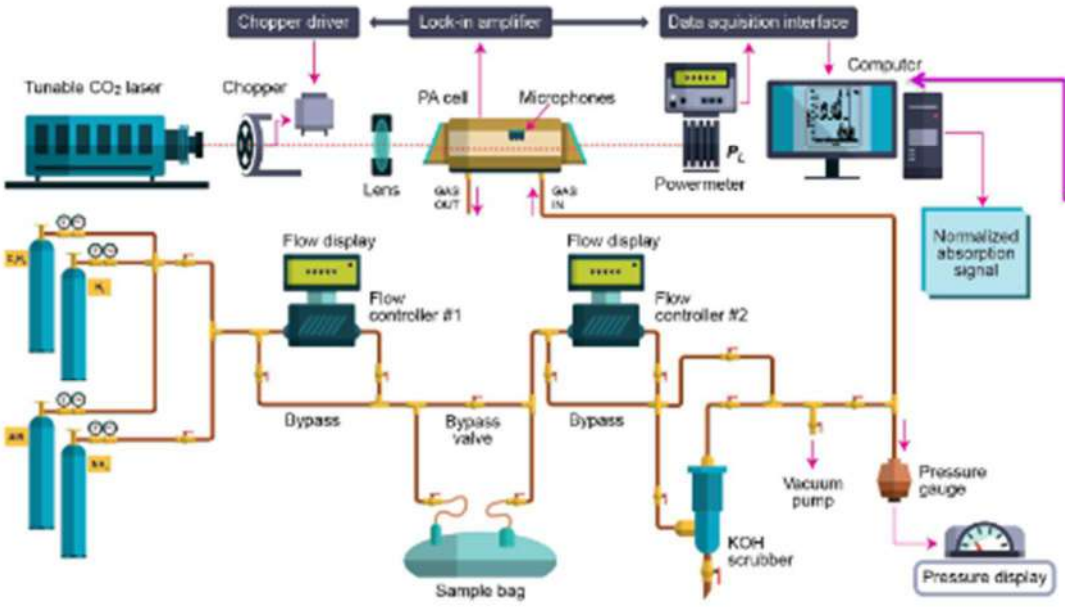
Cristina-Mihaela ACHIM (POPA)[1*], Ana-Maria BRATU[1], Mioara-Elena BERCU[1], Dan Constantin DUMITRAS[1], Doru Constantin Adrian DUTU[1]

[1]*National Institute for Laser, Plasma and Radiation Physics, Bucharest – Magurele, Romania*

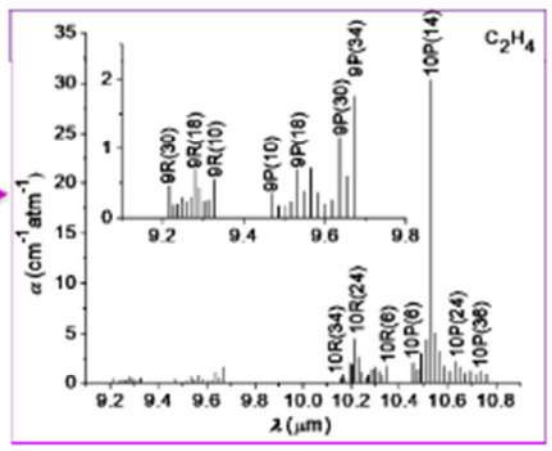
National Patent application: No. A/00068/2019

Contact person: cristina.achim@inflpr.ro

Short presentation: The **patent application no. A/00068/2019,** refers to a ***NOVEL*** **procedure for the analysis of ethylene** from gas mixtures, with ***USEFULNESS*** in the human breath analysis, assessment of pollution, and surgical smoke with great ***MARKET OPPORTUNITIES*** through the applications given by the quality evaluation of fruits, plants, and vegetables. The procedure consists of the ethylene gas detection unit, presented according to the process and includes, the acoustic unit along with a tunable laser in frequency and amplitude, the manipulation of the gas mixture and the electronics required to determine the ethylene concentration. Following this procedure, the concentration of ethylene is obtained, based on the electromagnetic radiation absorption with a specific wavelength.



*The experimental **DESIGN** for the analysis of ethylene using laser photoacoustic spectrometer.*

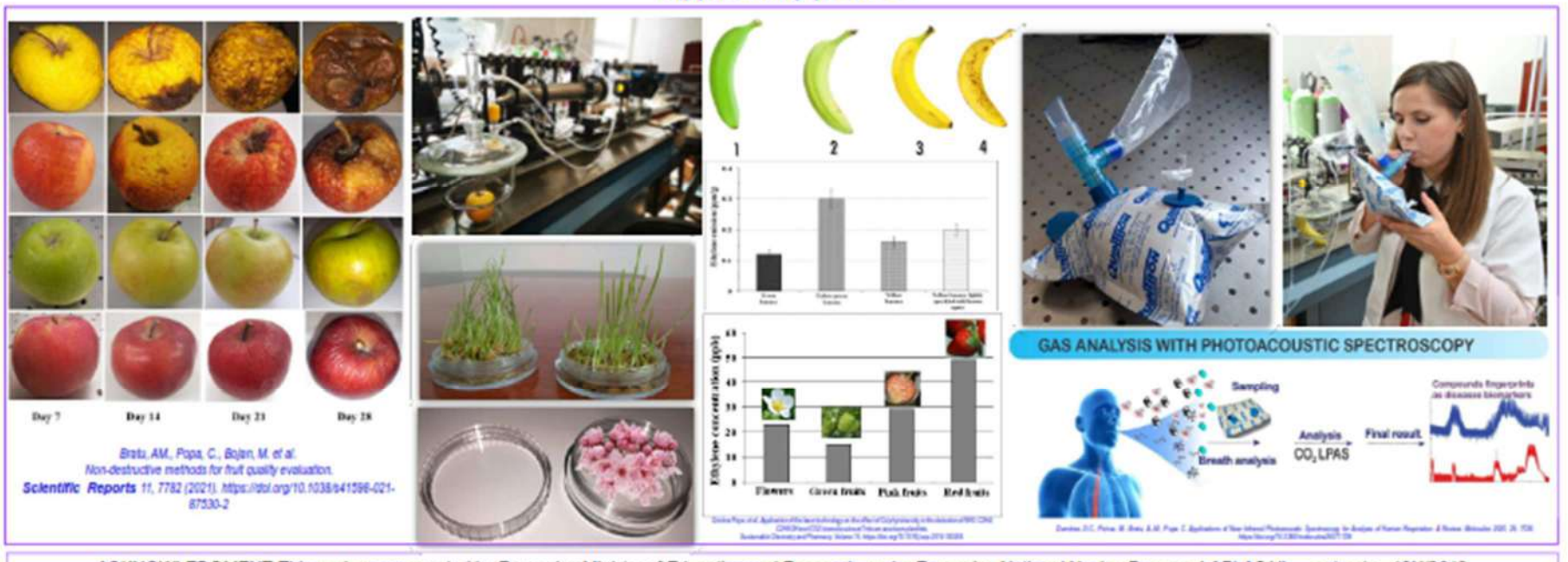


Absorption coefficients of ethylene at available CO_2 laser wavelengths.

Advantages & Applicability

1. **Medicine - human health assessment:** The analysis of human breath for diagnosis of diseases has certainly one of the highest potential impacts on public health and quality of life. In clinical medicine, breath testing is the least invasive of all diagnostic tests, presenting minimal risk and negligible discomfort to patients. Trace ethylene analysis of the breath composition gives information about various processes occurring inside the human body. One such process is lipid peroxidation in which free radicals induce oxidative degradation of the polyunsaturated fatty acids, causing cell damage and cell death. In a normal situation, free radical formation and antioxidants are balanced. Under certain conditions (e.g. UV radiation, ionizing radiation (X-ray) trauma, pulmonary and skin diseases, heart failure, diabetes, mental disorders, cigarette smoke, etc.) this balance is disturbed.
2. **Life sciences and Food quality evaluation - analysis of surgical smoke, pollution and evaluation of fruits, plants, and vegetables:** germination of seeds, ripening of climacteric fruits, plant resistance to stress factors and plant response to pathogen infection. Ethylene acts as a vegetal hormone produced by all plant tissues, is transported by diffusion through plant tissues, increases the plasmatic membrane permeability, has multiple effects on the cell metabolism, increases the oxidative processes, the transport inside the cells and the biodegradation of the organic acids and chlorophyll, plays a major role in many metabolic processes.

Applicability pictures



Brata, AM., Popa, C., Bojan, M. et al.
Non-destructive methods for fruit quality evaluation.
Scientific Reports 11, 7782 (2021). https://doi.org/10.1038/s41598-021-87530-2

ACKNOWLEDGMENT: This work was supported by Romanian Ministry of Education and Research, under Romanian National Nucleu Program LAPLAS VI – contract n. 16N/2019.

INFLPR

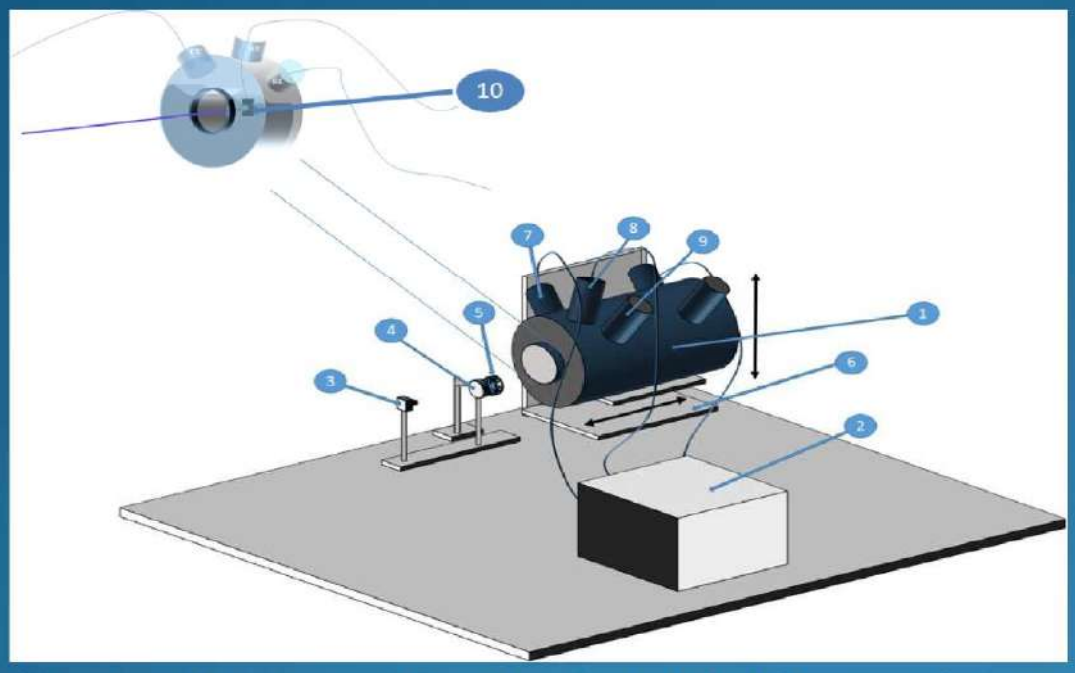
NATIONAL INSTITUTE FOR LASERS, PLASMA AND RADIATION PHYSICS

HETEROSTRUCTURES BASED ON INORGANIC PEROVSKITES FOR PHOTOELECTROCHEMICAL APPLICATIONS

ANDREI FLORIN, SCARISOREANU NICU, ION VALENTIN, DINESCU MARIA

NATIONAL PATENT APPLICATION A00830/02.12.2019

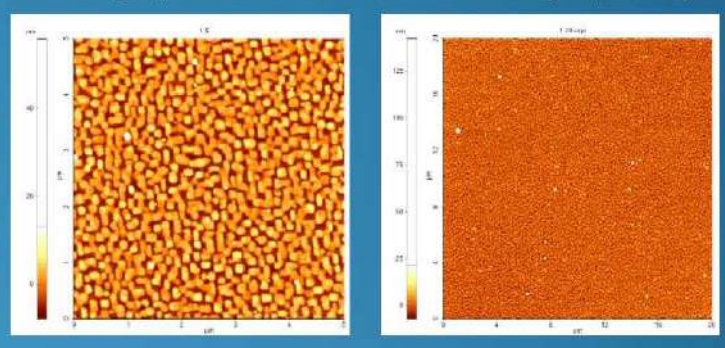
DOMAIN: ENERGY AND SUSTAINABLE DEVELOPMENT



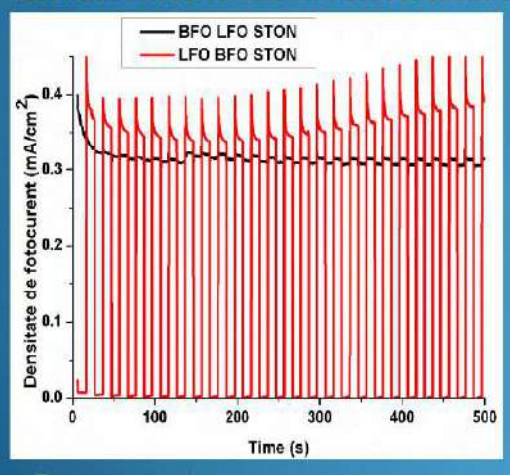
Photoelectrochemical setup: 1. Photoelectrochemical cell; 2. Potentiostat; 3. Laser diode; 4. Focusing lens; 5. Chopper; 6. Stand for the photoelectrochemical cell; 7. Counter electrode; 8. Working electrode ($LaFeO_3$/$BiFeO_3$ heterostructure); 9. Reference electrode; 10. Thin films prepared by PLD.

The invention is related to an original procedure for the obtaining of heterostructures based on $LaFeO_3$ (LFO) and $BiFeO_3$ (BFO) perovskites with enhanced photoelectrochemical stability. The heterostructures were manufactured via pulsed laser deposition (PLD) technique on Nb doped $SrTiO_3$ (STON) conductive substrates. The functionality of these devices was tested in a three-electrode system coupled to a photoelectrochemical cell. The electrolyte in which the samples were tested is a strongly alkaline NaOH solution (pH = 13.7). The irradiation was performed using a laser diode emitting at 405 nm.

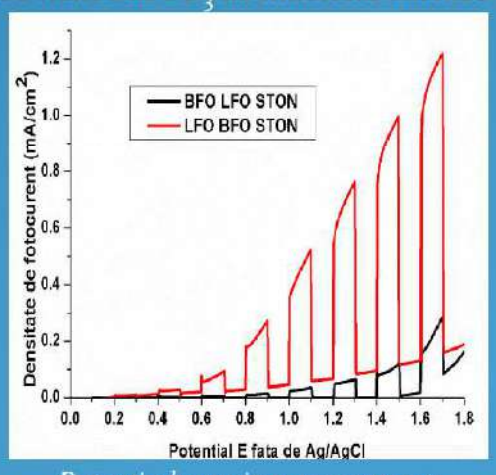
AFM images for heterostuctures with $LaFeO_3$ as final layer



The results confirm the great photoelectrochemical **stability** of heterostructures based on $LaFeO_3$/$BiFeO_3$ in **strong alkaline** experimental conditions. Potentiostatic measurements show excellent stability for the heterostructure having $LaFeO_3$ as top material, with a maximum of the photocurrent density of ca. **0.45 mA/cm² at 0.4 V vs Ag/AgCl**. A huge value of the photocurrent density was obtained during the potentiodynamic measurements for the heterostructure with $LaFeO_3$ as material surface.

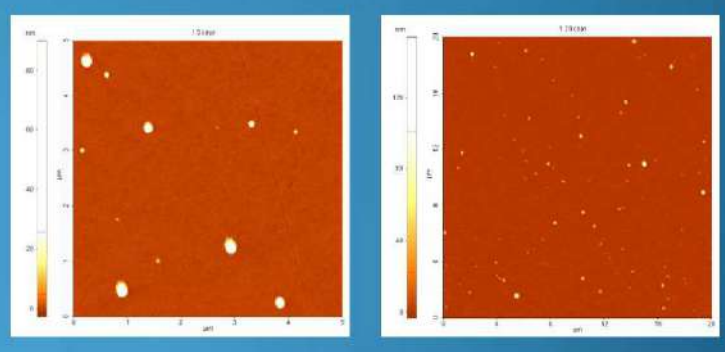


Potentiostatic measurements



Potentiodynamic measurements

AFM images for heterostuctures with $BiFeO_3$ as final layer



Acknowledgment:This work was supported by CCCDI-UEFISCDI, projects number PN-III-P4-ID-PCE-2016-0911

Contact person: Andrei Florin; florin.andrei@inflpr.ro

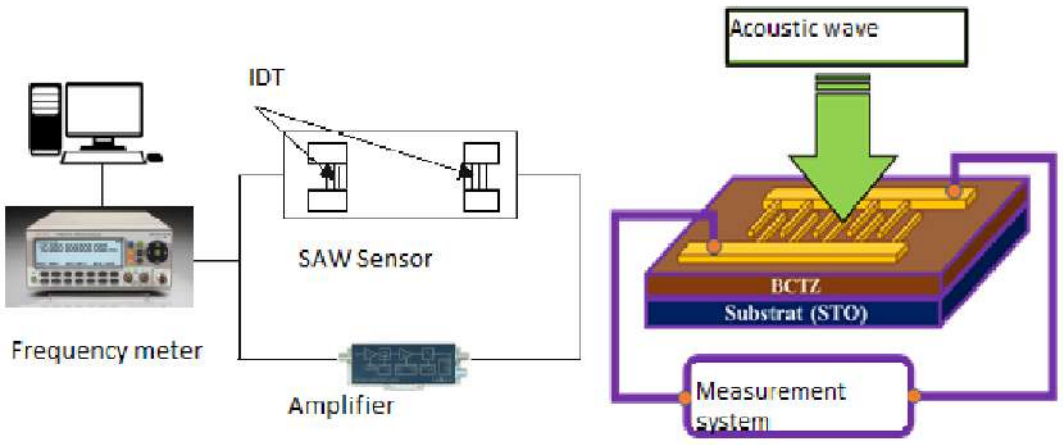
NATIONAL INSTITUTE FOR LASERS, PLASMA AND RADIATION PHYSICS

Method of obtaining pressure sensors based on thin films of ecological lead-free piezoelectric material $((Ba_{1-x}Ca_x)(Zr_yTi_{1-y})O_3$ deposited by pulsed laser deposition

SCARISOREANU N.D., ENEA N., VIESPE C., ION V.

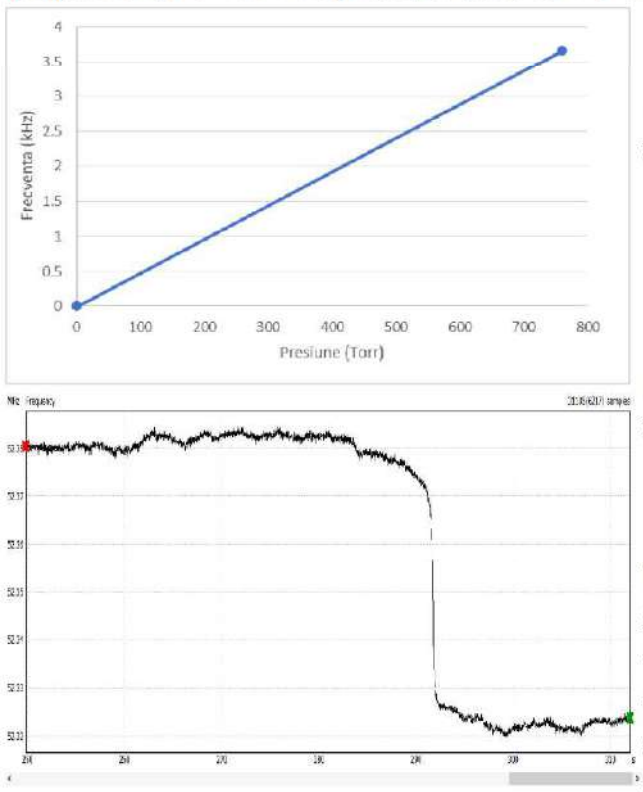
NATIONAL PATENT APPLICATION A/00747/18.11.2020

DOMAIN: safety, protection and rescue of people



Functional scheme for obtaining SAW sensors based on BCZT for detecting pressure variation

The **sensors** were tested in real laboratory and environmental conditions, the response of the sensors to the pressure variation being presented below. Following the tests we can conclude that the response of the sensors is proportional to both the pressure variation to which they are subjected..



SAW sensor response based on BCZT thin films deposited on STO, subjected to pressure variation in laboratory conditions

SAW sensor response based on BCZT thin films deposited on STO, subjected to a pressure variation in real environmental conditions

The technical problem solved by the present invention consists in obtaining new sensors type SAW- Surface acoustic wave for **the detection of pressure variation**. These sensors use as sensitive layers **ecological materials** based on a solid solution of calcium-doped barium titanate and zirconium-doped barium titanate $(Ba_{1-x}Ca_x)(Zr_yTi_{1-y})O_3$ (BCTZ). The sensor used was made on a single crystal substrate of $SrTiO_3$. The sensitive thin film of BCZT is obtained by the method of pulsed laser deposition (PLD) in the oxygen atmosphere, at a temperature of 700^0C. In order to determine the electrical properties of the BCZT thin films and to integrate them in the test device at different pressures, various configurations of metal electrodes were deposited using the thermal evaporation technique. Thus, deposits of metallic Au electrodes with a thickness of approximately 200 nm were made on the piezoelectric active thin films using a mask with interdigital type electrodes (IDT) with a period of 50 μm and a digit width of 50 μm. Au wires with a diameter of 50 μm and a length of approximately 5 cm were glued to the Cr / Au electrodes. For gluing, conductive Ag paste was used, with a concentration of Ag particles of at least 70%, and the procedure was performed using an optical microscope. In this way four wires were attached to each sample, which corresponds to the input signal and respectively output.

The use of the BCZT thin films as a sensitive layer in the SAW sensor offers some indisputable **advantages**:

- they are **ecological materials** - they do not contain toxic chemical elements;
- has a **high dielectric constant** (3000), small dielectric losses (0.001) and piezoelectric coefficient **d33 ~ 200 pm/V**;
- adequate functionalization of the BCZT thin films ensures a frequency jump of 60 kHz and an ordinal response time of milliseconds;
- **room temperature detection**.

Acknowledgment:This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI-UEFISCDI, projects number PN-III-P1-1.2-PCCDI-2017-0172

Contact person: Nicoleta Enea; nicoleta.enea@inflpr.ro

Process of experimental realization of Ag/ SiO_2 multilayer by optimized thin film depositions for metamaterial applications

Petronela GAROI, Cristian Viespe, Florin GAROI, Valentin CRĂCIUN

National Institute for Laser, Plasma and Radiation Physics, Laser Department

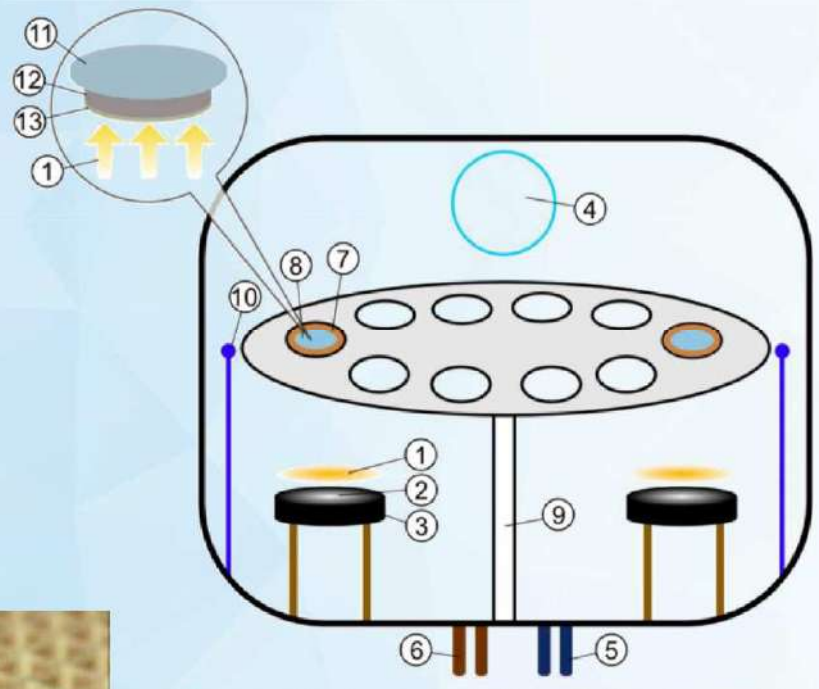
Apel Laser SRL

NATIONAL PATENT APPLICATION A/00772/ 23.11.2020

DOMAIN: Energy and sustainable development

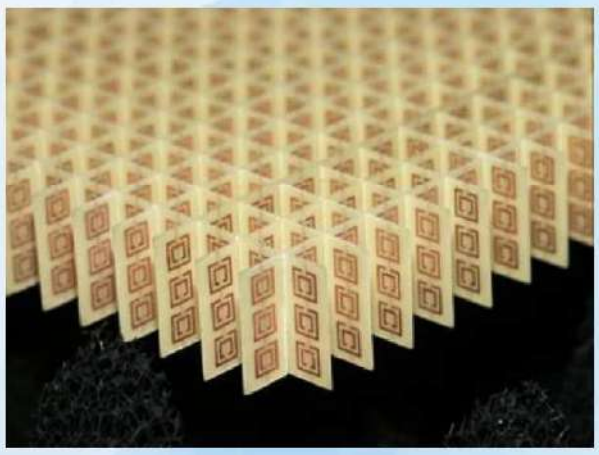
The invention refers to a process for making a recipe using the optimal deposition parameters, with the aim to achieve a Ag / SiO_2 multilayer using the magnetron sputtering technique.

In the process, sputtering takes place successively from the SiO_2 and Ag targets, which are placed on two magnetrons in the deposition chamber and in O_2 (for the SiO_2 target) and Ar (for the Ag target) working gas flow, introduced using flowmeters. Their designed, precise shape, orientation, and arrangement of these SiO2 and Ag component layers affect the electromagnetic waves, to create a structure of metamaterial. Exactly like an arrangement of artificial structural elements, with advantageous and unusual electromagnetic properties.

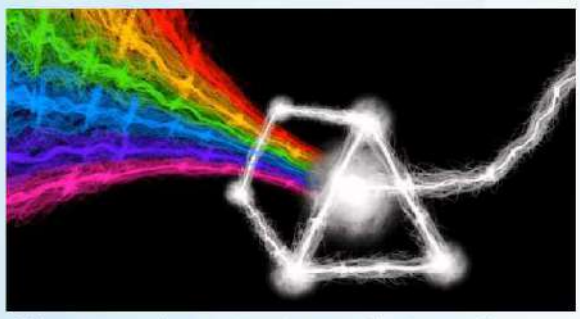


Schematic representation of the magnetron sputtering equipment used to obtain SiO_2 and Ag component layers, which improve the properties of metamaterial structures.

Traditional materials: clay, glass, wood. [1, 2]



Artificial materials: Metamaterials have enabled manipulation of electromagnetic waves and produced new functionalities. [1 – 4]



The complex structures that perform a special function, such as transparently blocking a specific color of light. [3, 4]

In the experimental conditions, silver and SiO_2 films with a uniform, reproducible nanoscale structure were obtained. The structural analyses show that the films have a granular-like and pinhole-free microstructure. The crystallites orientation, the granulation and columnar growth are evident in the Ag depositions.

We used metallic, semiconductor, and insulating nanostructures to construct the metamaterial structures. From the surface of the targets it is deposited individually, directly on the surface of the quartz substrate, the SiO_2 and Ag component layers, having good crystallographic quality of the layer on large deposition surfaces .

This Ag / SiO_2 multilayer, obtained from thin coatings, has dielectric and plasmonic qualities which improve the properties of metamaterial structures and space microsatellites due to the low values of the refractive index.

References:

1.Steven A. Cummer, Metamaterials, Cloaking, and Acoustics

2.Jeremy Wagstaff, *https://www.huffpost.com/entry/metamaterials-more-than-invisibility-scientists_n_4501918*

3.Wenshan Cai & Vladimir Shalaev, Optical Metamaterials Fundamentals and Applications

4.Photonics Crystals and Metamaterials: from Superlensing to Cloaking (Pendry's dream)

CONTACT: DR. PETRONELA GAROI (petronela.garoi@inflpr.ro)

Aacknowledgments: This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS-UEFISCDI, project number PD 52/2011 And project STAR 178/20.07.2017

HPTLC densitometry method for the analysis of irradiated thioridazine solutions based on laser-induced fluorescence and fluorescence lifetime characterization

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National Institute for Laser, Plasma, and Radiation Physics, Laser Department, Magurele, Romania

Patent application no. A/00120 from 18.03.2021

1. Technical field

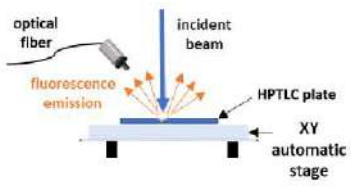
- The invention belongs to the industrial and laboratory equipment classification.
- The invention can be applied in the technical fields of chemical engineering and technology.
- High Performance Thin Chromatography (HPTLC) provides superior information on the separation of complex samples for qualitative and quantitative evaluation of pharmaceuticals, plants and herbs, pesticide mixtures, forensic samples, dyes and intermediates used in the food or cosmetics industry.
- The HPTLC technique is used to analysed simultaneously different samples with zero risk of cross-contamination, offering the advantage of evaluating the samples using different detection modes (absorption, fluorescence).
- The invention relates to an HPTLC densitometer able to generated the fluorescence chromatograms, the laser-induced fluorescence spectra and fluorescence lifetime of the constituents of the samples, obtaining qualitative and quantitative information.
- The invention was validated for thioridazine and was used to obtain the chromatograms, fluorescence spectra and fluorescence lifetime of the photoproducts of thioridazine prior exposed to laser radiation.

2. State of the art

- HPTLC is the most advanced form of thin layer chromatography and consists of chromatographic layers that have the highest separation efficiency.
- To obtain product separation on a HPTLC plate, the following steps are required: sample application, plate development, derivatization (if applicable), and detection.
- For sample application and plate development, existing technologies are mature and no improvements are needed.
- For the detection of separate compounds on the HPTLC plate, there are two ways of detection / visualization, qualitative and quantitative.
- The qualitative method: the HPTLC plates are introduced in a viewing cabinet equipped with two lamps (254 nm and 366 nm) and then are photographed.
- The quantitative method: called densitometry, is based on detecting separate substances on the HPTLC plate based on fluorescence or absorption and generates the chromatograms.
- Several densitometers, with various detection systems, were developed: patent no. SU661261A1, US4591272A, US4150899A, and 5243401, .
- The densitometers use as excitation sources lamps such as deuterium (UV), halogen-tungsten (visible), or mercury (various spectral lines), and a monochromator for wavelength selection.
- In the fluorescence module, the excitation radiation, usually 254 nm or 366 nm, with a spot of 6 x 0.4 mm is directed perpendicular to the HPTLC plate.

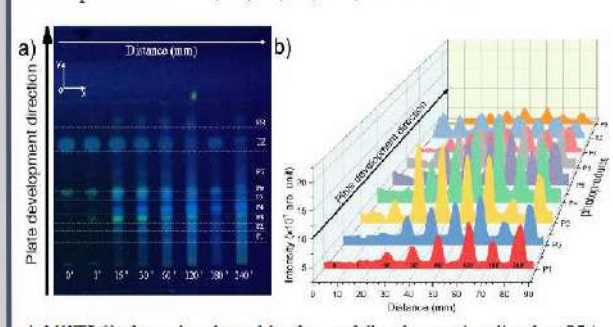
3. The invention

- The invention offers the vertical and horizontal chromatograms of compounds separated on HPTLC plates by recording laser-induced fluorescence spectra and the fluorescence lifetime.
- The excitation source is a laser diode emitting at 375 nm (pulse duration of 87.7 ps, pulse frequency 30 MHz, and an average power of 490 μW).
- The radiation emitted by the diode is directed perpendicular to the HPTLC plate.
- An automatic XY stage is used to move with 1 mm increment in the OX and OY directions the HPTLC plate.
- An optical fiber positioned at 45° from the incident beam, is used to collect the fluorescence signal emitted by the compounds separated on the plate.
- The fiber is alternately coupled to a spectrograph or photomultiplier, to record the fluorescence spectra or fluorescence signal resolved over time.
- The fluorescence signal is recorded in the OX direction (horizontal chromatogram - the evolution of the fluorescence of a certain compound) or OY direction (vertical chromatogram - the evolution of all compounds in a sample).
- The fluorescence spectra / fluorescence intensity and the fluorescence lifetime for the compounds separated on the HPTLC plate are obtained.

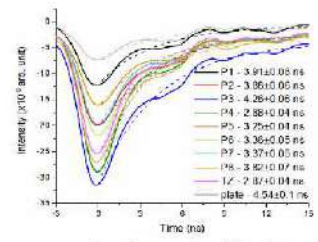


4. Invention results

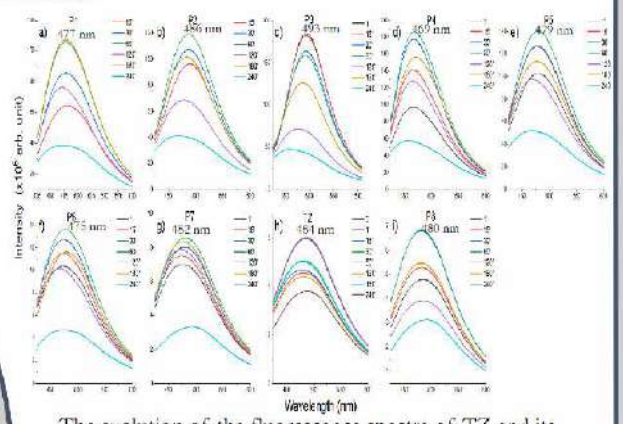
- Thioridazine (TZ) dissolved in ultrapure water.
- TZ concentration = 2 mg/ml .
- TZ solutions were irradiated with laser beam at 266 nm, emitted by an Nd: YAG laser (6 ns FWHM, 10 Hz, 6.5 mJ).
- Exposure time= 1, 15, 30, 60, 120, 180 and 240 min.



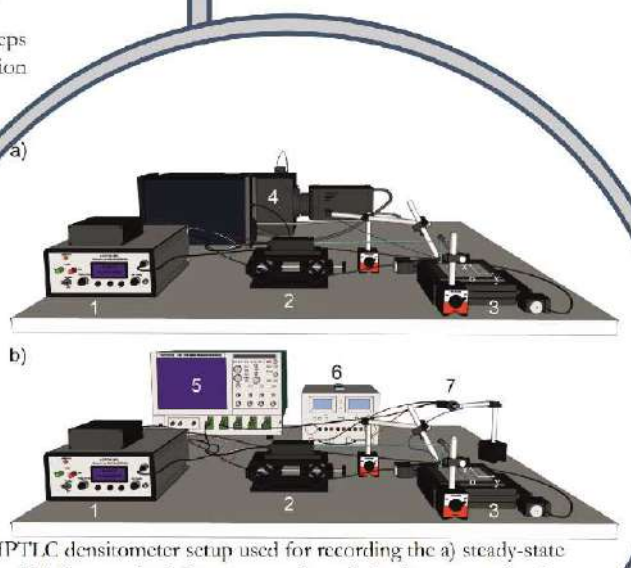
a) HPTLC plate, developed in the mobile phase, visualized at 254 nm; b) 3D chromatograms of TZ and its photoproducts, resulted from laser-induced fluorescence scanning on OX direction.



Fluorescence signals resolved in time of TZ and its photoproducts and their fluorescence lifetime.



The evolution of the fluorescence spectra of TZ and its photoproducts.



HPTLC densitometer setup used for recording the a) steady-state and b) time-resolved fluorescence; legend: 1 – laser control unit, 2 – laser head. 3 – translational stage with HPTLC plate on it, 4 – spectrograph, 5 – oscilloscope. 6 – control unit for photomultiplier, 7 – photomultiplier.

5. The technical problem that the invention solves

- The use of a laser diode for excitation instead of conventional lamps provides better reproducibility and selectivity of excitation radiation, providing fast and accurate measurements, especially in quantitative determinations.
- The excitation sources can provide manufacturers with miniaturization opportunities and lower cost solutions for the manufacture of new densitometers.
- The beam emitted by the laser diodes can be easily coupled to optical fibers.
- An advantage in using picosecond pulsed diodes is the possibility of determining the fluorescence lifetime of the compounds.
- The innovative method benefits from the superior characteristics of laser radiation compared to conventional light sources, namely coherence, directionality, monochromaticity.
- By using laser radiation, a good spatial resolution of the distribution of compounds on the HPTLC plate is obtained, allowing a better focus of the radiation on the plate and the investigation of an area determined by the beam size (in this case 1.6 x 1.8 mm).
- Determining the fluorescence lifetime can help to discriminate two molecules with overlapping fluorescence spectra but with different fluorescence lifetimes.
- The higher scanning resolution of the HPTLC plate obtained by using a laser beam with a small cross section can allow the purity of the compounds to be determined by evaluating the fluorescence in the OY direction for the same spot in the chromatogram band.

6. Advantages and application

- The invention offers the laser-induced fluorescence chromatograms, the fluorescence spectra, and lifetime of the compounds separated on the HPTLC plate.
- To our knowledge, there is no reported up to now, a method to investigate the fluorescence lifetime of compounds from HPTLC plates.
- Comparing HPTLC densitometry with HPLC-FLD :
  - HPTLC densitometry is more advantageous due to its simplicity, flexibility, accessibility;
  - for HPLC-FLD the fluorescence spectra cannot be obtained for photoproducts that do not spend enough time in the FLD detector;
  - HPTLC densitometry provides a much faster discrimination than HPLC-FLD, where optimizing the method can take a long time.
- The translation to industrial applications requires the use of existing equipment (pulsed emission laser diode excitation source in the field of picoseconds, a spectrograph coupled with an ICCD, a photomultiplier coupled with an oscilloscope and a automatic translation stage) .
- This invention can be applied industrially by a complete automatization of the data acquisition and processing for the developed equipment.

SOL Laser Spectroscopy Optics

ACKNOWLEDGMENT

This research was funded by Ministry of Research, Innovation and Digitization, CNCS/CCCDI-UEFISCDI, project PN-III-P1-1.1-PD-2016-1072, NUCLEU Program 3N/2018, and NUCLEU Program 16N/08.02.2019.

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INSTALLATION FOR WATER DISINFECTION

Patent Application for Invention No. A/00067/22.02.2021
Author: PhD student Emilia Dobrin, ISIM Timișoara
Applicant: National Research & Development Institute for Welding and Material Testing – Timișoara, Romania

Fields of use

- Medicine - Health Care - Cosmetics
- Industrial and laboratory equipment
- Environment - Pollution Control

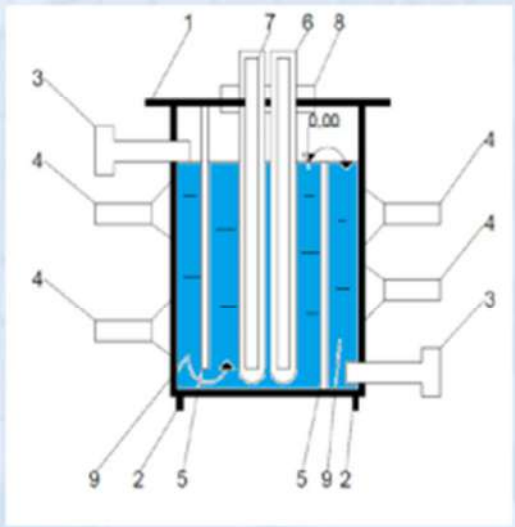

Figure 1

Technical specification

- Ultrasonic (US) generator:
  power 500 W
  frequency 20kHz
- Ultraviolet (UV) set:
  power 160 W/cm²
  length 1554 mm
  diameter 15 mm

Description (figure 1)

1- tank
2-support
3-industrial tap
4-snotrode
5-plates
6-tube
7-UV lamp
8-assambly
9-area
10-generator US
11-distribution box
12-monitory box

Advantage

- It covers a more efficient water disinfection process
- More optimal operation by remote monitoring of the installation
- It shows a better efficiency by registering, saving, archiving and real time data transmission in a local area network
- It has a more efficient control by remote control of the installation

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Method of making rectangular and square tubes of aluminum alloys, by the process of friction stir welding (FSW)

Patent request No. A 00242 / 06th.05.2020 / OSIM Bucharest.
Authors: VERBIȚCHI Victor, Timișoara, Romania; SÎRBU Nicușor-Alin, Timișoara, Romania; VLASCICI Miomir, Timisoara, Romania.
Applicant : National Research & Development Institute for Welding and Materials Testing - ISIM Timișoara
Address: 30, Blv. Mihai Viteazul, Postal Code 300222, Timișoara, Timiș, Romania

Technical specification

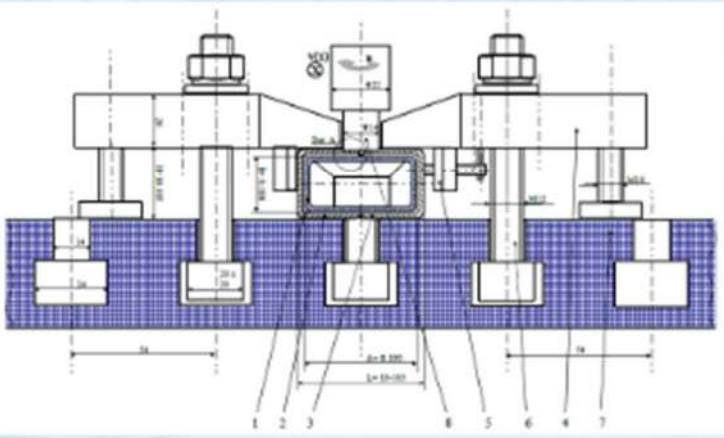
Tube cross section: (10 - 100 mm) x (10 - 100 mm). Material: aluminum alloy sheets, thickness range 2 - 5 mm. Friction stir welding (FSW) process for execution. Friction stir processing (FSP) for structure consolidation.

Applications

Products: various setups; light constructions; outdoor welded structures. Fields of application: electro-technique, construction, manufacturing, rolling stock and automotive industries.

Novelty items

Execution of rectangular or square tubes of aluminum alloys, as a more efficient technical solution, alternative to manufacture of tubes by extrusion, rolling or other welding processes.



Components

1 - Model;
2 - Sheet A;
3 - Sheet B;
4 - Clamp;
5 - Vise;
6 - Screw;
7 - FSW machine;
8 - FSW tool.

Figure 1. Method of execution of rectangular and square tubes, by the FSW process. Principal draft

Claims

1. Method of making rectangular and square tubes of aluminum alloys by FSW, characterized in that, it uses a model 1, a sheet 2 and a sheet 3, bent as U-shaped profiles on the model 1, placed on a FSW machine 7, so that a FSW tool 8 rotates and moves between the sheets 2 and 3, to weld the sheets and make a tube.

2. Device for the method of making rectangular and square tubes of aluminum alloys, characterized in that, it has the following components: a model 1, a sheet 2 and a sheet 3, bent as U-profiles, fixed with flanges 4, vices 5 and screws 6, around the model 1, so that the a FSW tool 8 welds the sheets.

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Method and device for FSW joining and FSP processing, with tilted parent metals

Patent application No. A 2020 00291 / 27th.05.2020/ OSIM Bucharest.
Authors: VERBIȚCHI Victor, Timișoara, Romania; DAȘCĂU Horia-Florin, Timișoara, Romania; BOȚILĂ Lia-Nicoleta, Timișoara, Romania; COJOCARU Radu, Timișoara, Romania
Applicant: National Research & Development Institute for Welding and Materials Testing - ISIM Timișoara
Address: 30, Blv. Mihai Viteazul, Postal Code 300222, Timișoara, Timiș, Romania

Technical specification
Material: aluminum alloy sheets, thickness range 1 - 4 mm. Friction stir welding (FSW) process for execution. Friction stir processing (FSP) for structure strengthening.

Applications
Target products: components and parts for devices, electrical appliances, welded structures and transport means. Fields of application: electro-technique, manufacturing, constructions, rolling stock and automotive industries. Increasing the quality level of the parts made by FSW equipment, by improving the operation procedure.

Novelty items
Tilted parent metals, as a simple solution to reduce load and stress on the tool during FSW and FSP, instead of tilted tool drive, as a difficult solution for the same aim.

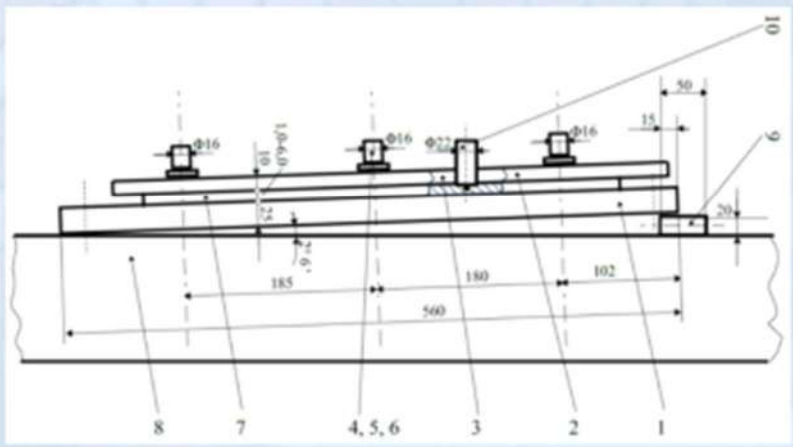

Figure 1. Device of the method for FSW joining and FSP processing, with tilted parent metal

Description (Figure 1)
Method and device for FSW joining and FSP processing, with tilted parent metals (PM), characterized in that it uses a base plate 1, two clamping plates 2 and 3, screws 4 and accessories 5, 6; these pieces fix PM sheets 7; base plate 1 is tilted at an angle $\alpha = 1 - 3°$ to the table 8 of a FSW (FSP) machine, using a calibrated part 9; processing tool 10 performs movements $v(z) = v(x)\ tg\ \alpha$, correlated by software; tool shoulder progressively penetrates sheets 7; burrs decrease and productivity increases.

Claims
1. Method for FSW joining and FSP processing, with tilted parent metals;
2. Device of the method for FSW joining and FSP processing, with tilted parent metals.

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Title: Preparation, optimization and application technique of recycled materials provided from electrodes of the spent car batteries

Patent No. RO 132873 A0, BOPI Nr.10/2018 page 27 / Patent application No. A00282/20.04.2018

Authors: Simona RADA[1, 2], Mioara ZAGRAI[1], Marius RADA[1], Eugen CULEA[2], Adrian BOT[1]

[1]National Institute for Research and Development of Isotopic and Molecular Technologies, Cluj-Napoca, Romania

[2]Technical University of Cluj-Napoca, Romania

Abstract

The invention relates to a preparation and optimization technique, namely melt quecching method of new materials obtained from the recycled electrodes from spent car batteries and doping with CuO powder. New electrode materials were investigated by the analysis of X-ray diffraction and measurements of cyclic voltammetry. The X-ray patterns show diffraction peaks corresponding to the metallic lead phase with cubic structure, as main phase and traces of PbO_2 and PbO crystalline phases. The doping with 20 mol% CuO can improve the reversibility of the cyclic voltammetry, to reduce the amount of hyrogen evolution and to remove of passivation phenomena of the anodic electrode by increasing of residual current density in the potential range of 0 and 1V. Technique has the following advantages: i) the recycling of active mass of the spent electrodes by an eco-innovative, low cost and low energy consumption method; ii) the recovering of recycled materials in the environment from which they came from – like new electrodes for renewable batteries.

PURPOSE

the efficient optimization of the recycled lead from spent lead acid battery in order to new applications as electrode material.

DESCRIPTION

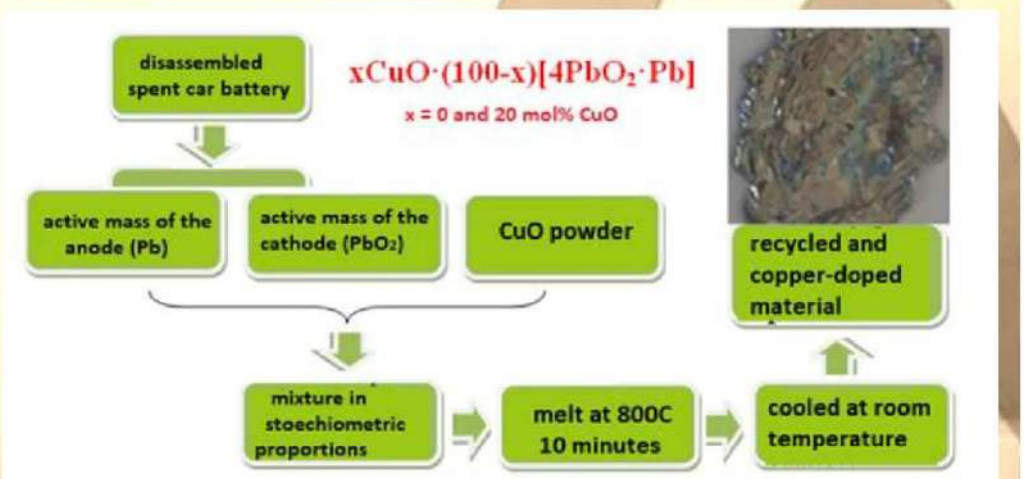

Figure 1: The preparation scheme of the recycled and copper-doped electrode materials.

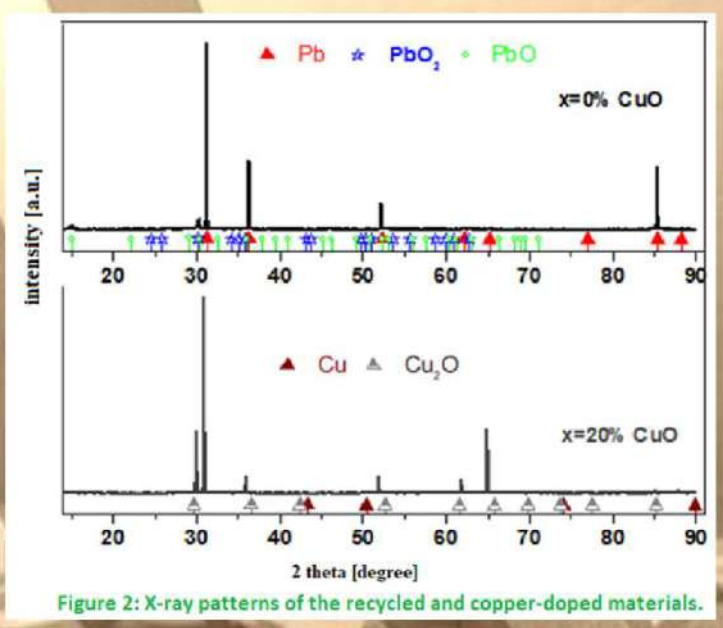

Figure 2: X-ray patterns of the recycled and copper-doped materials.

ADVANTAGES

- simple preparation method, high purity products;
- the recycled electrode and modified with cupric oxide has electrochemical performances clearly superior to the undoped electrode;
- no processes of hydrogen evolution were evidenced;
- the phenomena of anodic passivation are diminished by the doping with CuO contents (see Figure 3).
- the metallic lead (the diffraction peaks of the metallic lead phase can be observed in the Figure 2) was recycled from spent plates and optimized with 20 mol% CuO for applications as electrode material at the car batteries.

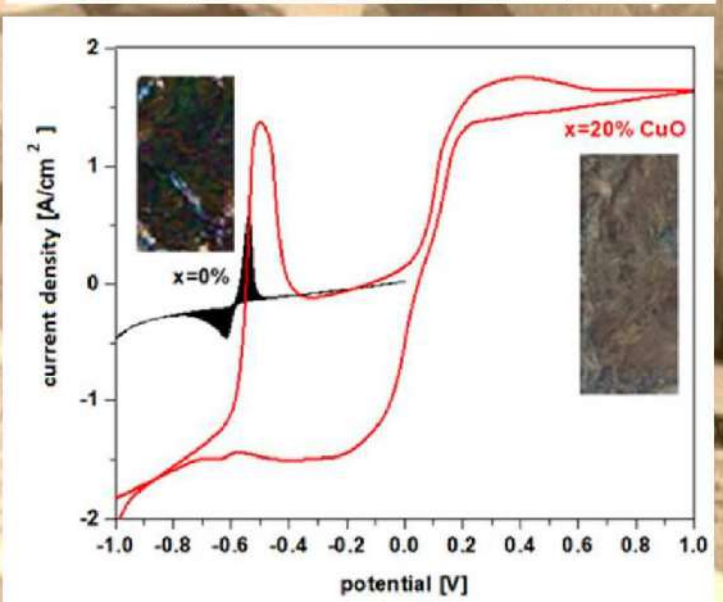

Figure 3: Cyclic voltamograms of the recycled and copper-doped materials as working electrode at a car battery.

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The financial support of this work was provided by the PED project No. 82/2017 and the Romania – JINR Dubna 2021 and the Nucleu project with the No. 19350101.

NANOSTRUCTURES BASED ON PHBV AND Fe DOPED ZnO NANOSTRUCTURES AND THEIR OBTAINING PROCESS

PATENT REQUEST Nr. A 00322/09.06.2020

M. Stefan[1], M. Rapa[2], O. Pana[1], D. Vodnar[3], E. Matei[2], D. G. Barta[2], A. Popa[1], D. Toloman[1], C. Leostean[1], S. Macavei[1]

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[2]UNIVERSITY POLITEHNICA OF BUCHAREST, CENTER FOR RESEARCH AND ECO– METALURGICCAL EXPERTISE (ECOMET), 313 SPLAIUL INDEPENDENTEI, 060042 BUCHAREST, ROMANIA

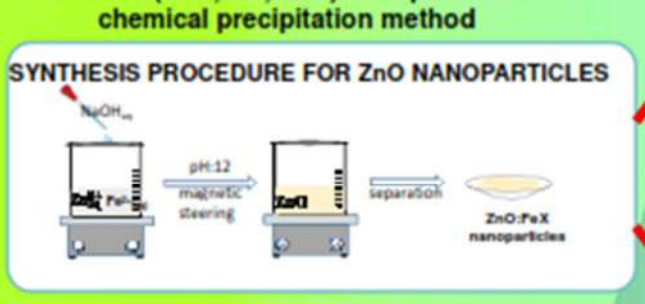
[3]UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE , 3-5 CALEA MANASTUR, 400372 CLUJ-NAPOCA, ROMANIA

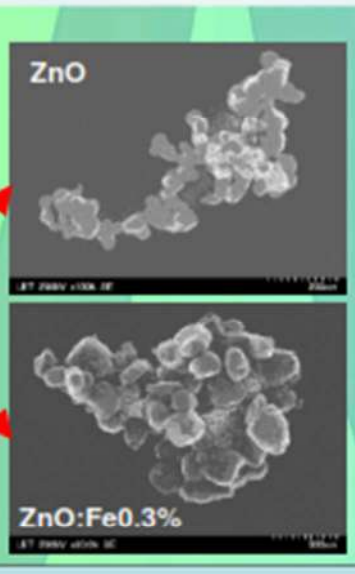
ABSTRACT

The invention refers to nanostructures based on Fe-doped ZnO (ZnO:FeX) nanoparticles embedded in polyhydroxybutyrate-co-valerianate (PHBV) and to their obtaining procedure. The obtained nanostructures are uniformly deposited by electrospinning on PLA film and were designed for antimicrobial food packaging. According to the invention, the nanostructure compositions consists in 8% solution of PHBV (in mass percentages) dissolved in a mixture of dichloromethane and ethanol as solvents, in volume ratio of 6:1, by stirring at 60 °C, 400 rpm for 30 minutes and 0...1% (in mass percentages) of Fe doped ZnO (ZnO:Fex%) (x= 0%, 0.1%, 0.3%) used as antimicrobial agent. The PLA film coating process with the components mixture was performed by using the electrospinning technique.

EXPERIMENTAL

ZnO:Fex (x= 0, 0.1,0.3%) nanoparticles - chemical precipitation method



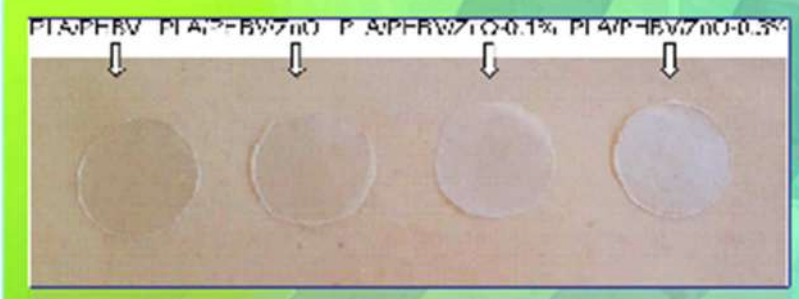


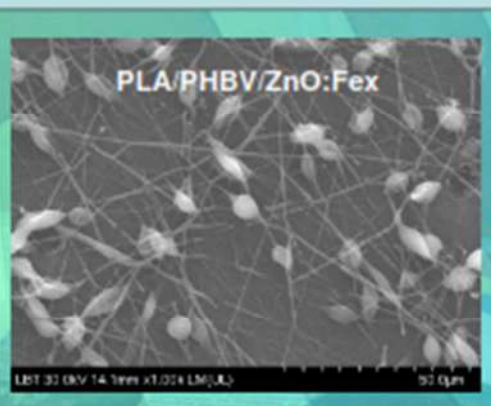
PHBV-ZnO electrospinning

The parameters for electrospinning procedure are: flow rate of 0.4 - 3.6 mL / h, voltage in the range of +16.63 - 16.77 kV and the distance between the needle to the collector of 14 cm.

ADVANTAGES

- ZnO: Fex nanoparticles were obtained by the precipitation method which is a simple and inexpensive method that not require sophisticated equipment.
- The process for obtaining antimicrobial nanofibers is simple, versatile, reproducible and takes place by electrospinning the PHBV / ZnO: Fex solution at room temperature, without high energy consumption and without toxic solvents.
- The procedure requires small amounts of ZnO:Fex nanoparticles and PHBV solution, respectively to coat the PLA film by electrospinning.





Cell number (CFU) at different successive dilution for ZnO: Fex samples

Samples	1:10	1:100	1:1000
PLA/PHVB	10	7	1
PLA/PHBV/ZnO	3	3	0
PLA/PHBV/ZnO:Fe 0,1%	12	9	1
PLA/PHBV/ZnO:Fe 0,3%	0	0	0

CONCLUSIONS

- The films coated with PHBV / ZnO:Fex nanostructures have a good microbial adhesion;
- The obtained PHBV / ZnO:Fex nanostructures offer suitable mechanical and thermal properties, good barrier properties to ultraviolet light, water vapour, oxygen and carbon dioxide;
- The migration into food simulants falls within the accepted limits according to EU Regulation No 10/2011 for plastic materials and articles intended to come into contact with food.

This patent was funded by UEFISCDI, Romanian Ministry of Research through Project PN 19 35 02 03 (Core Program).

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Title: PREPARATION TECHNIQUE OF PARTIALLY STABILIZED ZIRCONIA CERAMICS BY THE OXIDES ADDITION

Patent No. RO 132713 A0, BOPI Nr.7/2018 page 19 / Patent application No. A00160/07.03.2018

Authors: S. RADA[1, 2], M. ZAGRAI[1], M. RADA[1], E. CULEA[2], M. MANOLE[3, 4], R. HENDEA[4]

[1]National Institute for Research and Development of Isotopic and Molecular Technologies, Cluj-Napoca
[2]Technical University of Cluj-Napoca, Physics and Chemistry Department, Romania
[3]Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, România
[4]ZIRCON DENT SRL, Cluj-Napoca, România

Abstract

The novel of invention relates to a preparation technique of new ceramic materials based on partially stabilized zirconia with other oxides after sintering at room temperature. This technique combines the sintering method used in ceramics with the melt quenching method used in glasses and implies a high temperature solid state reaction process. By using oxides and carbonates as starting materials in the presented procedure, high purity ceramic products will be obtained – a requirement solicited by the medical field. The analysis of X-ray diffractions data shows that the invented ceramics noted with PI1 and PI2 have two main phases, namely cubic zirconia (c-ZrO_2) and tetragonal zirconia (t-ZrO_2) phases. The formation of tetragonal or/and cubic zirconia crystalline phases is highly desirable in technological and medical applications while the monoclinic zirconia (m-ZrO_2) phase has limited applications due to the volume expansion which yields micro-cracking and the mechanical instability in the ceramic. These high temperature zirconia crystalline phases were also detected in the commercial brands (BC1, BC2 and BC3) used for the dental applications.

PURPOSE

i) synthesis of new zirconia ceramics (PI1, PI2) in order to minimize costs and to improve dental aesthetics; ii) stabilization of high temperature zirconia phases.

DESCRIPTION

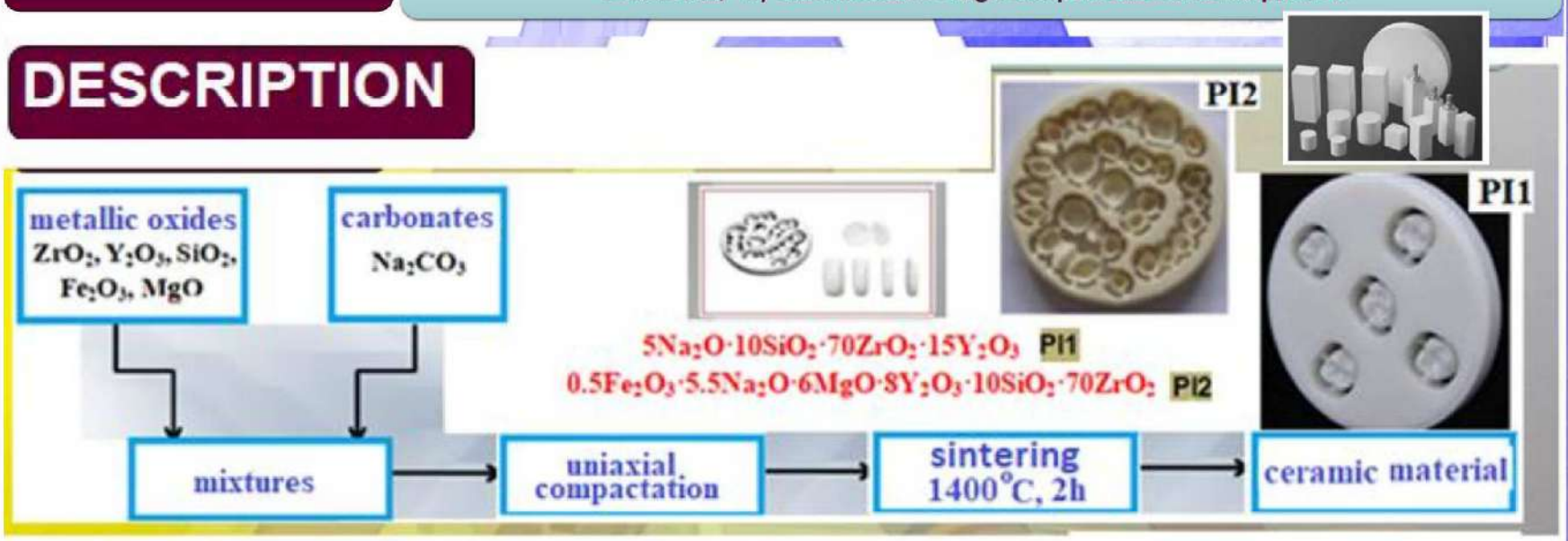

Figure 1: Preparation scheme of the ceramic materials.

ADVANTAGES

- The analysis of X-ray patterns illustrated in the Figure 2 shows that: i) the invented ceramics (noted as PI1, PI2) have the diffraction peaks corresponding to the ZrO_2 (zirconia) phase stabilized at the cubic (c) / tetragonal (t) structure; ii) in the commercial brands (noted as BC1, BC2, BC3) used for dental technique were also detected tetragonal ZrO_2 and/or cubic ZrO_2 phases and small amounts of monoclinic ZrO_2 phase (for the samples BC2 and BC3) ;
- The absence of monoclinic ZrO_2 phase (responsible of micro-cracking of the material) in the PI1, PI2 and BC1 samples;
- The change of color of the ceramic by the adding of Fe_2O_3 contents (white → cream);

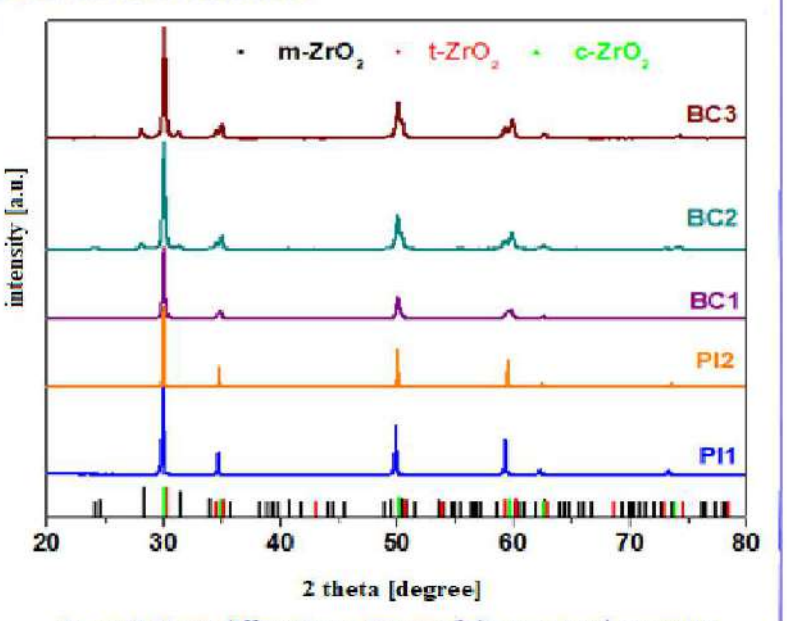

Figure 2: X-ray diffraction patterns of the prepared ceramics (PI1, PI2) and comercial ceramics (BC1, BC2).

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The financial support of this work was provided by the Bridge project No. 106BG/2016 and the Romania – JINR Dubna 2021 projects.

PREPARATION, INCORPORATION AND APPLICATION TECHNIQUE OF RADIOACTIVE WASTE IN GLASSES BASED ON B_2O_3-PbO

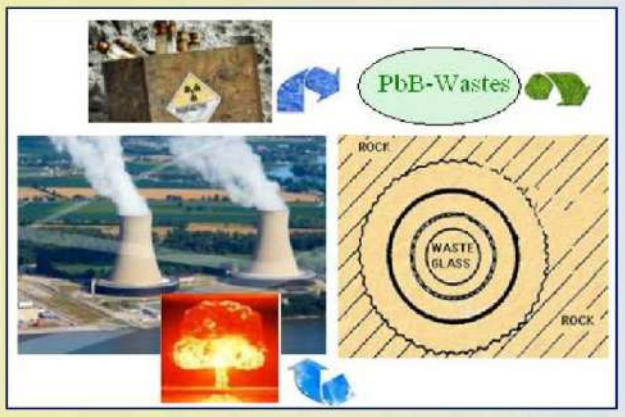
Patent No. RO 134558 A0 BOPI No. 11/2020 page 29 / Patent application No. A00097/25.02.2020

SIMONA RADA[1,2], ADRIANA DEHELEAN[1]

[1]National Institute for Research and Development of Isotopic and Molecular Technologies, Cluj-Napoca, Romania
[2]Technical University of Cluj-Napoca, Department of Physics & Chemistry, Romania

ABSTRACT

The invention relates to a preparation, incorporation and application technique of new glasses based B_2O_3-PbO host glass (*PbB-Wastes* products) as an alternative for the immobilization of radioactive waste and development of new optical materials. The experimental model used for the testing of the photoluminescent properties shows a good efficiency, a selectivity depends on the nature of the component ions and an increased reproducibility. The proposed procedure allows: i) the immobilization of a high level of radioactive waste in the glasses; ii) the immobilization of the volatile components from the radioactive segment; iii) applications of the *PbB-Wastes* products for the optoelectronic devices.



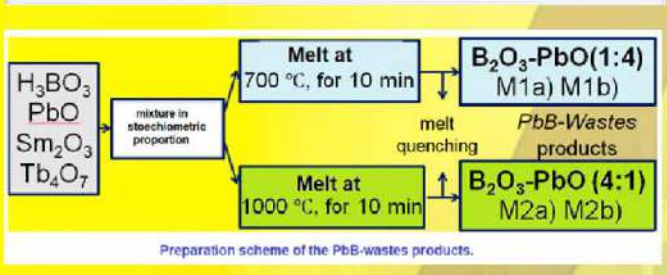
AIMS

- Obtaining of new B_2O_3-PbO glasses as an alternative for the immobilization of radioactive waste;
- Development of new products with luminescent properties suitable for the optoelectronic applications

ADVANTAGES

- Simple preparation method for the luminescent materials;
- Method for the capture at low temperature of the volatile contaminants from radioactive waste;
- A theoretical model for the immobilization in glasses of the radioactive waste;
- Superior luminescent materials due to the presence of rare earth ions in the host matrix

EXPERIMENTAL PROCEDURE



Preparation scheme of the PbB-wastes products.

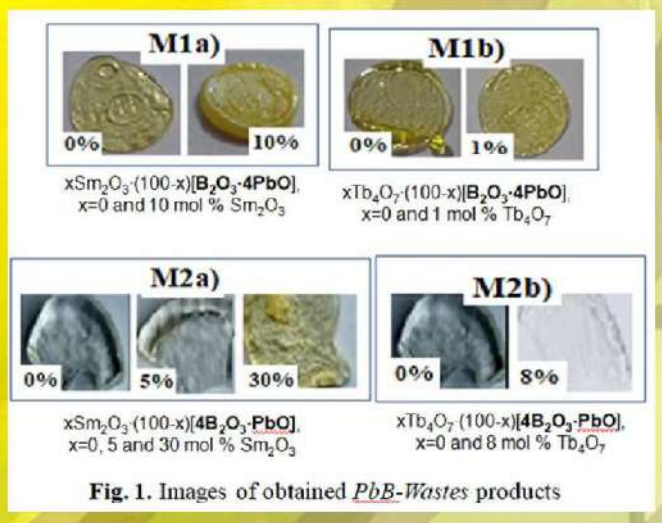
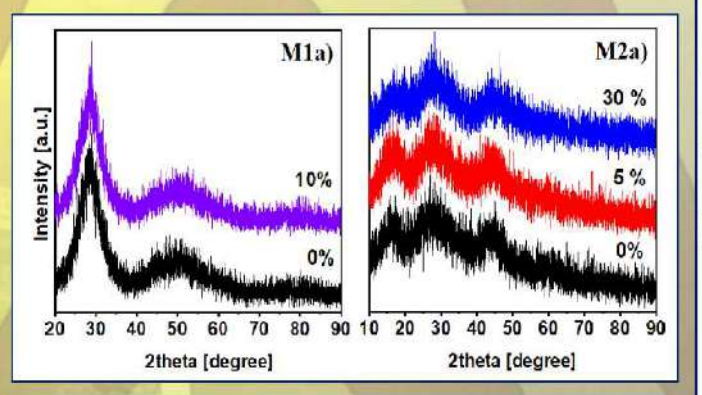
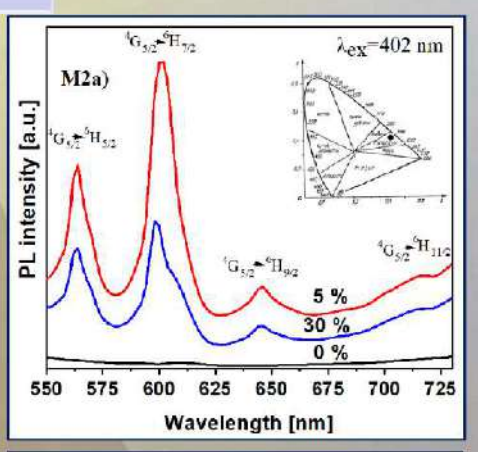
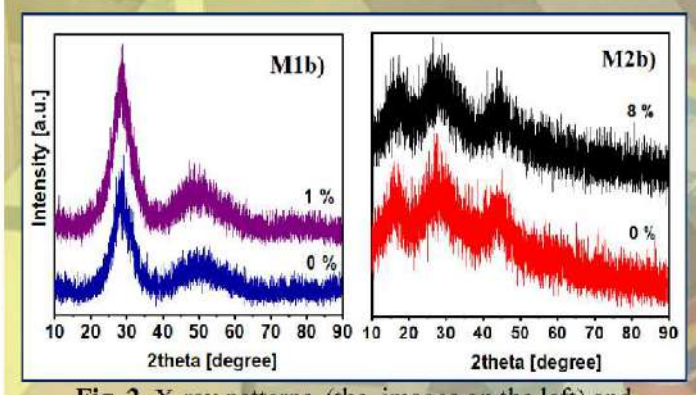


Fig. 1. Images of obtained *PbB-Wastes* products

RESULTS







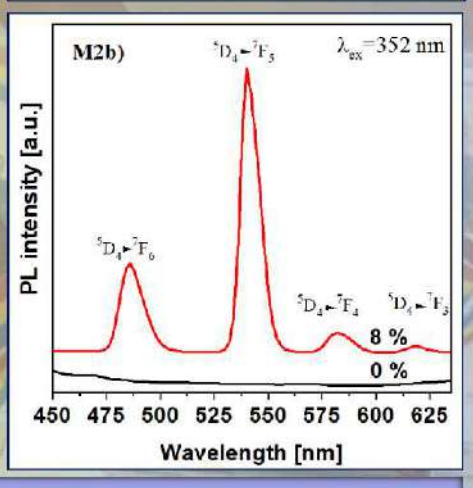


Fig. 2. X-ray patterns (the images on the left) and photoluminescence spectra (the images on the right) of *PbB-Wastes* products

CONCLUSIONS

- For the radioactive waste with a high content of volatile components, **[B_2O_3·4PbO]** glass matrix (M1) prepared at **700 °C** will be used due the immobilization of a content up to 10 mol % of uranium and 1 mol % of plutonium;
- For the radioactive waste with a high level of uranium and plutonium, **[$4B_2O_3$·PbO]** glass matrix (M2) prepared at **1000 °C** will be used because a high rare earth content up to 30 mol % Sm_2O_3 and 8 mol % Tb_4O_7 can be immobilized.
- Obtained products have potential applications in the field of laser s due to the luminescent properties of the immobilized ions.

This patent was funded by UEFISCDI, by the Postdoctoral Research Project No.33/2018 and MEC by Nucleu-Program, project PN 19 35 02 02 project.

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Automated cold plasma treatment line for the quick activation of leather and fabric surfaces

by Tudoran Cristian, Marcela Corina Rosu, Maria Coros

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- The presented cold plasma treatment line was built by the authors with the goal to have in our laboratory an automated treatment system which can plasma treat narrow rolls of leather or textile materials, in order to obtain special properties on their surfaces: hydrophobic and/or hydrophilic surfaces, and also anti-fouling/self cleaning surfaces. This device enables us to obtain the aforementioned properties at laboratory scale, and the results can easily be up-scaled at industrial level. This treatment line is based on a new type of cold plasma applicator head with its power supply (Romanian Patent application RO201800648A, 2018-09-05).
The entire treatment line resembles a full size industrial line and it contains the following components: a roll which contains the material to be treated (leather / textile) (2b), a drive mechanism (2,2a,6,7) which moves the material through a dying stage or a spraying stage (4) (which deposits nanomaterials), the cold plasma treatment stage (3), which activates the material/leather surfaces right before the dying/painting process and a quick drying system (5,5a) which dries the material with hot air after its staining stage. All these components are held in place by a metallic frame (1). In the lower part of the picture, marked with (A) and (B) we present the aspect of the generated open-air plasma working in helium (A) and in argon (B). The plasma has a temperature of 36...40 deg.C for an input power of 50W and a gas flow rate of 5l/min.

- Our treatment line can be very easily converted for the plasma treatment of both leather bands (***A***) and textile (cotton, linen, etc.) bands (***B***).(Figure 1 **A** and **B**)

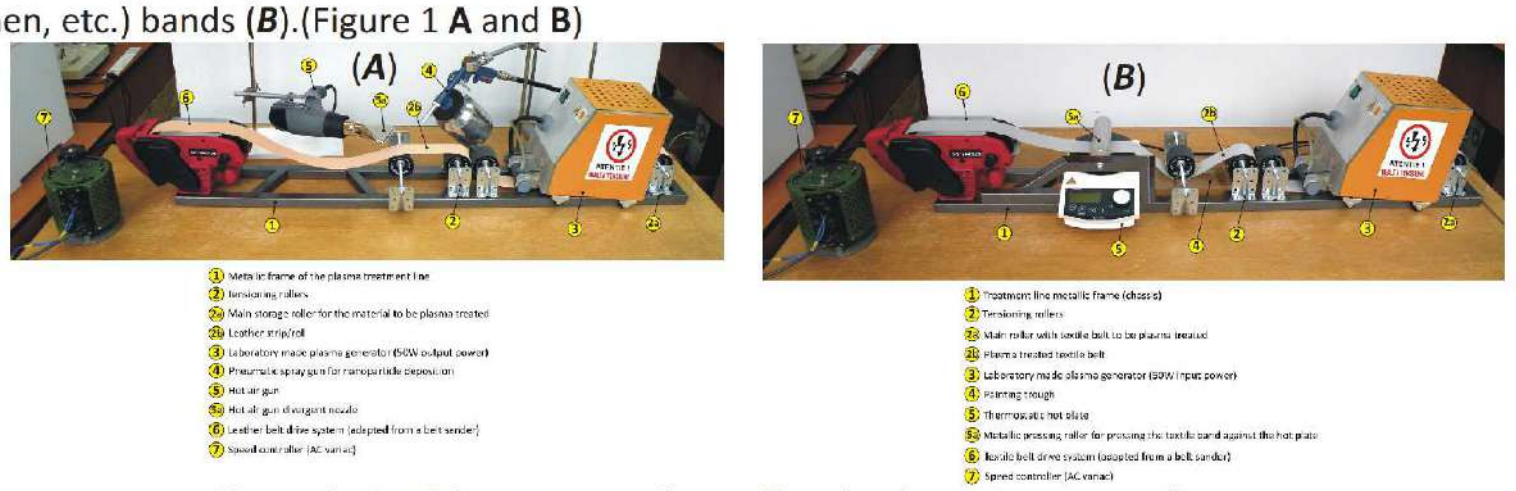

Figure 1. Our laboratory made small scale plasma treatment line

- In **Figure 2**, marked with (**A**) and (**B**) we present the aspect of the generated open-air plasma working in helium (A) and in argon (B). The plasma has a temperature of 36...40 deg.C for an input power of 50W and a gas flow rate of 5l/min.

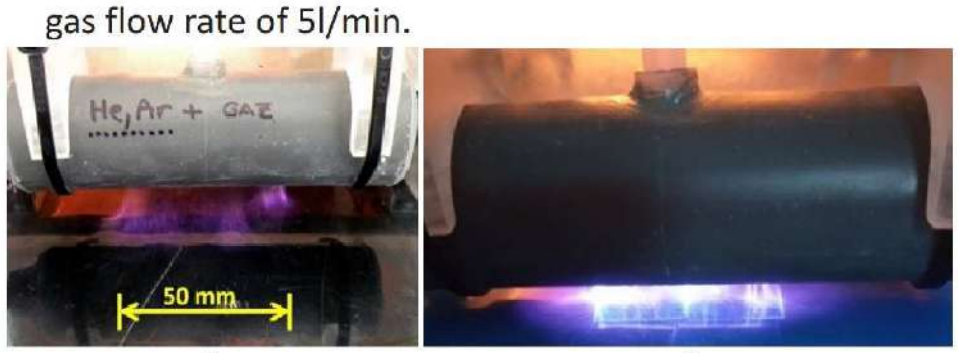

Figure 2. Our cold plasma applicator head generating open-air type plasma discharge in Helium (A) and in Argon (B)

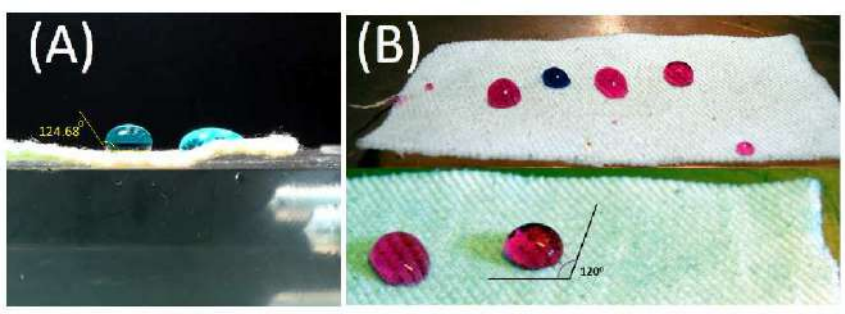

Figure 3. Result examples: hydrophobic leather (A) and hydrophobic cotton fabric (B)

Acknowledgment.This work was financially supported by a grant of the Romanian Ministry of Research and Innovation, CNCS-UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0743/44PCCDI/2018/PHYSforTeL

Electrohydrodynamic propeller for in-atmosphere propulsion; rotational device first flight

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A rotary ionic engine with possible applications to in-atmosphere propulsion was developed [1]. We designed electrohydrodynamic (EHD) propeller-counter-electrode systems in which the propeller spins and flies (Fig.1-3). The EHD propellers are the first rotational ionic devices to fly. Commercial plastic propellers were converted to EHD propellers by equipping them with conductive electrodes. An axial shaft is used to inject high voltage (HV) in the blades through the conductive material running along the blades. A surrounding ground electrode helps create an intense electric field when high voltage above corona onset is applied. The forces acting on the propeller blades create torque which eventually results in propeller rotation. Negative bias voltage was applied to test propellers with masses and diameters ranging from 0.2 g to 28 g and 3.5 cm to 25 cm, respectively. They were able to spin and fly either off the shaft or sliding upwards on the shaft. The voltage (U), current (I) and rotational speed (n) characteristics in positive and negative ion mode are presented in Fig. 4.

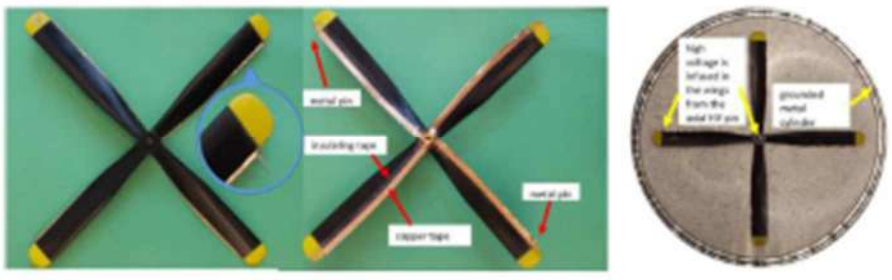

Fig.1 Sample propeller electrode design; copper tape runs along the trailing edges, and metal pins (about 1 cm long) are attached towards the blade tips.

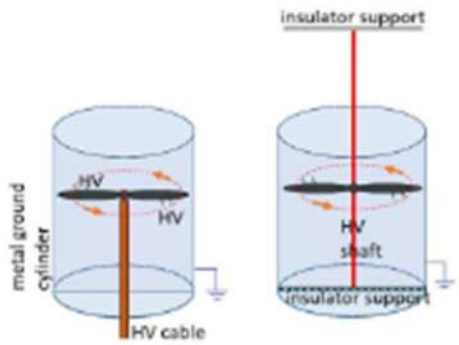

Fig. 2: Left, propeller can rotate on the HV shaft. Right, propeller can fly along the HV shaft.

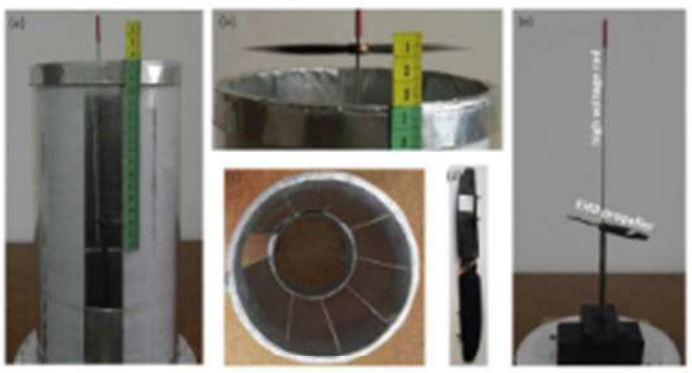

Fig. 3: (a) system overview (b) propeller flight above cylinder (c) top view of the ground cylinder. (d) propeller top view – propeller designed with copper tape (insulated) and two pins per blade. (e) Propeller setup with cylinder removed.

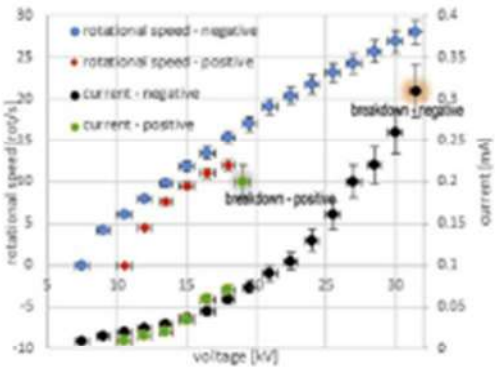

Fig. 4: Polarity testing. The setup in Fig. 3a with propeller at 2.5 cm below the cylinder top was used for testing both positive and negative polarities.

Table: Comparison of propeller performance in gases at atmospheric pressure. An EHD propeller (2.56 g, 12.6 cm diameter) was placed axially on a high voltage metal rod at a 2.5 cm height inside of a 14 cm inner-diameter ground cylinder with a height of 18 cm. The system was placed in a glass enclosure equipped with a three-way "open/close/open" valve connected to a rotary vacuum pump, pressure gage, and gas supply pipe. Pressure inside the glass bell was controllable in 0.1 P_0 (atmospheric pressure) increments. Data was collected up to the highest achievable voltage before the breakdown or the power supply tripping occurred. All liquid gases have a 5.0 purity and were obtained from Linde Gas, Romania.

Gas/Mixture	U [keV]	I [mA]	n [rot/s]	ρ [kg/m^3]	specific gravity	flight
SF_6	60	0.33	27.36	6.17	5.12	yes
CO_2	31.5	0.33	28.95	1.81	1.51	yes
Air	27	0.34	28.68	1.20	1.00	yes

When the 12.6 cm diameter 2- blade propeller (2,56 g) was loaded with an additional 5.73 g, 11.16 N/kW for thrust/power and 5.68 N/m^2 for thrust density were obtained at 27 kV at P_0 in the air. These values exceed those reported by MIT [2] for the first ionic plane (5 N/kW and a designed/desired thrust density of 3 N/m^2). A higher value than in air (15.95 N/kW and 1.75 N/m^2 at 21 kV) was obtained in CO_2. The top was 33.98 N/kW and 1.75 N/m^2 at 25.5 kV in sulfur hexafluoride (SF_6). Supplementary technical data and relevant videos can be found at: https://www.sciencedirect.com/ science/article/pii/ S0304388619300890, https://www.youtube.com/watch?v=0g8z7wWIoJs

ACKNOWLEDGMENTS: This work was supported by a grant of the Romanian Ministry of Education and Research, CCCDI, project number PN-III-P2-2.1–PED-2019-3646, within PNCDI III. The authors acknowledge the contributions related to this work to Dr Liviu Mocanu, Mihai Marghitas PhD student, and Mircea Nicolaescu, PhD student, all from Applied Physics/Condensed Matter Department, National Institute for Research and Development in Electrochemistry and Condensed Matter, Timisoiara, Romania. SUNY Oswego, USA and and INCEMC Timisoara are also acknowledged for supporting the project.

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PROCESS FOR PRODUCINDG WHITE PORTLAND CEMENT-BASED CEMENTITIOUS TILING MATERIALS, WITH SELF-CLEANING CAPACITY

Andreea HEGYI, Elvira GREBENIȘAN, Adrian-Victor LĂZĂRESCU, Henriette SZILAGYI, Vasile MEIȚĂ, Mihaela SANDU, Cornelia BAERĂ

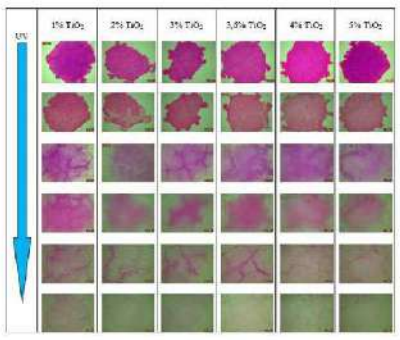
Patent application
No. A/00117 / 17.03.2021

The invention relates to a process for obtaining a composite material, based on white Portland cement, natural river aggregates, additives and TiO_2 nanoparticles, with self-cleaning capacity and, respectively, finished elements, in the form of tiles, intended for use in the production of finishes in the form of coatings by tiling the surface of the outer or inner walls of buildings or other inclined or vertical elements thereof.

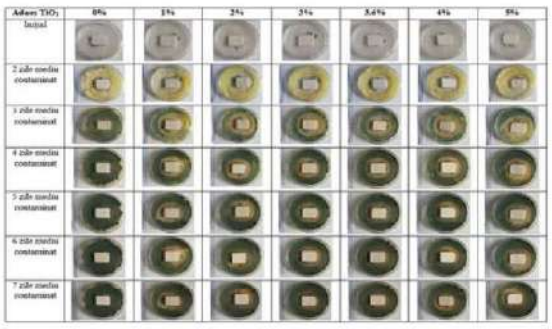
Innovativeness:

- capitalizing on local potential by developing new compositions of cementitious materials and prefabricated elements.
- self-cleaning ability, under the effect of solar light radiation or artificial UV radiation.
- long-term preservation of the aesthetic appearance of buildings.
- making surfaces safe for the population ensuring a low degree of contamination with microorganisms.
- the ability to contribute to the reduction of air pollution by reducing the concentration of oxides of type NOx, SOx
- the ability to contribute to the reduction of water and soil pollution by substantially reducing the need for the use of substances intended for cleaning, maintenance and maintenance of construction surfaces.

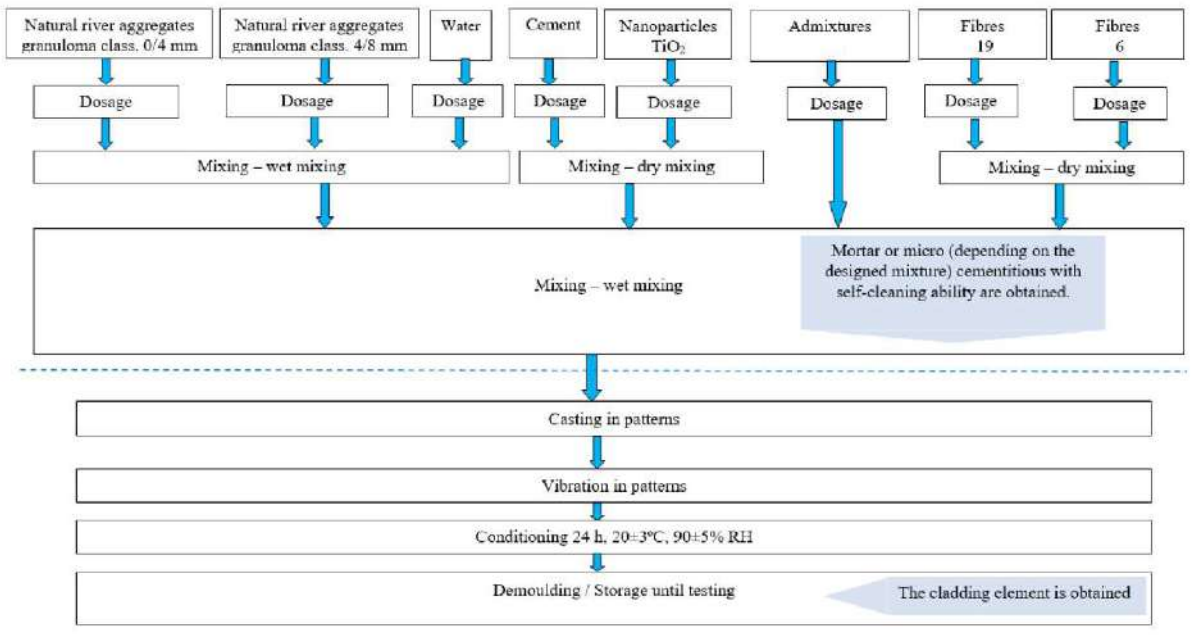
Claim 1: Process of producing cementitious composites based on white Portland cement, respectively tiling elements, with self-cleaning capacity.
Claim 2: Self-cleaning mortar based on white Portland cement.
Claim 3: Micro-concrete with self-cleaning capacity, based on white Portland cement.
Claim 4: Micro-concrete tiling elements based on white Portland cement, with self-cleaning ability.

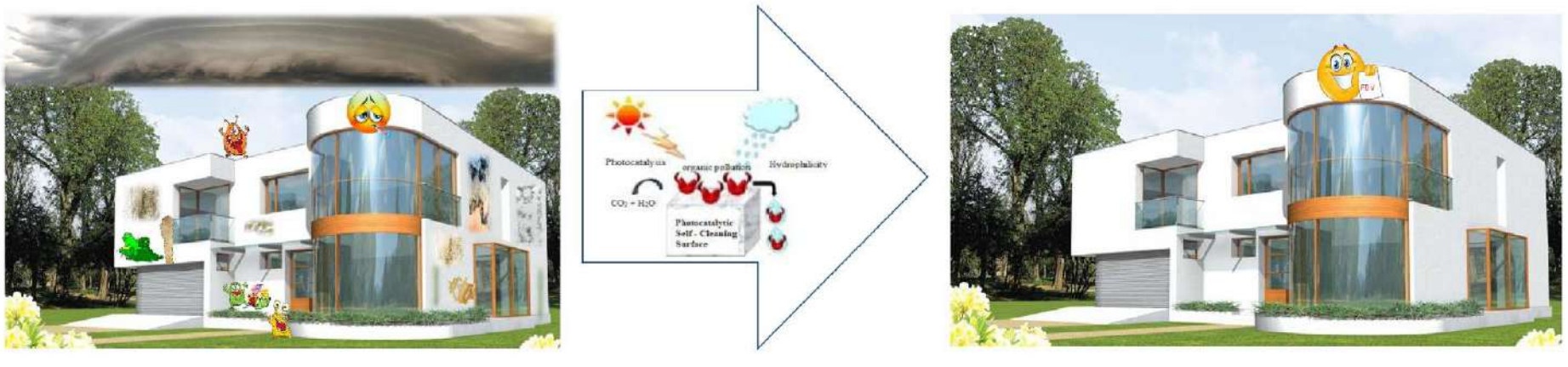


Recovery of the degree of whiteness-self-cleaning effect in the situation of staining with rhodamine B



Ability to inhibit biofilm development (Penicillium sp.) on the surface of micro-concrete specimens with self-cleaning capacity





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Sustainable development of local communities in Romania, through the enhancement/preservation of historic buildings

Anamaria BOCA, Tudor Panfil TOADER, Ioana Camelia TIȘE, Lidia Maria LUPAN

Local communities within the reach of historical monuments can develop economically and culturally by their integration and promovation in the tourist and cultural circuit. In Romania can be found numerous buildings with historical value, which are in various stages of degradation, or even abandoned. These monuments are at risk of loosing their original value if interventions of rehabilitation, consolidation or restoration are not carried out. In order to identify the structures with historical value and propose an optimal solution for their rehabilitation, it is necessary to understand the initial conception, the technical details, the traditional materials used. This stage requires the collaboration of specialists in the field of architecture, engineering, topography, archeology or restoration.

Fig.1 Constanta Cazino before restoration

Rehabilitation and Restoration

Architecture Engineering Topography Archeology or Restoration.

Fig.2 Proposal of restoration of Constanta Cazino

Preliminary research on the structural problems of historical monuments will be carried out in order to define the appropriate intervention techniques in accordance with the principles of conservation and restoration through the combined use of traditional materials and techniques with modern and innovative ones. Those communities where the historical monuments have been conserved and integrated in the tourist circuit, have attracted an increased number of tourists therefore the economic activity have also increased.

**Reformed church
Santamarie-Orlea, HD
HD-II-m-A-03445**

Historical values

Cultural Value

Sustainable development

These rehabilitated monuments should be promoted and included on a tourist route taking the example of TRANSROMANICA - The Romanesque route of European heritage. This will lead to the sustainable development of the communities they are part of, from both economically and cultural points of view. The economic growth will lead to increased jobs, development of infrastructure in the respective areas and possible investments.

1.https://www.sospatrimoniu.ro/sos-articole/patrimoniu-din-tara/item/189-monumente-istorice-uitate-de-autoritati
2.Boca A., Toader T.P., Mircea C. (2020), Romanesque **Historical Monuments Reconstruction by Using Original Materials and Recycling of Those That Have Lost Their Historical Value, Proceedings2020, Volume 63, Issue 1,7**

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MASONRY ELEMENTS BASED ON UNBURNED CLAY WITH THE ADDITION OF INDUSTRIAL WASTE

Gabriela Adela CĂLĂTAN, Tudor Panfil TOADER, Lidia Maria LUPAN, Carmen FLOREAN

1.Context

The compositions of clay with ash and limestone sludge were made with the following proportions: 60% clay, 20% ash and 20% limestone sludge (specimen 2 at 40 days and specimen 8 at 1 year); 50% clay, 25% ash and 25% limestone sludge (specimen 3 at 40 days and specimen 9 at 1 year) and 40% clay, 30% ash and 30% limestone sludge (specimen 4 at 40 days and specimen 10 at 1 year).
The clay compositions with dumped waste and gypsum sludge were made in the following proportions: clay 70%, dumped waste 15%, and gypsum sludge 15% (specimen 5 at 40 days and specimen 11 at 1 year); clay 60%, dumped waste 20%, and gypsum sludge 20%(specimen 6 at 40 days and specimen 12 at 1 year); and 50% clay, 25% dumped waste, and 25% gypsum sludge (specimen 7 at 40 days and specimen 13 at 1 year .

2.Materials and methods


Clay


Ash

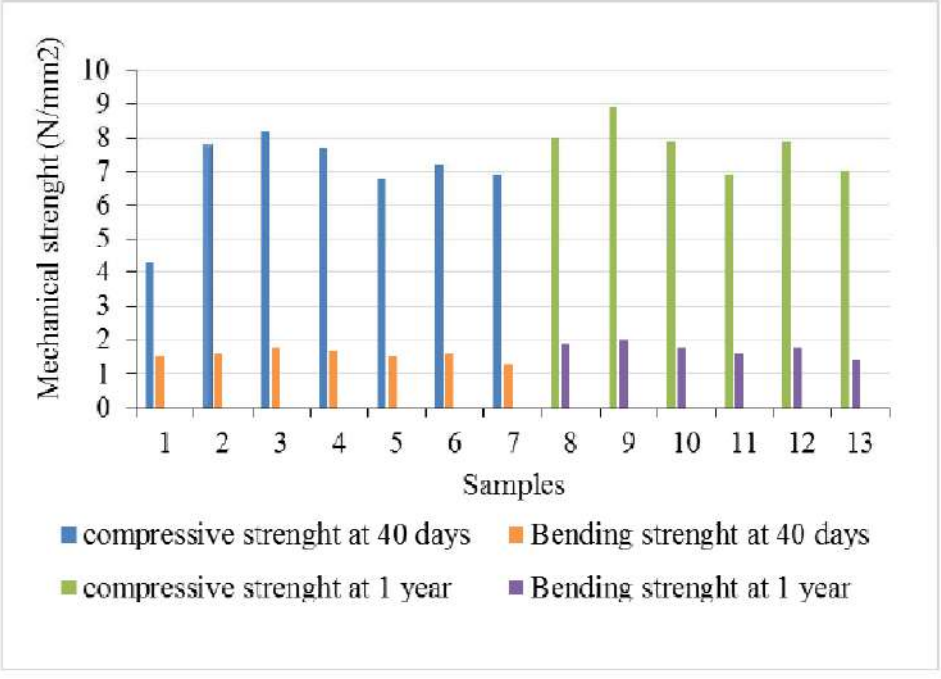

dryed limestone sludge


dumped waste


dryed gypsum sludge


Unburned clay bricks

3.Experimental results



All mixtures was tested at 40 days after manufactured, and after one year after manufactured.

No mixture has cracks when dried. All the values of densities of the specimens reached the equilibrium humidity, are included in the interval 1600 - 2000 kg / m^3. The mechanical strengths are higher than the control sample. The composition with the addition of 25% ash and also 25% limestone sludge, has the highest mechanical strength of all mixtures; 8.2 N / mm^2 at 40 days from manufacture and 8.9 N / mm^2 at 1 year. The results confirm that industrial waste can be used as an additive in the clay matrix for making unburned clay bricks, resulting an environmentally friendly and healthy material.

4.Conclusions

All the conclusions confirm the fact that the industrial waste can be successfully used as an addition in the clay matrix intended for the production of unburned clay bricks
The bricks made according to the studied recipes can be successfully used to make environmentally friendly constructions, energy efficient and which give a pleasant and healthy climate to the inhabitants.

1.Lazarescu A., Szilagyi H., Baera C., Hegyi A. *Betoane alternative-Betonul geopolimer. Cercetari si oportunitati emergente*, Editura Napoca Star (2020)
2. Călătan G., Hegyi A., Dico C., Mircea C. (2015), *Additives influence on the earth characteristics used in vernacular construction,* Ecoterra -Journal of environmental Research and Protection **12(1):**7-20.
3. Călătan G., Hegyi A., Mircea A., Grebenisan (2020), *Cercetări experimentale privind utilizarea cenușii de termocentrală ca adaos la realizarea cărămizilor din argilă nearsă*, Rev.Constr., vol XVII0000

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INFLUENCE OF TiO_2 NANOPARTICLES ON THE MOLD RESISTANCE OF CEMENTITIOUS COMPOSITE MATERIALS

Elvira GREBENIŞAN, Adrian-Victor LĂZĂRESCU, Andreea HEGYI, Henriette SZILAGYI, Vlad STOIAN, Carmen FLOREAN

The aim of this paper is to demonstrate the influence of titanium dioxide (TiO_2) nanoparticles on the ability of the self-cleaning and the resistance of development of bio-film, of the cementitious composites, in terms of conditions of contamination with mold spores (Penicillium sp. or Aspergillus sp.), by determining the appearance and dimensions of the inhibition halo, as well as its maintenance over time.

1. Context:

- Mold contamination – one of the causes of building degradation.
- *Penicillium* sp., *Aspergillus* sp. – some of the most common mold species that attack the surface of buildings.

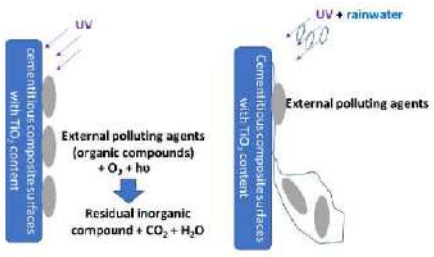
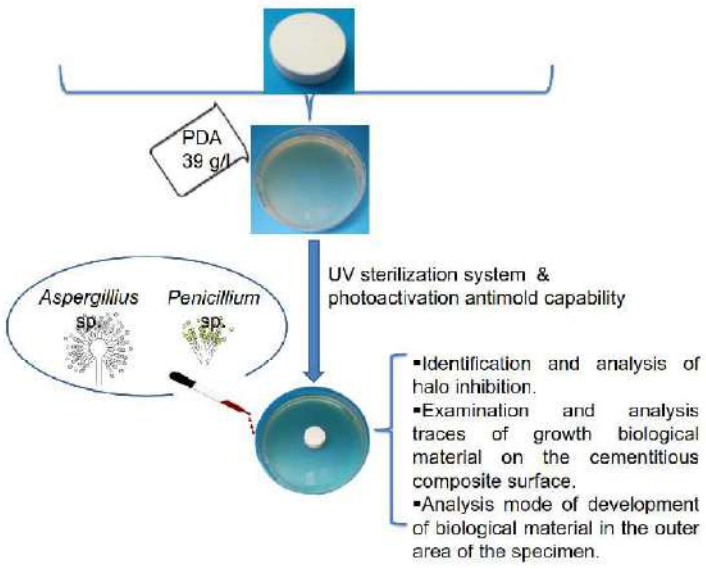


Fig. 1. Schematic representation of the self-cleaning capacity by the cumulation of the two mechanisms: the process of photocatalytic oxidation of organic substances (left) and facilitating the removal of foreign substances by increasing surface hydrophilicity (right).

2. Materials and methods:

Tab. 1. Recipe for preparation of cementitious materials

Code	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Amount of nano-TiO_2 in relation to the amount of cement(%)	0	1	2	3	3,6	4	5	6	10	12
Water / dry material ratio	0,45									



3. Experimental results:

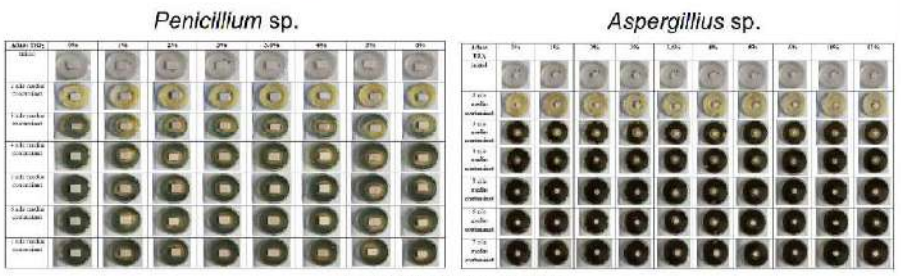


Fig. 2. Visual examination

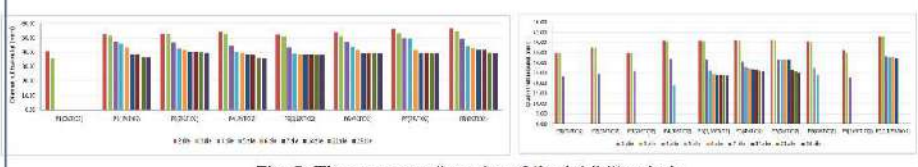


Fig. 3. The average diameter of the inhibition halo

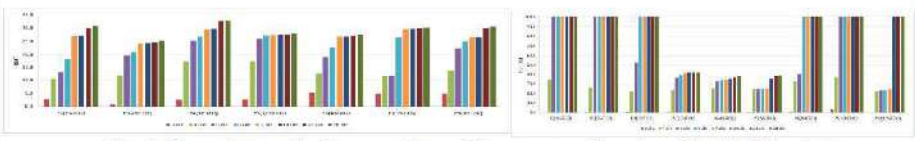


Fig. 4. Percentage reduction, over time, of the average diameter of the inhibition halo

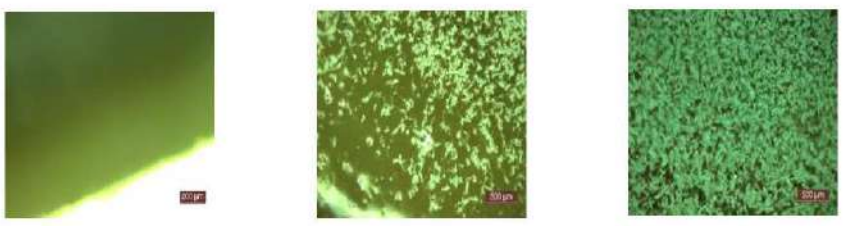


Fig. 5. Identification and microscopic analysis of the inhibition halo (a), transition zone (b) and intense growth Zone (c) for spore contamination *Penicillium sp.*

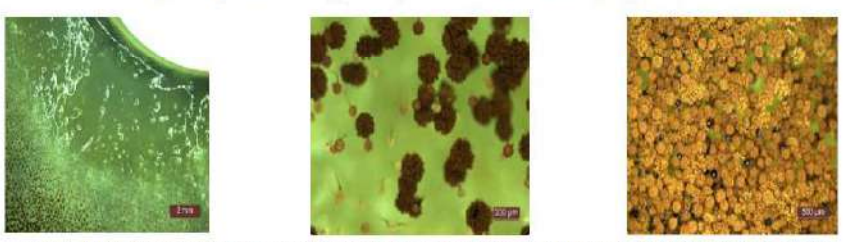


Fig. 6. Identification and microscopic analysis of the inhibition halo (a), transition zone (b) and intense growth zone (c) for spore contamination *Aspergillius sp.*

4. Conclusions:

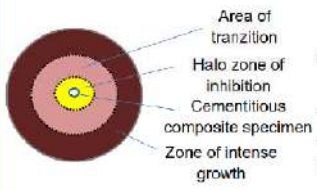


Fig. 7. Graphical representation of contamination areas

- in the case of both exposures to mold, the maximum efficiency of the cementitiuos composites was observed, namely the development and maintenance of a maximum inhibition halo, during 72 hours of exposure; the development of 3 contamination zones was observed: the inhibition zone, the intermediate zone and the intense growth zone of the mold-type biological material.
- the control sample (0% TiO_2) also initiates an inhibition halo, but it disappears most quickly. This control behavior is due to the reduced native TiO_2 content of white cement.
- the 2% nano-TiO_2 composite sample shows the best resistance to action *Penicillium* sp..
- in the case of *Aspergillius* sp. not all samples managed to maintain the inhibition halo during testing.
- composite samples with 3,6 - 5% nano-TiO_2 have a satisfactory behavior to both types of contaminants, thus, cumulating the resistance to the action of the 2 types of fungi, it is possible to define this concentration range of nano-TiO_2 right field of maximum efficiency.
- the use of more than 5% TiO_2 nanoparticles in relation to the amount of cement is neither cost-effective nor economically motivated.

Folli A., Jakobsen U. H., Guerrini G. L., Macphee D. E., *Rhodamine B Discolouration on TiO_2 in the Cement Environment: A Look at Fundamental Aspects of the Self-cleaning Effect in Concretes*, J. Adv. Oxid. Technol. Vol. 12, No. 1, 2009
Krysa J. et al., *Photocatalitic performance test*, Institute of chemical tehnology, Prague, Faculty of Chemical Tehnology

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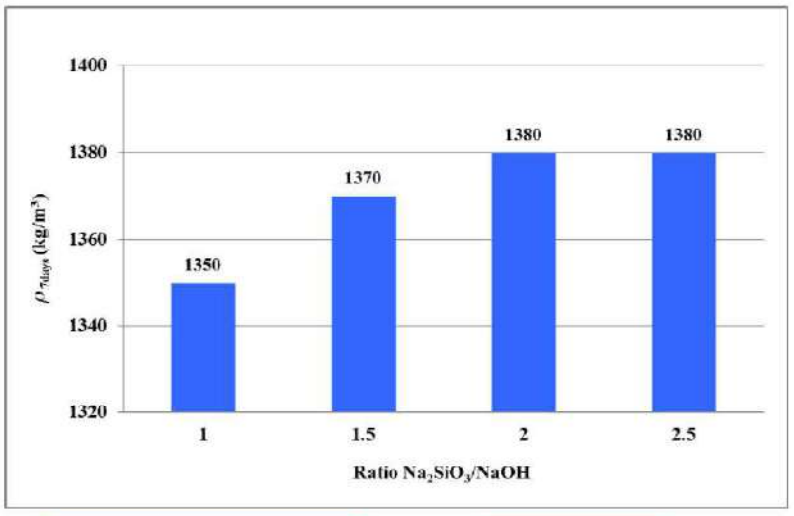
INFLUENCE OF Na_2SiO_3/NaOH RATIO ON THE COMPRESSIVE STRENGTH OF GEOPOLYMER PASTE

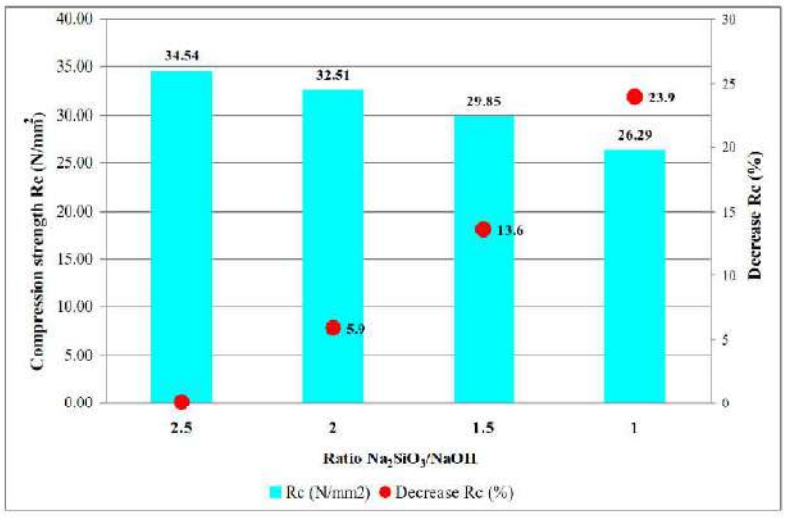
Brăduț Alexandru IONESCU, Adrian-Victor LĂZĂRESCU, Mihail CHIRA, Carmen FLOREAN

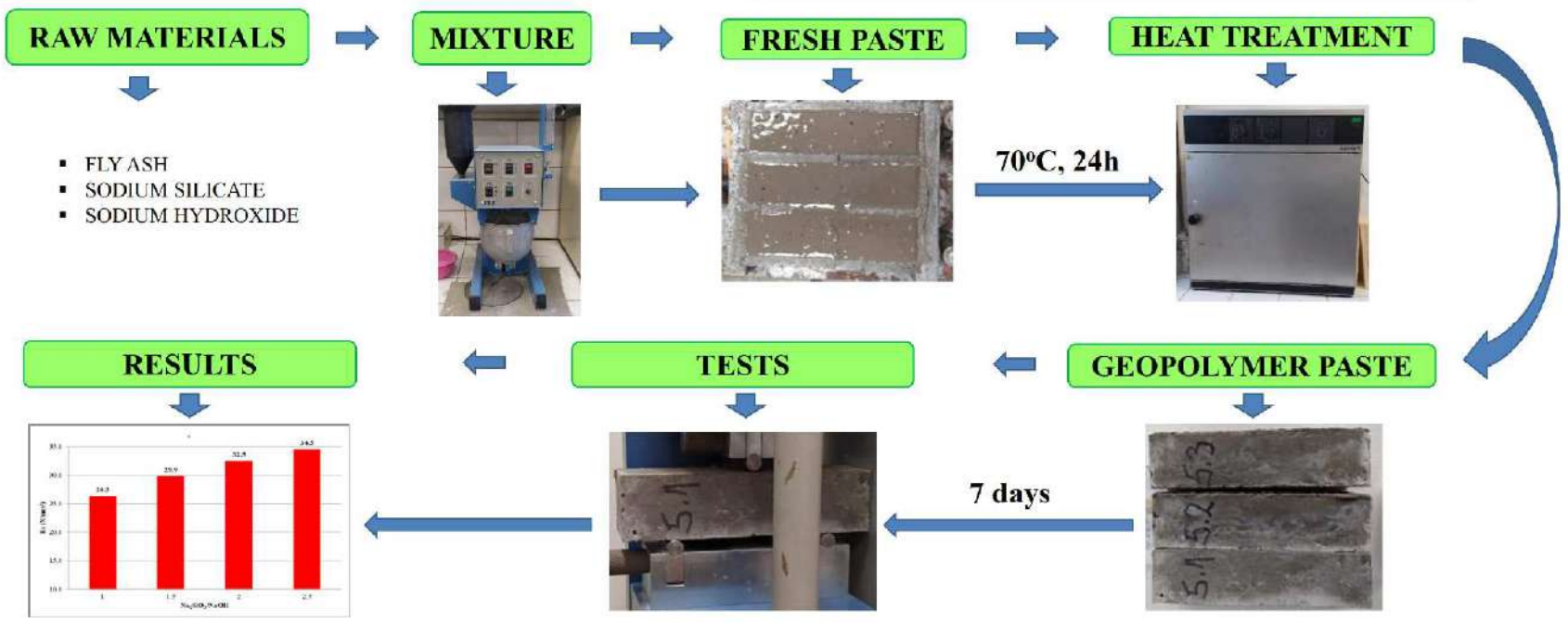
The construction industry has the fastest development in the world. These world statistics show that 260,000,000 tons of cement are needed annually. The cement industry is responsible for producing CO_2 emissions because, for the production of one tone of Portland cement, about one tone of CO_2 is released into the atmosphere leading to air pollution. In order to try to protect the environment from these harmful emissions, sustainable solutions must be sought. An alternative to traditional concrete is ecological concrete based on alkaline activated mineral binders. Geopolymers are a subclass of alkaline activated concrete.

For the production of alkali-activated geopolymers, the most used activators are a combination of sodium hydroxide (NaOH) and sodium silicate (Na_2SiO_3).

Compressive strengths increased as the ratio of sodium silicate to sodium hydroxide increased.







The compressive strength of the alkaline-activated geopolymer pastes based on fly ash and alkaline activator solution (Na_2SiO_3 + NaOH-10M) was between 34.54 N / mm² for a ratio of Na_2SiO_3/NaOH=2.5 and 26.29 N/ mm² for a ratio Na_2SiO_3/NaOH=1. Compressive strength decreased by 23.9% for one ratio Na_2SiO_3/NaOH=1 compared to resistance for one ratio Na_2SiO_3/NaOH=2.5.

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- Davidovits **J. 1994**, High-Alkali Cements for 21st Century Concretes. In Concrete Technology, Past, Present and Future, ACI SP- 144,383-397.
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Improving the thermal comfort in an attic using the appropriate thermal insulation

Tudor Andrei SALAJANU, Tudor Panfil TOADER, Lidia Maria LUPAN, Anamaria BOCA

Due to climate change, the summer months are getting hotter and hotter and this trend is getting worse.

In summer, excess heat is stored in thermal insulation materials → **Propose** → **Eliminate thermal discomfort during summer nights due hight temperature**

Thermal insulation with 15 cm of mineral wool

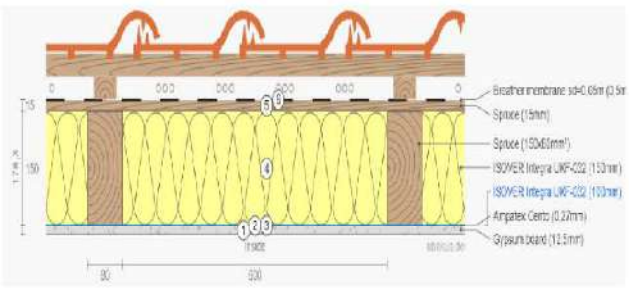

Fig.1 - Distribution of layers of the analyzed element

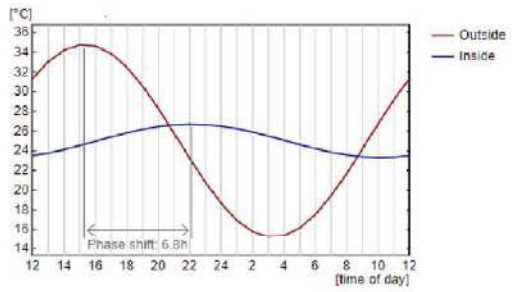

Fig.2 - Distribution of surface temperatures of the element during a day, using mineral wool insulation

The thermal phase shift was 6.8 h, and the highest temperature was felt at 22 o'clock in the evening

In order not to feel discomfort caused by temperature fluctuations, the graph showing the indoor temperature should have a tendency to linearity, or the temperature on the inside to reach its maximum value when the outside temperature is lowest.

Thermal insulation with 15 cm of wood fiber insulation boards

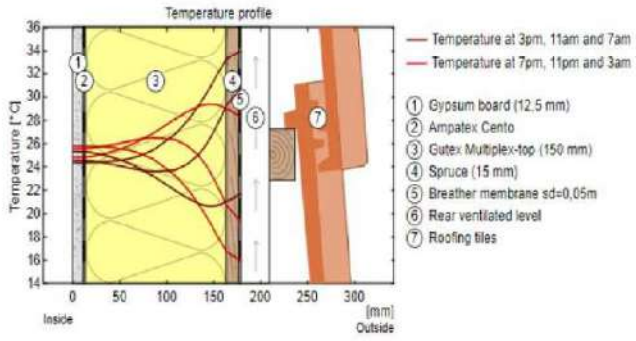

Fig.3 - Temperature profile within the element at different times

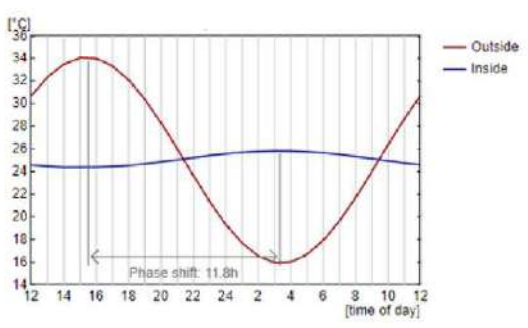

Fig.4 - Distribution of surface temperatures of the element during a day, using wood fiber insulation boards

The thermal phase shift was 11.8 h, and the highest temperature was felt 3 o'clock in the morning

The replacement of the mineral wool having a storage capacity of 1300 J / kg K, with wood fiber insulation boards having storage capacity of 2100 J / kg K, considerably attenuated the heat flow from the outside to the inside of the building.
Thus, investing in compatible and sustainable materials means fewer replacements over time, less carbon emissions, less waste generated and lower life cycle costs.

1. https://www.ubakus.com/

2. C107/1-3/2005 – Romanian standard for the computation of global thermal insulation coefficients for civil buildings, 2005

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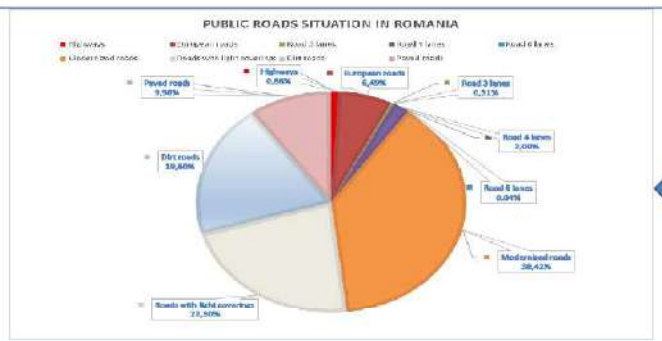
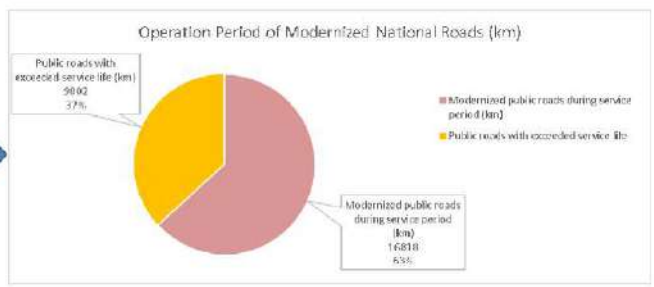
THE AUTOGENOUS SELF-HEALING CAPACITY OF CEMENTITIOUS COMPOSITE MATERIALS PRODUCED USING LOCAL ORIGIN MATERIALS

Tudor Panfil TOADER, Carmen DICO, Carmen FLOREAN

The purpose of this research is to evaluate and demonstrate the self-curing capacity of a cement composite material made with local raw materials.

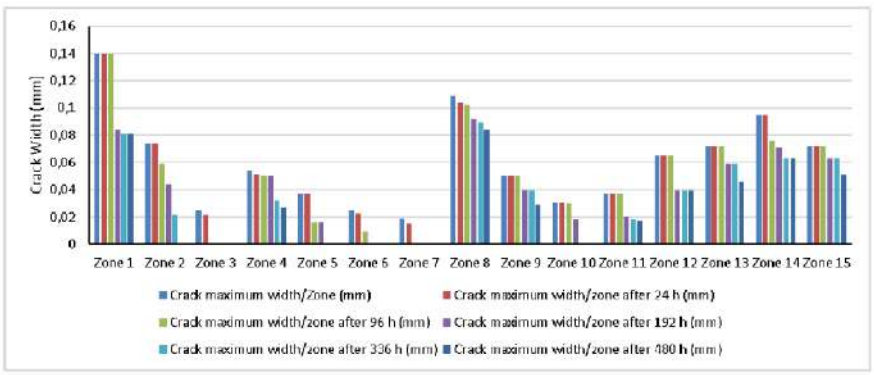
1. Context:



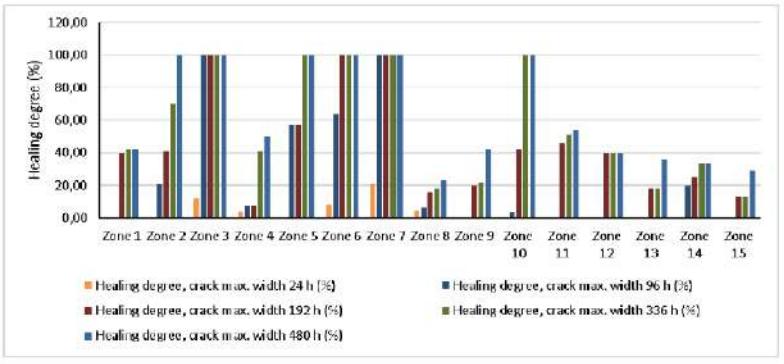


2. Materials and methods: The self-healing capacity determination of the cementuos composite, with average compressive strength Rc = 54.3 [N/mm2], made on local raw materials basis: Cement CEM I 42.5 R, Alesd, Bihor, Mintia thermalpower plant ash, Hunedoara, natural aggregates of river, 0-4 mm sort, Slam Cluj-Napoca, superplasticizer additive Master Glenium 51 type, BASF, water, PVA fibers 8 mm, integral waterproofing additive by crystallization MasterLife WP 1000, BASF, was evaluated on prismatic specimens, with age of 28 days.

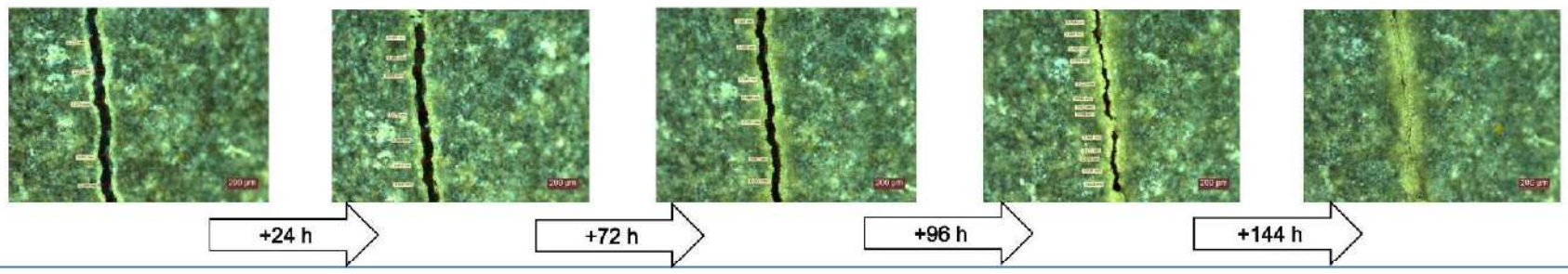
3. Experimental results : Bending tensile strength tests indicated an average force of P = 7046 [N] and Rti = 16.5 [N/mm^2], respectively. The cracking force required to induce the controlled cracking was 85% of the average breaking force at bending through tensile, respectively, P = 6000 [N]. Microscopic analysis of cracked and conditioned specimens for 24 hours, 96 hours and 168 hours by exposure to wet-dry cycles (8 hours dry - 16 hours immersion in water) indicated the self-healing ability.



The evolution of the maximum crack width during conditioning



The evolution of the healing degree calculated for the maximum width of the cracks, during conditioning



4. Conclusions:

The microfissures with a width of 14-17 µm were closed in proportion of 99% after 24 h, those with a width of 18-34 µm were closed, after 96h, in a proportion of 98% and those between 35-60 µm, were closed in a proportion of 95%, after 168 h.

Baeră, C., Szilagyi, H., Matei, C., Hegyi, A., Lăzărescu, A., Mircea, A.C., *Optimizing approach on Fibre Engineered Cementitious Materials with Self-Healing capacity (SH-FECM) by the use of slurry lime (SL) addition* - MATEC Web of Conferences 289, 01001 (2019)

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THE INFLUENCE OF FLY ASH ON THE WORKABILITY OF CONCRETE WITH SELF-HEALING PROPERTIES

Tudor Panfil TOADER, Carmen DICO, Carmen FLOREAN

The purpose of this research is to evaluate the influence of power plant ash on the self-healing capacity of a cement composite material made with local raw materials.

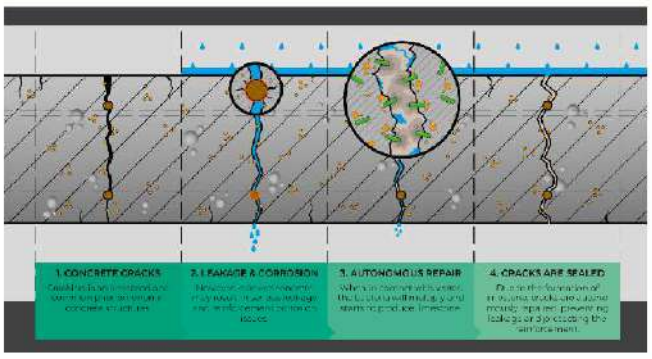
1. Context:

Experimental studies around the world demonstrate the self-healing potential of cement composites. The factors that constitute the self-healing potential are:

-Many microcracks under load or the generation of a large number of microcracks with high chances of self-healing

-The presence of fibers in the composition that plays an important role in the cement matrix

-The generous amount of the thermal power plant ash, which generates a late puzzolanic character.



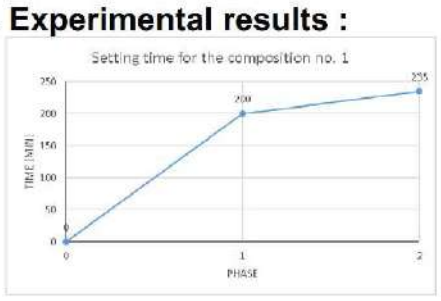
2. Materials and methods:

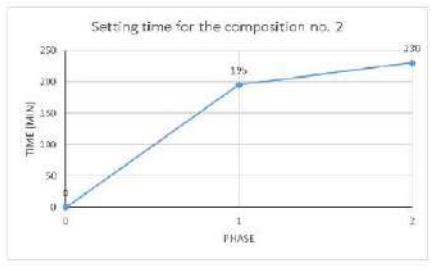
The influence of thermal power plant ash on the microbeton workability with self-healing properties was analyzed by evaluating the amount of water required for the standard consistency and of setting time of Portland CEM I 42.5 R cement paste, in case of substitution of 0%, 22.4%, 32 , 4%, 42.4% and 52.4% of cement, with thermal power plant ash, Mintia.

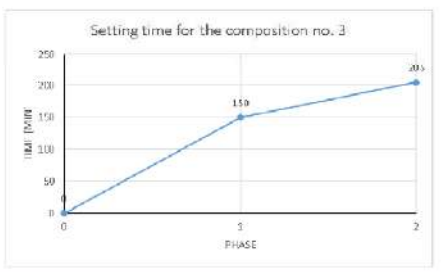
Nr. Composition	Raw Materials	
	Portland Cement - CEM I 42,5 R [g]	Thermal Power Plant Ash [g]
Composition no. 1	238	262
Composition no. 2	288	212
Composition no. 3	338	162
Composition no. 4	388	112

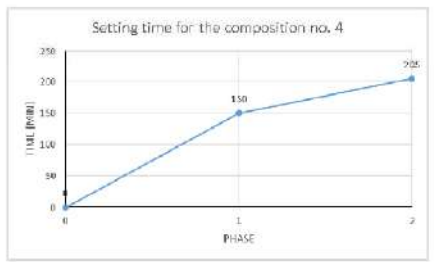
Mass ratio of thermal power plant ash and cement

3. Experimental results :

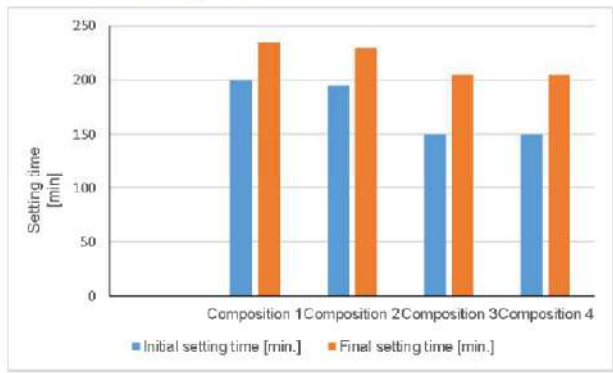








Phase
0 – casting of the paste into VICAT device pattern;
1 – initial setting time;
2 – final setting time.



4. Conclusions:

The experimental results indicated:

- increasing the need for water to obtain the paste of normal consistency, from 140 g (control paste with 0% ash from the thermalpower plant) to 150 g (paste with 52.4% ash from the thermalpower plant), as the cement amount replaced with ash of thermalpower plant has increased.
- increase of the initial setting time from 94 minutes to 200 minutes, as the amount of cement substituted by thermalpower plant ash increased.
- the increase of final setting time from 110 minutes to 235 minutes, as the amount of cement replaced by power plant ash increased.

The experimental results indicate the benefits of substituting a quantity of cement with thermalpower plant ash to increase the workability of the paste.

Szilagyi H., Baeră C., Hegyi A., Lăzărescu A.,-*Romanian resources of waste and industrial by-products as additions for cementitious mixtures,* International Multidisciplinary Scientific GeoConference : SGEM; Sofia, Vol. 18, Iss. 6.3, 325–332. (2018)

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MINET nonwovens

BIO-ECO-INNOVATIVE THERMAL INSULATION PRODUCTS OBTAINED BY RECYCLING AND REUSING POST-INDUSTRIAL TEXTILE WASTE, NATURAL VEGETABLE FIBERS AND SHEEP WOOL

Andreea Hegyi, Cezar Bulacu, Henriette Szilagyi, Adrian - Victor Lăzărescu, Vasile Meiță, Mihaela Sandu, Carmen Florean

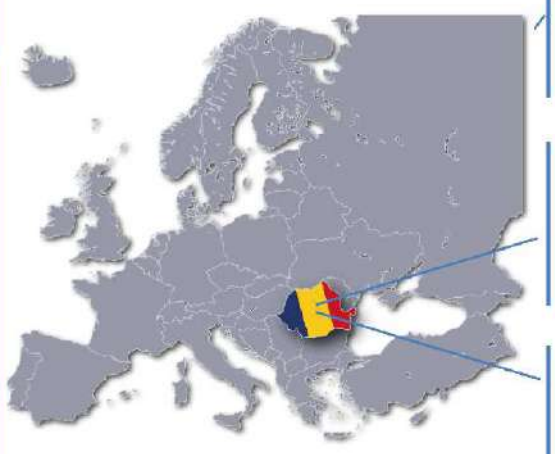
The aim of the project is to integrate and fully capitalize the postindustrial textile waste, natural plant fibers and sheep wool, in the framework of thermal-insulation products, as an ecological alternative to the classical thermal insulation products (polluting both when they are produced and also post-production and utilization by their lack of biodegradability), usable in the construction field, with beneficial effects on population health, environmental protection and also to create new materials with high added value.

1. Context:

Worldwide, only 13% of the market for thermal insulation materials is covered by natural materials of plant and animal origin.

The textile industry is the second largest polluter, but 95% of textile waste can be recycled.

If we consume plastic at the same rate as before, by 2050 there will be more plastic than fish in the oceans.
An amount equivalent to a garbage truck is dumped into the oceans every minute, totaling 8 million tons of plastic, and recycling a ton of plastic can save up to 7, 500 liters of oil.
Every year, Europeans generate 25 million tonnes of plastic waste, but less than 30% is collected for recycling..
The plastics circularity alliance brings together both the private and the public sectors to promote action, voluntary commitments and aims to ensure that 10 million tonnes of recycled plastic are used to manufacture products in Europe by 2025.



In 2017, Romania was the fourth country in the EU in terms of the number of sheep and goats and the fifth in terms of the number of sheep and goats / 100 ha land, but domestic demand and implicitly the price of wool have fallen dramatically, which creates alarming premises for the waste of this valuable natural resource.

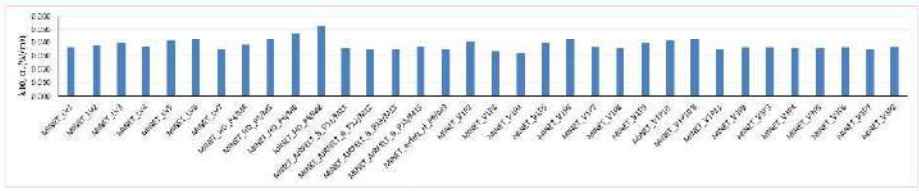
- shep wool: 23.000 tonnes / year - 0.3 $ / kg

In 2014, 336825 tons of plastic packaging were placed on the market, of which 44.5% was recycled.
In Romania, in 2016, 348794 tons of plastic packaging waste were generated from which 167351 tons were recycled.

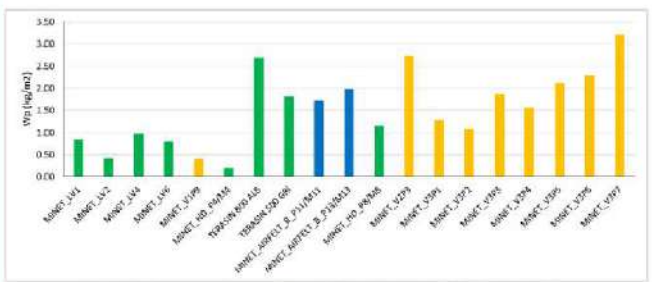
Plastic is not garbage but a good. Used pets are traded on the world market: 500 euros per tonne.

From the point of view of fibers from post-industrial textile waste recycling, at national level, 118 economic agents have been identified that carry out general activities of collection of textile materials, but no economic agent to carry out recycling activities by breaking up with the obtaining of graded wool. There are 6 economic agents that use this waste energy by burning.

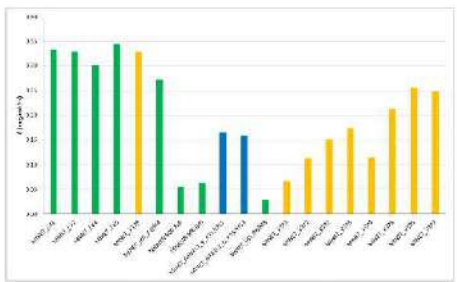
2. Experimental results:



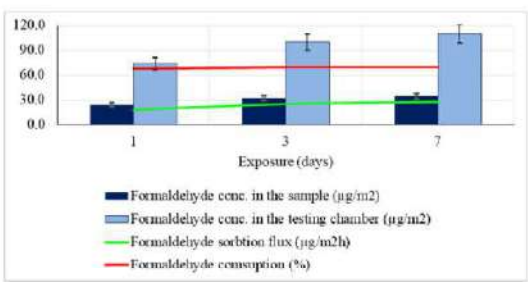
Thermal insulation performance



Short-term water absorption by partial immersion



Water vapour permeability



Capacity of the 44 mm thickness sheep wool heat-insulating mattress on the sorption of formaldehyde

water drop on the wire

drop of water at the intersection of wires

water film

Microscopic images (1x, 5x) of fine droplets or water films formed on samples subjected to 23°C and 95% humidity during the hygroscopic adsorption characteristics assessment test

recycled textile fibres

recycled PET fibres

sheep wool

Microscopic examination of test specimens for assessment of microbiological resistance

3. Conclusions:

This type of products contribute to the achievement of all previously stated objectives as follows:
- it contributes to the reduction of energy consumption by increasing the energy efficiency of existing and future buildings;
- through the re-introduction into the circuit of production, recovery, mining, textile, industrial, energy, waste stored at the time of manufacturing the product became a waste;
- use of sources of renewable raw material (natural fibres, plant and animal), had not been sufficiently exploited up to the present;
- it contributes to the protection of the environment through the removal of large quantities of material, or deposited on land or disposed of through incineration (waste textiles, sheep wool);
- offers substantial advantages on the air quality inside the rooms, as a result of water vapor permeability, desorption capacity of atmospheric moisture sorption and also has the ability to reduce formaldehyde.

INNOVATION BASED ON TRADITION – HEALTHY HUGS FROM NATURE

Acknowledgments:
This work was supported by a grant of the Romanian Ministry of Education and Research, CCDI – UEFISCDI, project number PN-III-P2-2.1-PED-2019-0463, within PNCDI III.

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THE ASSESSMENT OF NON-HAZARDOUS INDUSTRIAL BY-PRODUCTS AS SUSTAINABLE MATERIALS IN ENGINEERING APPLICATIONS

Cornelia - Florentina DOBRESCU

Numerous scientific studies are focused on finding alternative ecological binders, with low carbon footprint, using industrial by-products such as fly ash and slag to produce new green cement materials. This solution can provide an environmentally friendly and efficient soil improvement option. Due to the urban expansion and large areas with unstable soils, there is an increasing demand for soil improvement projects. For this reason, new method and techniques for deep soil improvement are widespread implemented, one example being deep mixing method (DSM).

Experimental program

The experimental applications were focused on assessing the geotechnical characteristics and the behavior of native soil mixtures with different types of non-hazardous industrial by-products. The laboratory tests have allowed both the quantification of the feasibility of industrial waste reuse as geo-materials in fulfilling adequate technical requirements, as well as the identification of benefits in geotechnical applications
Details regarding the composition of mixtures and curing periods are presented in Table. The compressive strength was determined on samples at different curing time of 3, 7, 14 and 28 days.

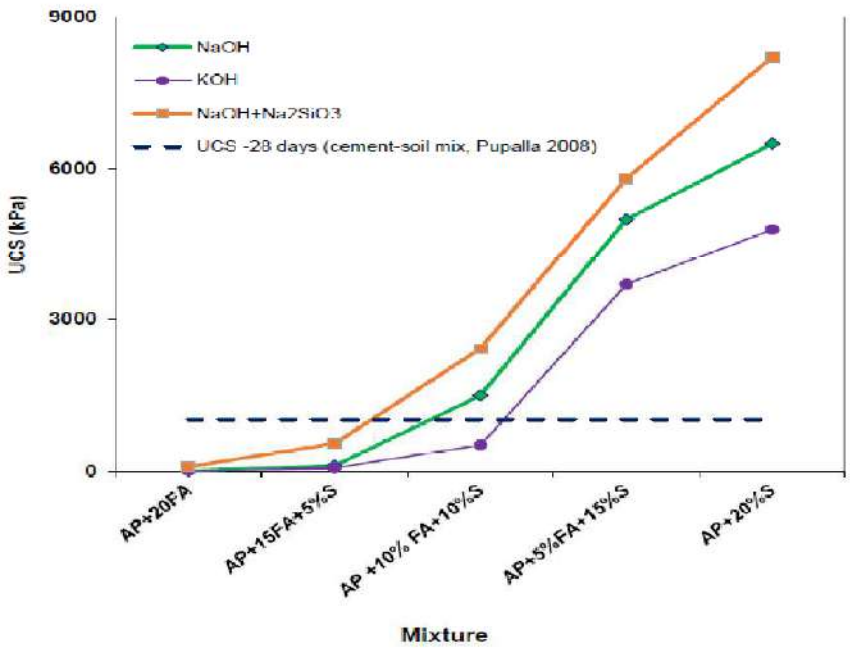
Mixture of soil with industrial by-products	Curing period (days)
AP+20%FA	3, 7, 14, 28
AP+15%FA+5%S	
AP+10%FA+10%S	
AP+5%FA+15%S	
AP+20%S	

For the experimental tests, soft clay with high plasticity was used. Tests results have determined the grain size distribution and plasticity limits are presented in Table .

Soil parameters	Determined values
Clay (A)	33%
Silt (P)	57%
Sand (N)	10%
Moisture content (w)	40%
Liquid limit (wL)	50%
Plastic limit (wp)	23%
Plasticity index (Ip)	27%
Consistency index (I_C)	0,435
pH	7,7
Organic content	4,4%

Experimental results

Compressive strength values obtained after 28 days curing time for the mixture sets prepared with three types of activating binders are represented into Figure.



Conclusions

The minimum value of UCS at 28 days recommended by Puppala et al. (2008), i.e. 1034 kPa, for cement-soil mixtures using deep mixing method is presented by comparison. A significant increase of UCS value was observed with the increasing of about 15% addition blast furnace slag, a consistent increase starting from 10% to 15% slag waste addition, with a lower increase rate thereafter.

- ❑ The aim of the performed studies was to assess the variability of the compressive strength on soft clay samples mixed with industrial by-products as fly ash (FA) and slag (S) and activated with three different liquid alkaline binders, in laboratory conditions.
- ❑ The methodological approach was focused on the identification of a sustainable binder as alternative to the conventional ones, such as non-environmentally friendly Portland cement, in order to be used for soil improvement, respectively in deep mixing method (DSM).
- ❑ The results of experimental tests have pointed out that the binder type used for activation has a high influence in increasing the compressive strength of the mixtures. It has been demonstrated that the sodium-based binder is more effective than the potassium-based one.

Advantages

The application of efficient and facile techniques for reusing industrial waste in the sustainable construction works are considered key tools in achieving the targets proposed by the national strategy for sustainable development and implicitly the global objectives of 2030 Agenda.

Acknowledgements: The authors acknowledge the financial support from The Ministry of Education and Research through the project PN 19 33 04 02: "Sustainable solutions to ensure the health and safety of population in concept of open innovation and environmental protection"

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Contributions regarding the development of LCA type cost analyzes in the construction materials sector

Author – researcher Silviu Lambrache

Context. **Life cycle cost analyzes in the construction activity have become an essential component of determining the feasibility and timeliness of construction works both in terms of choosing the raw materials, materials used and the chosen construction options.**

Methodology. **A complete life-cycle cost analysis for a construction material takes into account the lifetime costs for the material used, namely manufacturing, installation, use, maintenance and replacement costs due to physical wear and tear. Before calculating the lifetime cost/use of the material, future lifetime costs for specific time and annual periods must be converted to a certain set time period (present value) so that comparability and aggregation of costs can be achieved, being done by using the discount rate.**

The discount factor of future periodic costs is determined on the following relationship:

$$\frac{1}{(1+r)^i};$$

where:
r = discount rate in year "i„.

Lifetime cost estimation of materials is based on ISO 15686-5:2017 standard:

Life-cycle costing $LCC = \sum_{t=0}^{T} \frac{C_t}{(1+r)^t}$;

where:
Ct = total costs in year t (procurement, repairs, replacements);
r = discount rate;
t = current year;
T = analyzed time period.

Results. **To exemplify the methodology and the results obtained, an analysis model will be detailed for two constructive variants in order to select the variant that has an optimal cost during use. The duration of use of the considered materials is 40 years, and the discount rate is 2.70%**

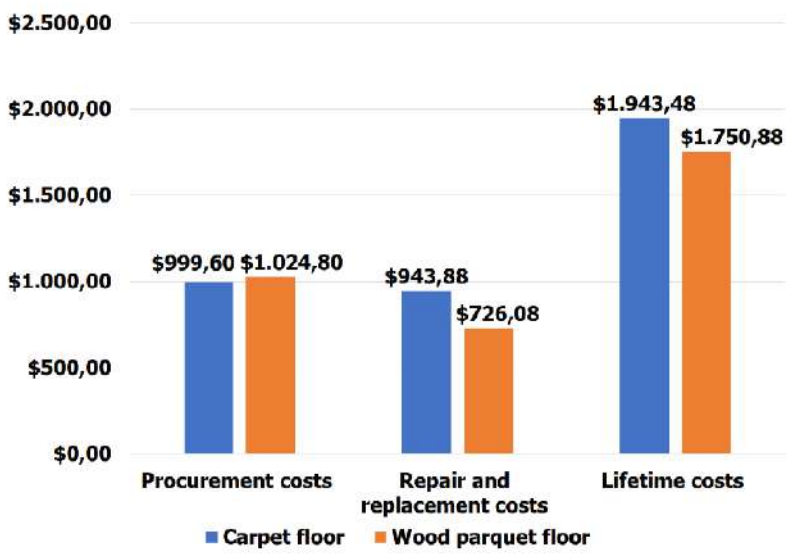

Fig. 1 Life cycle cost analysis results

Table 1. Analysis of intervention activities and related costs for repairs and replacements during the lifetime of materials

Material type	Duration of use (years)	Year of intervention (repairs, replacements)	Weight cost of the intervention (%)	Repair and replacement costs* $\sum P_c x \frac{1}{(1+r)^t} xW$
Carpet floor	40	7	15	$ 124,43
		14	15	$ 100,26
		21	15	$ 85,69
		25	100	$ 513,53
		32	15	$ 63,92
		39	15	$ 53,05
Wood parquet floor	40	10	10	$ 78,51
		20	100	$ 601,49
		30	10	$ 46,08

* P_c – purchase cost; r – discount rate; t – current year; W – weight cost.

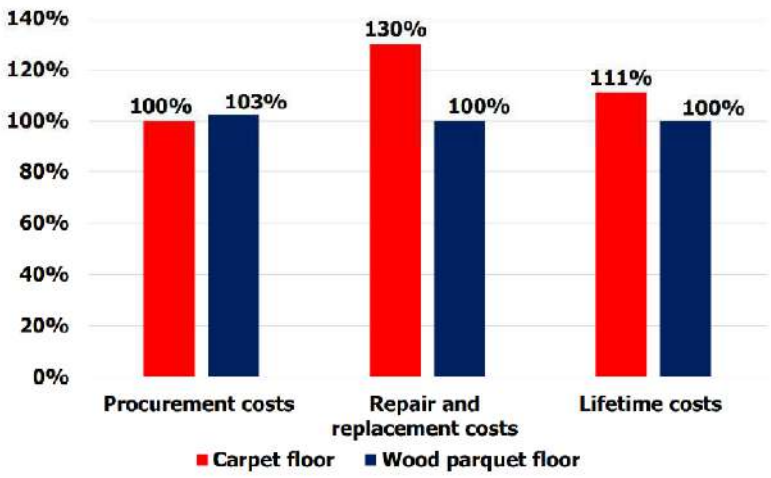

Fig. 2 Weight costs over the life cycle of the analyzed materials

Conclusions. **In order to make construction investment projects more efficient, great importance must be given to optimizing the cost of construction materials (costs for repairs and replacements) due to their high share in the total cost, that contribute to a large extent of the formation for life-cycle cost, mainly due to the long duration of their use.**

ACKNOWLEDGEMENTS

The authors acknowledge the financial support from The Ministry of Education and Research through the project PN 19 33 04 02: "Sustainable solutions to ensure the health and safety of population in concept of open innovation and environmental protection".

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URBAN INCD INCERC

MINISTRY OF RESEARCH, INNOVATION and DIGITALIZATION

National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development "URBAN-INCERC"

INNOVATIVE THERMO-INSULATING AND DECORATIVE COATINGS WITH SUNFLOWER SEED HUSKS

IRINA POPA, CRISTIAN PETCU, ALEXANDRINA MUREŞANU

General presentation

The work presents aspects of an experimental research in which basic recipes have been designed in order to obtain innovative products intended to be used in construction as finishes. Starting from products with sunflower seed husks, a vegetal waste resulting from the industry of edible sunflower oil, were obtained multi-layered coatings with thermal isolation and decorative characteristics.

Experimental program. Experimental results

There were developed three recipes/products, each one having two components: a continuous one (binders L1, L2, L3, being an acrylic film product, a silicon-acrylo-styrenic copolymer film product or an acrylic one, respectively) and a discontinuous one (three mixtures of three sorts of sunflower seed husks waste, having maximum dimensions of 4 mm, 6 mm and 8 mm). The primer, noted with *a*, and the products P1, P2, P3, applied in three and four-layered systems (S1, S2, S3) on gypsum board surfaces (PB1, PB2, PB3), generated three plasterboard samples whose coatings were further studied as thickness, adherence to the drywall and thermal insulation properties.

Product	Basic recipe of the product	System (number and type of layers)
P1	x g L1 + (A g φ4 + A g φ6)	S1 (1 layer *a* + 3 layers P1)
P2	y g L2 + (B g φ4 + B g φ6 + C g φ8)	S2 (1 layer *a* + 2 layers P2)
P3	y g L3 + (A g φ4+B g Aφ6)	S3 (1 layer *a* + 3 layers P3)
a	D g L + E g φ4	

Plasterboard sample notation	Adherence to the plasterboard sample, (MPa)	Thickness of each system applied on one side of a plasterboard sample, (mm)	R_{system} (m^2K/W)	λ_{system} (W/m.K)
PB1 PB2 PB3	-	-	0,062* 0,062* 0,068*	0,202* 0,202* 0,185*
PB1 + S1	1,31	5,11	0,156	**0,108**
PB2 + S2	1,29	6,25	0,134	**0,104**
PB3 + S3	1,30	3,15	0,126	**0,172**

* = Thermal resistance and thermal conductivity of the plasterboard uncovered samples

Sample PB3+S3. Overview

Sample PB3+S3. Detail

Discutions

- Due to the specific properties, shape and dimensions of the vegetal waste used and of the aerated structure of the innovative products, the resulting multi-layered coatings, having an approximate total thickness of only 3,15 – 6,25 mm, are defined by their thermal conductivity from 0,172W/m.K to 0,104 W/m.K and good adherence to gypsum surface, between 1,29 MPa and 1,31 MPa.
- The presence of the waste of 8 mm gives the coating, at lower number of layers, better thermal isolating properties and higher thickness, even so much thinner than that of traditional thermal isolating materials.
- The mixture of the three dimensional fractions of waste also confer a textured, original decorative appearance to this type of coating.

Advantages

- Obtaining innovative decorating coatings, with a certain contribution to the thermal insulation performance of the support on which it is applied;
- Efficient production, acquisition and putting into operation costs for this type of innovative product and for the double-function coating respectively;
- A new method for integrating this kind of industrial vegetal waste in construction, generating products with high added-value.

Acknowledgements: The authors acknowledge the financial support from The Ministry of Research and Digitalization through the project PN 19 33 04 02: "Sustainable solutions to ensure the health and safety of population in concept of open innovation and environmental protection"

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ACOUSTIC INSULATION FOR GLASS DOOR AND WINDOWS, INFLUENCE DEPENDING ON THE DIFFERENT DEGREES OF THEIR OPENING

Marta Cristina ZAHARIA PhD.Dipl.Eng.,
Ioana Mihaela ALEXE PhD.Dipl.Eng., Ciprian ENE Dipl.eng.

In Romania, there were made researches about the acoustic insulation, considering different degrees of opening positions, for a type of glass door and for some windows and there were conducted during 2020, in project Romania, there were made PN 19 33.03.01 concluded with MEC and in project 87PED - ACOUPERM/2017-2018.

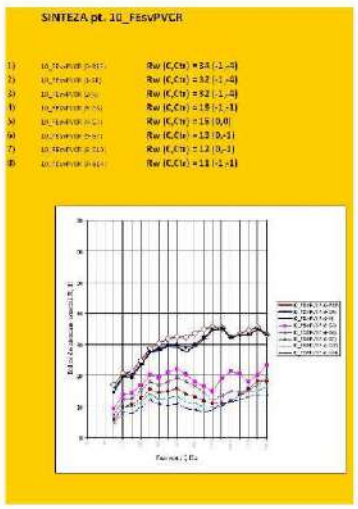
Civil buildings have, usually, the facade walls made of opaque construction elements and glazed building elements. The studies performed about the fact that when there are façade walls with doors and windows on it, the acoustic insulation made by them depends very much of the materials from which they are manufactured, on the type of configuration of glasses and frames and the dimensional characteristics, as well as the degree of sealing on the contour, respectively the degree of opening of them when there are open.

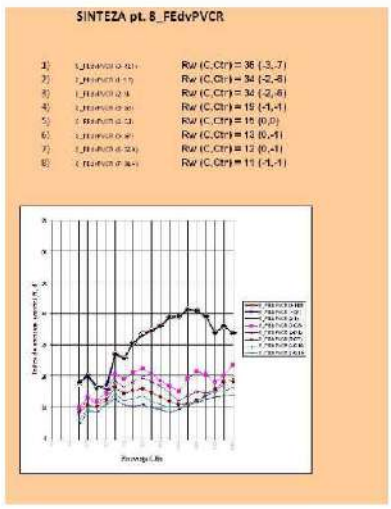
Studies were made with acoustics laboratory experiments in the *airborne sound insulation stand* of *Building Acoustics Laboratory of INCD URBAN-INCERC, INCERC Bucharest Branch*.

The ***windows*** analyzed were made using ***different materials and products***, like: *PVC (Polyvinyl chloride)* windows frames, with *structures of glass:* double glazing, triple glazing, simple glazing *sheets of glazed materials*, and also *aluminium* window *frame*, with *structures of glass:* duble glazing. The *windows were mounted* in a *brick standardized wall*.
The ***glass door*** analyzed was made using ***materials and products***, like: *aluminium* door *frame, with double glazing sheets*. The *door was mounted and is part of a glass wall*.

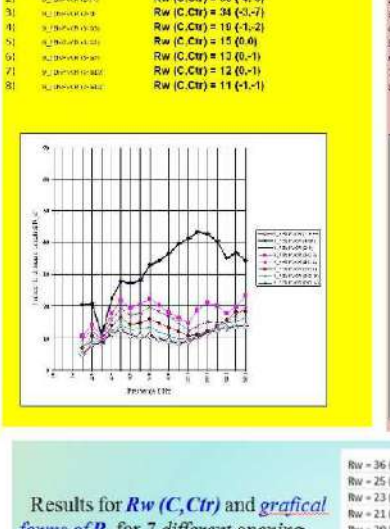
We ***analyzed the results*** of the acoustical measurements *comparing the values of* R_w (C,C_{tr}) for the types of the ***analyzed windows and the glass door***, *each of them* with *many (8 for a window and 7 for glass door) different opening positions, in total almost 40 different opening positions*, and *studied graphical forms of* ***R***, in one third octave frequency band.

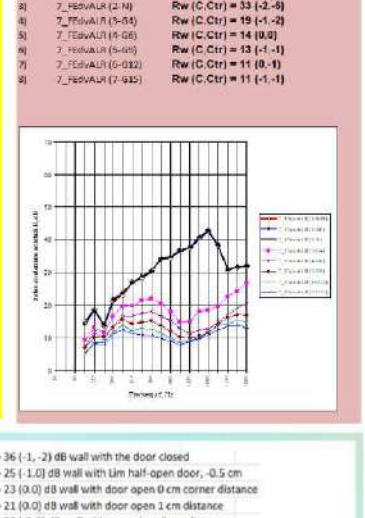
Experimental results Here are presented comparative studies, between the results of the acoustic insulation of windows and the glass door.



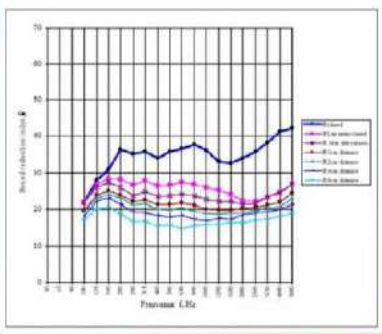


Results for R_w (C,C_{tr}) and *grafical forms of* ***R***, for *8 different opening positions* of the **PVC (Polyvinyl chloride) windows, with simple, double and triple glazing, Aluminium window with double glazing.**





Results for ***Rw (C,Ctr)*** and *grafical forms of* ***R***, for *7 different opening positions* of the **glass door, duble glazing**.



Conclusion: Considering the results of the acoustic measurements, we can conclude that the acoustic insulation of windows and the glass door, the airborne sound insulation index, R_w, decreases from max.36 dB (for closed door) and max 32 dB (for the most sealed and closed windows) to min.9 dB (for the most bigger degree of opening that was tested), depending on the type of door or window configuration. Also the acoustical results show that for all analyzed windows and door, the resonance areas, in the graphs of R indices, occur when the wavelength dimensions of the resonant frequencies are in accordance with the size of the air space of the opening and the spacing between the glass sheets of the window and of the door.

Acknowledgements: The authors acknowledge the financial support from The Ministry of Education and Research (MEC) through the **project *PN 19 33 03 01, "Researches to achieve the acoustic and thermal comfort inside the buildings, using an innovative tool for choosing the optimum structures of construction elements, from classical versus modern materials"*** *and project 87PED – ACOUPERM / 2017-2018.*

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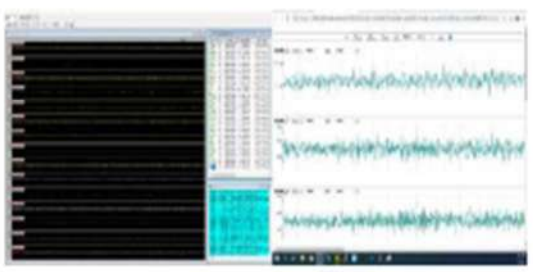
National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development "URBAN-INCERC"

DIGITALIZATION OF STRUCTURAL HEALTH AND SEISMIC MONITORING OF STRATEGIC BUILDINGS

Claudiu-Sorin DRAGOMIR, Iolanda-Gabriela CRAIFALEANU, Vasile MEIȚĂ, Daniela DOBRE, Emil-Sever GEORGESCU, Mihaela SANDU, Adelin CIȘMELARU

General presentation

By using sensor technologies and incorporating these into seismology and building infrastructure is an important step forward in understanding and responding to the status of built environment before, during, and after an extreme seismic event. New information on what is happening within a building, by incorporating high-density seismic instrumentation, both at the ground level and on upper floors, at any moment, can be used to make manual and **automated real-time decisions**. Within the National Network for the Seismic Monitoring and Protection of Building Stock from NIRD URBAN-INCERC, the recent research studies are being conducted in the field of **digitalization of structural health and seismic monitoring of buildings** having as object real buildings, seismically instrumented with modern equipment.



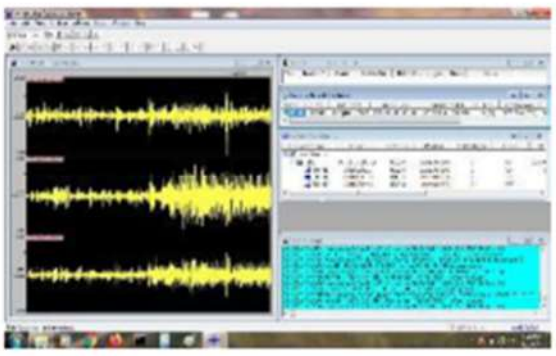
Locations of equipments. GeoDAS and Kinemetrics software for real-time data acquisition installed in the data centre.

Experimental program

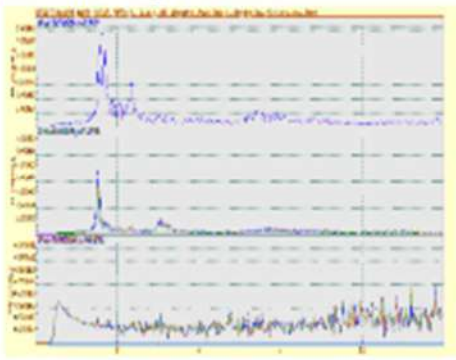
Modern equipment of last generation exists, many buildings can be monitored from distance and data can be transmitted to users or to research institutes in the field through a system of transmitting in real time (wireless smart sensor networks, within a frequency range (0.. 100 Hz).

ETNA 2 seismic equipments installed in the buildings of Ministry of Internal Affairs - General Inspectorate for Emergency Situations/IGSU and Ministry of Research, Innovation and Digitalization

Experimental results



Following the analysis of the Fourier spectra of the accelerograms recorded in the 3 location schemes, during the day, respectively the vertical scheme at night (silence time), the values of the oscillation periods for the two main directions are: f1 = 1.60 Hz and f2 = 1.50 Hz.



Discutions

Research conducted in INCD URBAN-INCERC converges towards the development of **a large monitoring system** capable, in the future, to allow remote identification, in a very short time after a seismic event, of possible dangerous changes in the condition of the instrumented/monitorized building. The completion of the registered and processed data, from the sites where seismic sensors (free-field type, or in buildings) were installed, specific to different soil conditions and soil-structure interaction and of compared to the values of the accelerations from the seismic zoning map.

Advantages

Digitalization of structural health and seismic monitoring of buildings are active research approaches from which the dynamic characteristics are obtained in structural identification and a damage detection could be possible using a specialized software. all financial investments in this field will lead to a dense network from which useful information related to the behavior of structural systems will make possible **the adoption of measures to increase urban resilience**.

In the future stages, **NIRD URBAN-INCERC**, through its specialists, will continue with **digitalization of structural health and seismic monitoring of buildings for the entire network of national research institutes in Romania**.

Acknowledgements: Results are part of the project "Research on the implementation of an integrated system for ensuring the security of the constructed space, with semi-automatic generation of PGA maps provided by seismic actions or other vibratory sources and quick evaluation of vulnerability of instrumented buildings" (PN19 33 01 01).

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I A S I BRANCH

ASSESSMENT METHODS FOR RESILIENT CONSTRUCTION TO EXTREME WEATHER CONDITIONS AND DYNAMIC ACTIONS

Florina FILIP, Adrian CIOBANU, Monica CHERECHEȘ, Aurelia BRADU, Ionel PUSCAȘU, Marius MÂRȚ

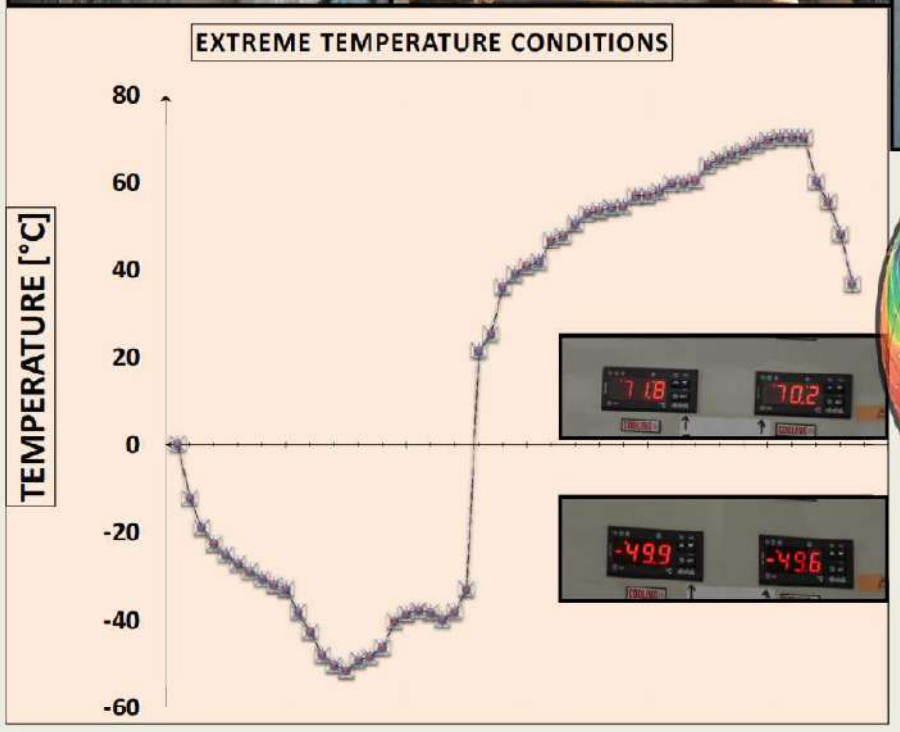
Description:

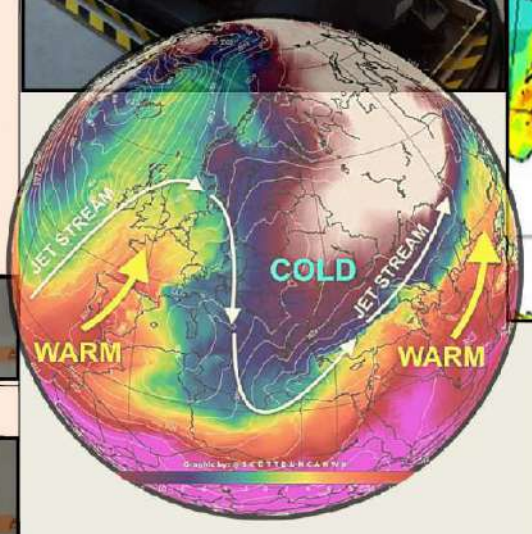
For a sustainable global future we must prepare with new test methods related to system-system interactions that can spread rapidly in the value chain, in the construction sector (structural and functional safety, medical units, emergency systems, support infrastructures for energy sources and security of energy supply, etc).

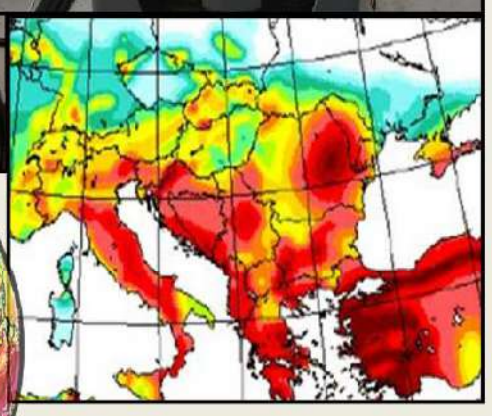
The increasing frequency and severity of climate change disrupts systems in which extreme weather events like ice, temperature conditions, extensive droughts, earthquakes and others are emerging and systemic risks.

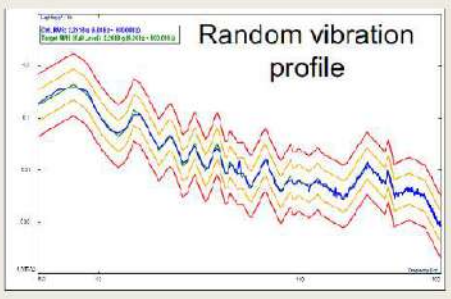
The implementation of a program for testing the effect of environmental and dynamic actions on buildings, has the role of learning from systems behavior triggered by extreme weather events, which can be used in the analysis of the response of structures.

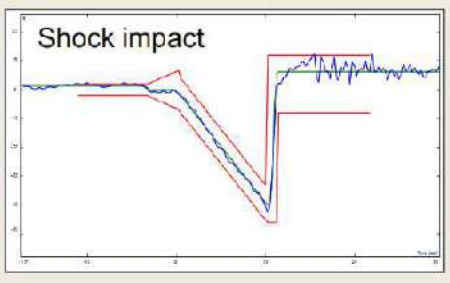
Such an analysis framework with a direct impact on the performance of existing and new constructions, as well for the related installations, represents an area in which INCD URBAN-INCERC has special competencies and attributions.











The purpose of the program for testing the effect of environmental and dynamic actions on buildings is to artificially replicate the conditions which machinery, materials, devices or components might be exposed to and accelerate the effects of exposure to the environment, sometimes at conditions not actually expected.

Acknowledgment:

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I A S I BRANCH

INFLUENCE OF THE SELF COMPACTING CONCRETE MIX DESIGN ON THE MECHANICAL PROPERTIES

Aurelia BRADU, Adrian CIOBANU, Monica CHERECHEȘ, Florina FILIP, Marius MÂRȚ

INTRODUCTION

Self compacting concrete (SCC) is a relatively new material, with high fluidity and ability to spread into place under its own weight. Contrasted with mix design of traditional concrete, which has a well-developed sizing method, the establishment of the self-compacting concrete recipe is guided only by the international recommendations. SCC constituents are similar to conventionally vibrated concrete, but the dosage differs significantly. Its composition allows a few combinations in terms of component materials and dosages used. This situation increases the degree of difficulty to design recipes due to the large number of variables which should be taken into account.

In order to evaluate the influence of mix design on the mechanical characteristics of SCC were studied 3 different classes made by same constituent material and designed in 2 different ways.

Table 1 Mix details of the concretes

Const.	Units	SCC1	SCC1-A	SCC2	SCC2-A	SCC3	SCC3-A	European Guidelines	ACI	JSCE
Cement	kg/m³	320	320	340	340	360	360	-	-	-
Powder content	kg/m³	480	470	490	480	490	480	380-600	>458	-
	l/m³	165	161	160	164	166	162	-	-	160-190
Paste	l/m³	359	346	373	359	381	368	300-380	340-400	
Water	l/m³	170	160	180	170	190	180	150-210	-	155-175
Coarse aggr.	kg/m³	881	883	876	876	883	809	750-1000	-	
	l/m³	333	327	327	316	327	316	270-360	280-320	280-350
Sand	kg/m³	814	883	809	876	883	809		-	-
	% G_{ag}	48	50	48	50	50	48	48-55	-	-
W/p	kg/m³	0,35	0,34	0,33	0,33	0,38	0,38	-	0,32-0,45	0,28-0,37
	l/m³	1,03	0,99	1,01	1,04	1,1	1,1	0,85-1,10	-	0,85-1,15

Fig.1 Testing SCC workability

RESULTS

The properties of fresh SCC mixtures were similar, the workability was evaluated according The European Guidelines for Self Compacting Concrete being assigned the following classes: Flowability – SF2, Viscosity – VF2, Passing ability – PA2.

Compressive strength

The failure mode of the SCC specimens corresponds to pure uniaxial compression loading, the lateral shear stresses completely disintegrated the cube sides, leaving a relatively undamaged central core.

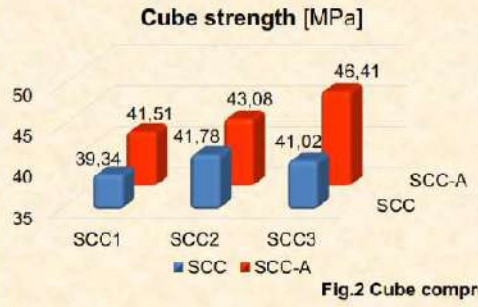

Fig.2 Cube compressive test

The mean cube compressive strength of SCC-A showed an improved values comparative to SCC with 5,52%, 3,11%, respectively 13,14%.

The relationship stress – strain developed in cylindrical concrete specimen is similar to that existing in structural compression members, hence, tests of cylindrical specimens are more realistic.

SCC-A specimen proved increased cylindrical strength with 19,43%, 13,82%, respectively 11,77%.

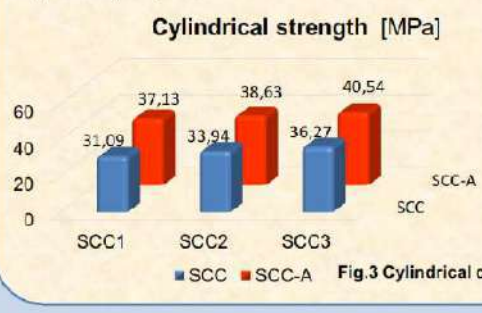

Fig.3 Cylindrical compressive test

Tensile strength

The knowledge of tensile strength is necessary for: considerations of cracking, shear, punching shear, bond and anchorage drawing moment-curvature diagrams and in the calculation of deflection.

The difference between the tensile strength values between series is insignificant: 0,99%, 1,39% and 2,82%.

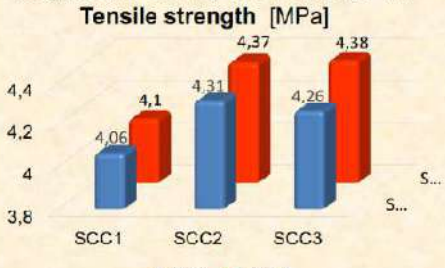

Fig.4 Splitting Tensile Test

Modulus of elasticity

The modulus of elasticity is used in the elastic calculation of deflection, often the controlling parameter in slab design, and of pre or post tensioned elements. E-value of the SCC mixtures were lower than that of SCC-A with 11,64%, 5,18% and 0,91 %.

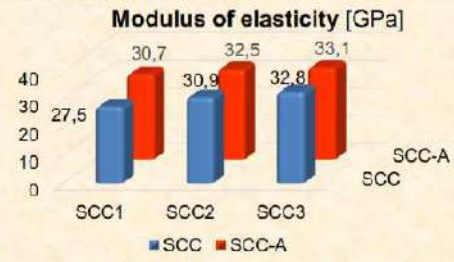

Fig.5 Determination of the secant modulus of elasticity in compression

CONCLUSION

The addition of powder improve the workability but is also diluting the cement particle system, affecting the ordinary distance between them and modifying the water quantity available for the hydration process. The optimization of the mix design for SCC-A has contributed to the improvement of the mechanical characteristics.

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Cities under COVID-19: revisiting the compaction versus sprawl dillema

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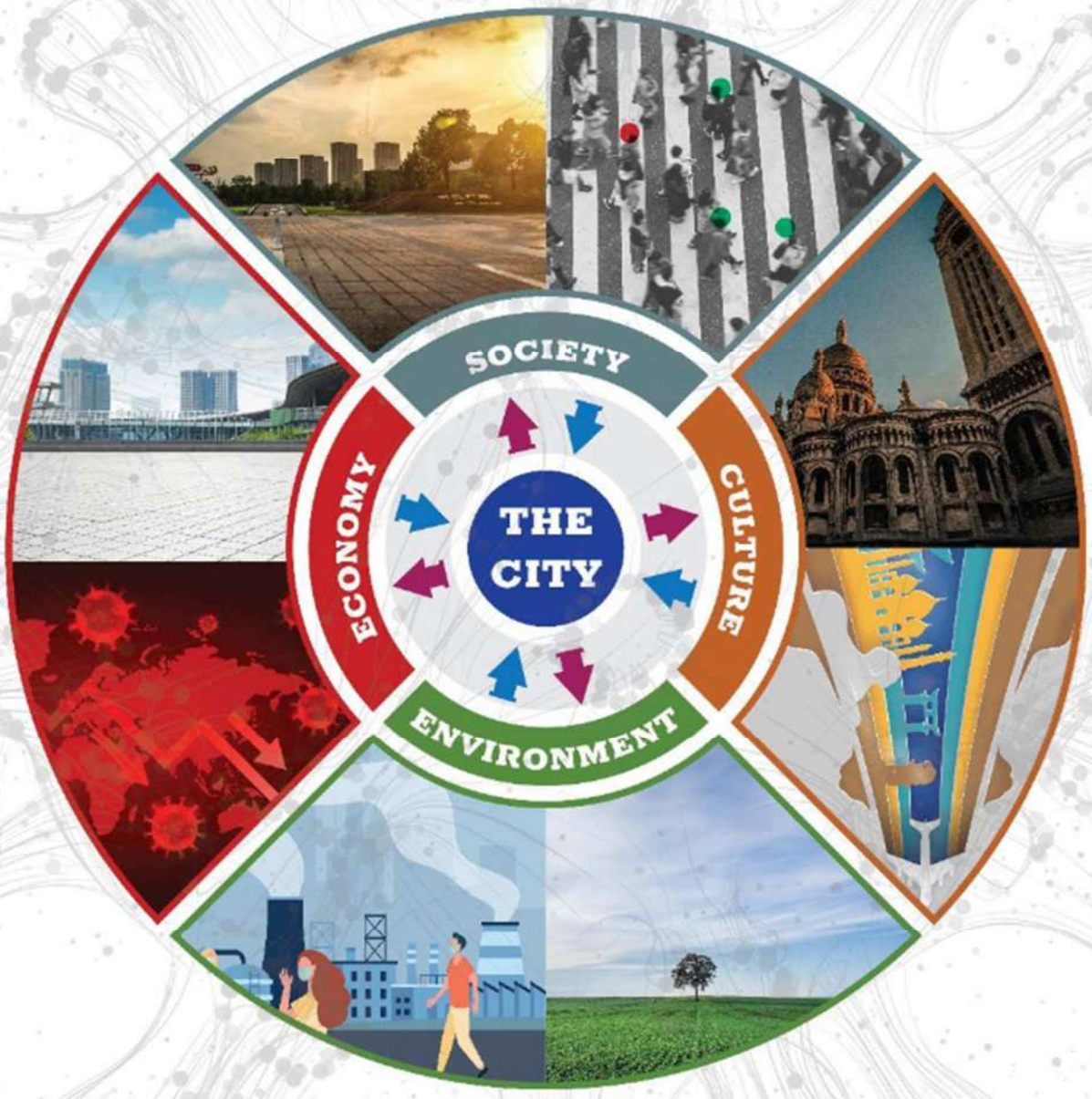
PhD (Ecology), PhD (Geography), Habil. (Urban Planning) Alexandru-Ionuț Petrișor,
PhD(c) ec. Mihaela Sandu, PhD(c) ec. Alexandra Marina Barbu, PhD(c) geogr. Andreea Cătălina Popa,
PhD(c) urb. Cristian-Mihai Șurghie



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National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development "URBAN-INCERC"

Integration into the European tourist circuit of Romanian rural cultural values

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INTRODUCTION

At the European level, there are numerous cultural attractions. Culture is one of the key areas to which the European Union has directed funds. The existence of cultural routes has contributed to the development of many European regions, with an increasing number of tourists arriving in these areas to enjoy their existing heritage.
Since 1987, the Council of Europe has supported the implementation of cultural routes that integrate history and certain peculiarities of the place. To date, more than 30 routes have been designated at the European level.
The most important elements of cultural heritage must be promoted to ensure the enhancement of local cultural identity.
In Romania, many monuments can be part of cultural routes at both European, national and local levels. Many of these monuments need refurbishments, and tourism and the support of operational programs can be means of their exploitation.
Gorj is representative of the many monuments, including Brancusi's works of art, as well as outstanding natural surroundings.

NATIONAL CONTEXT

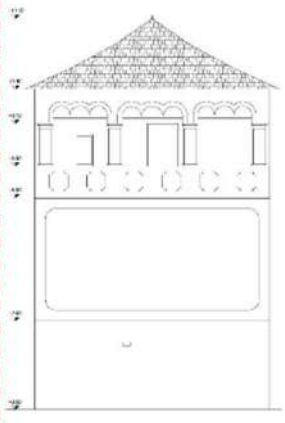
LOCAL CONTEXT

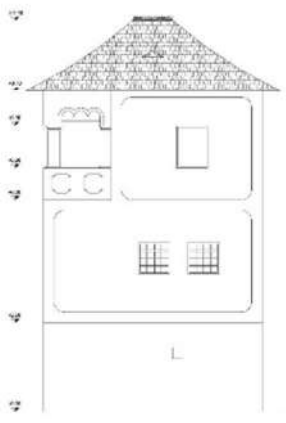
CULA CIOABA-CHINTESCU, SIACU

ARCHITECTURAL AND LANDSCAPE DESIGN

At the national level, there are about 30 semi-fortified cule, most of them in a state of decay.
The cule is a fortified construction specific to the 18th and 19th centuries, which was a defense and protection. The most representative of the items were found in the territory of Gorj County in the number of 20, and today there are only 5. Cula Cioaba Chintescu was erected in 1818 and was strategically placed on the top of a hill, to observe the three valleys.
From an architectural point of view, the construction is carried out on three levels, with a burnt brick resistance structure, with walls 0.6m thick with a compact rectangular plane, with a single access.
The reconditioning proposal retains all the aesthetic elements of detail that provide authenticity to the construction. Structural consolidation is also needed to provide stability. From a landscape point of view, the arrangement is inspired by the popular Gorjean motif, which imposes a rhythm transposed in a route along the lot.

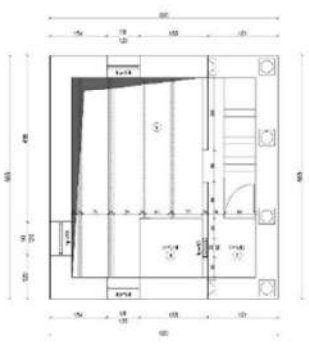
ELEVATIONS



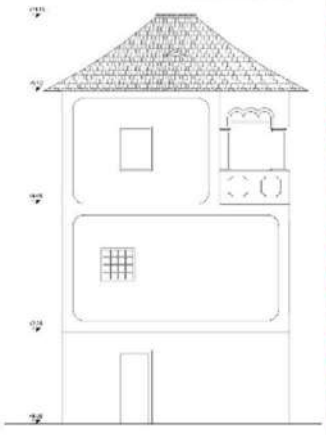


LANDSCAPE DESIGN - PLAN

2ND FLOOR PLAN



ELEVATION



LANDSCAPE DESIGN - 3D MODELS

PN 19 33 05 01 "3D reconstruction of immovable cultural heritage using intelligent photogrametry solutions based on UAV and 3D Scanner – Case study: Şiacu cule, Slivileşti, Gorj county"

URBAN INCD INCERC
MINISTRY OF RESEARCH, INOVATION AND DIGITIZATION
National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development "URBAN-INCERC"

CEMENT-BASED MATRIX MATERIALS WITH SELF-REPAIRING PROPERTIES GENERATED BY DISPERSE, POLYMERIC COATED REACTIVE GRAINS

Constantin-Dorinel VOINIȚCHI, Flavius-Valeriu CLADOVEANU, Miron ZAPCIU, Adriana NICOLAE, Nicoleta-Adaciza IONESCU, Cătălin DIMA, Vasile MEIȚĂ, Claudiu-Lucian MATEI, Henriette SZILÁGYI, Cornelia BAERĂ, Andreea-Cristina HEGYI, Mihaela SANDU, György DEÁK, Mihaela-Andreea MONCEA, Florina-Diana DUMITRU, Ana-Maria PANAIT

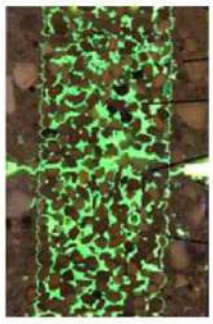
Patent application A/00022 / 20.01.2020

CONCEPT OVERVIEW

In order to ensure the continuous hydration potential for the cementitious materials, also as essential self-healing (SH) promoter, the addition of reactive grains is considered. The added grains would be polymeric coated for further preservation of their reactivity for when it would be necessary: initiation of a crack and the necessity of its sealing, when also the humidity is provided. The present research is focused on the possibility of polymeric encapsulation of some specific types of reactive grains, the feasibility of the concept in terms of smart addition compatibility to the cementitious matrix and also the self-healing performance of the composite under induced, controlled damage.

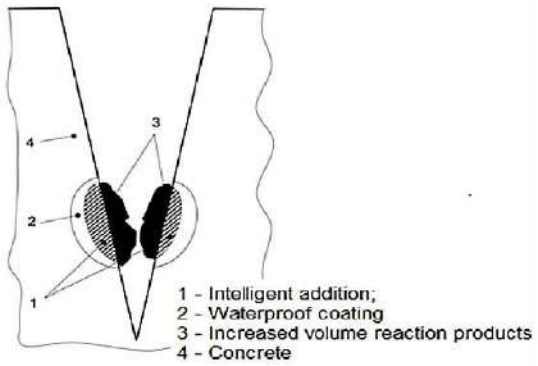
ADVANTAGE of the CONCEPT

Identifying a practical solution for providing the long-term continuous hydration potential, for preservation of healing effect as well



Self-Healing of Concrete - association of the phenomenon with the healing of living tissues (Snoeck, 2015)

PC-RG smart addition for concrete and cement-based materials
Active hydraulic grain

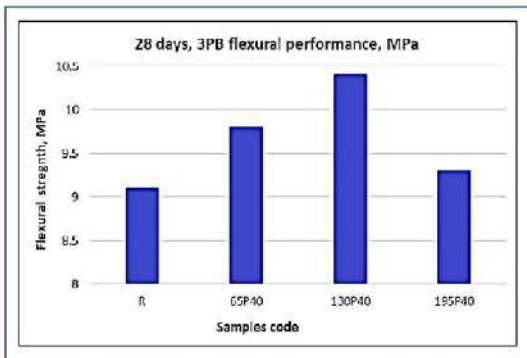


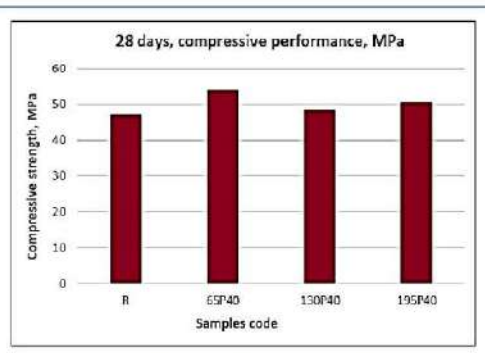
Graphical representation of the theoretical design for the reactive grains concept

METHODOLOGY

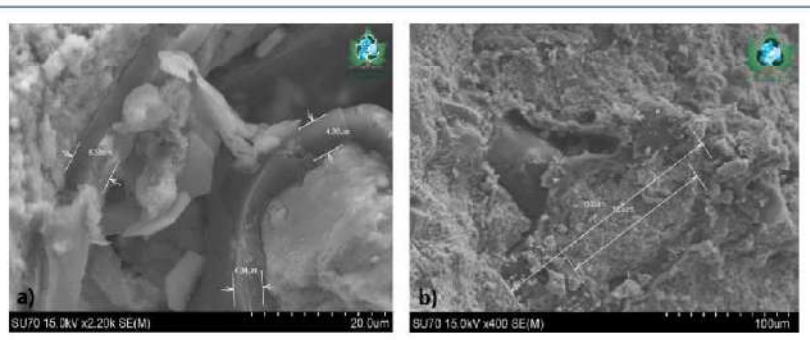
REACTIVE CLINKER GRAINS
POLYSTYRENE DISSOLVED / MELTED
→ PC-RG smart addition for concrete and cement-based materials
→ CEMENT-BASED MORTAR
→ MECHANICAL EVALUATION
- Flexural (3 Point Bending)
- Compressive Strength
THE SELF-HEALING EVALUATION

RESULTS





28 days 3PB flexural and compressive strength for Reference (R) sample and PC-RG samples



SEM Capture: Evaluation of the healing degree

CONCLUSIONS

- ❑ The mechanical evaluation of the PC-RG samples vs. R, proved the expected compatibility of the smart addition to a usual cement-based material.
- ❑ The 28 days, 3PB tensile and compressive strength showed slight increase of the PC-RG samples vs. R, attribute to the reactive grains becoming active during mixing.
- ❑ Crack healing within a cementitious matrix with intelligent addition can be properly evaluated by electron microscopy analysis, that highlights the presence of a polymeric layer on the surface of the reactive addition; in the presence of intergranular solution and microcracking the polymeric shell is partially damaged. The diffusion of the intergranular solution at the polymer film / reactive addition interface is initiated, fallowed by the initiation of hydration-hydrolysis processes, generating the formation of additional hydration products, crystallizing in the microcracks in the matrix, thus healing the area.

ACKNOWLEDGMENTS: This research is supported by the Programme: Innovative solutions for transport infrastructure protection by the use of building materials with special self-maintenance and self-repair properties", Programme code: 6 PS / 13.09.2019, financed by the Romanian Government

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3D reconstruction of a Romanian Historical Monument (Cula) using the UAV photogrammetry

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Context

The Cula Cioabă-Chinţescu building (GJ-II-mA-09392) is located in Şiacu village / Silvileşti commune, Gorj county, built around 1820. The construction has a regular shape, with dimensions in plan 6.20 x 6.65 m and height of 9.1 meter.
Characteristics:
- Seismic zoning according to P100: ag = 0.15g, Tc = 0.7 s
- Climatic zoning: II (te = -15°C)
- Wind zoning: qb = 0.4 kPa IMR 50 years
- Snow zoning: Sk = 2.0 kN / m2, for altitudes A ≤ 1000 m
- Foundation ground: Neozoic, Neogene-Pliocene Levantine (p4) with high load-bearing capacity

Recently, GIS (Geographical Information Systems) and BIM (Building Information Modeling) systems have been increasingly used for storing and managing architectural cultural heritage management information, in order to use them for further analysis (Eastman et al, 2011; Murphy et al., 2011, Achille et al., 2012).

The research activities were first dedicated to the digital mapping of historical buildings, in order to provide urban planners a (GIS) topographic database to support the design of important reconstruction interventions. In addition to the footprint of the heritage building, the identification of protection areas were considered essential.

Features of historical buildings can be recorded by using remote sensing technology such as aerial and satellite imagery, including multispectral, hyper-spectral, and synthetic aperture radar imagery. By its capacity of detecting, cataloguing, differentiating and classifying surface or underground features of historical buildings, remote sensing plays an important role in the investigation, prospection, and management of cultural heritages elements.

Image-based techniques (such as photogrammetry) represent important tools for documenting the cultural heritage, and their precise positioning and features are accessible even after the processing phase. Producing and archiving the data acquire by these technologies are crucial for future preservation and conservation works related to a cultural heritage building.

By combining aerial images (recorded in aerial missions by multicopter systems, such as drones) with photogrammetric processing techniques (SfM - Structure from Motion), orthophotographs and digital terrain models are now developed, especially in the field of cultural heritage and archeology.

Developing 3D models for historical buildings is largely used for preservation, documentation and reconstruction activities, as well as in museum exhibitions.

Materials and methods

The photogrammetry method was used, performed with a UAV platform in order to develop the 3D model of historical building – Cula Şiacu (Slivileşti locality, Gorj county). The following instruments were used: a multirotor drone, a centimeter precision GPS (GPS Rover GNSS RTK ComNav T300) and specialized software: Mission Planner and Agisoft Photoscan.

1. The first step in creating the 3D model of the Cula Şiacu was the flight planning.
- **Step 1**: identifying the Ground Control Points (GCP), in order to work with a centimeter accuracy in data processing;
- **Step 2**: generating the flight on photogrammetric strips by using the Mission Planner software, using as flight parameters the resolution of 1 cm / pixel.

2. The second step: the implementation of the Structure from Motion (SFM) algorithm. Structure in Motion (SFM) is a technique that uses a series of two-dimensional images to reconstruct the three-dimensional structure of an object, in our case of the Cula Şiacu heritage building. SfM produces 3D models based on point clouds in order to create high-resolution digital surface. In our case, the images were processed using Agisoft Photoscan Pro software.

3. The third step: making the complete geometry of the scene using a dense stereo reconstruction with multi-visualization, resulting in a 3D model, called Digital Surface Model (DSM). The previous point cloud obtained in step 2 was used to create a surface that allows creating a texture from the original images and superimposing them on the model (Themistocleous, 2019). Useful information was extracted from the obtained point cloud in order to characterize the shape and geometric structure of the building and to detect potential damage. Using the Agisoft Photoscan Pro software, a network of polygons was built and the network texture was calculated.

Results

The final result of the photogrammetry was the ortho-photogrammetry of the Cula Şiacu construction: the 3D model, heights, sections, and material textures integrated with the 3D model.

The textured model has been exported in VRML (Virtual Reality Modeling Language) format and can be viewed with any VRML viewer.
Photogrammetric results:

The sparse point cloud using GCP;

The dense point cloud

The 3D model of the Cula Şiacu construction:

Conclusions

The final Agisoft report contains information on the drone's flight (number of images, flight altitude, ground resolution, flight surface, projections etc.), camera calibration and error estimation, including GCPs, digital DEM model (resolution and density points), as well as all processing parameters (sparse and dense point clouds, errors, reconstruction and texture parameters, DEM information, orthomosaic, etc.).

The UAV platform equipped with a high-performance camera has become a widely used method in 3D modeling of cultural heritage sites, as it overcomes the problems of traditional photogrammetry in terms of system constraints – such as launching, camera calibration and high cost.

This method has multiple advantages. In our case, reconstructing this historical building – Cula Şiacu – has positive consequences on tourism, with a major impact on the local economy, generating income for those public authorities that are managing it and also for the local people.

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Remarks

This study was carried out under the Program Nucleu - PN 19 33 05 01 Reconstrucția 3D a patrimoniului cultural imobil utilizând soluții inteligente de fotogrammetrie bazate pe UAV și Scanner 3D. Studiu de caz: cula Șiacu, comuna Slivilești, județul Gorj / 3D reconstruction of the immovable cultural heritage using intelligent photogrammetry solutions based on UAV and 3D Scanner. Case study: Cula Șiacu, Slivilești commune, Gorj county.

PN 19 33 05 01 "3D reconstruction of immovable cultural heritage using intelligent photogrametry solutions based on UAV and 3D Scanner - Case study: Șiacu clue, Slivilești, Gorj county"

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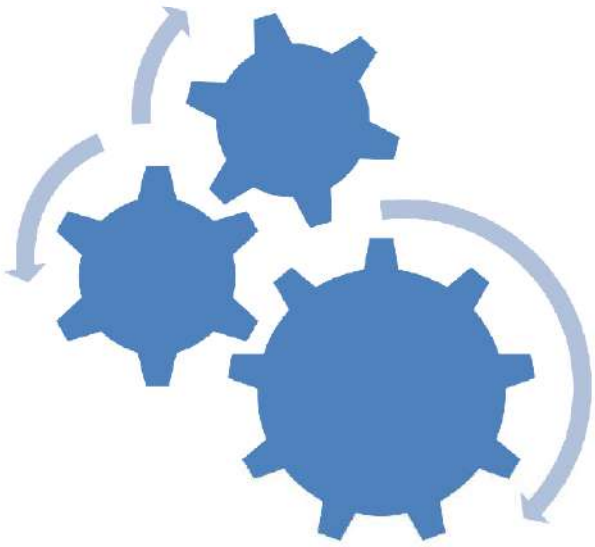
BLOCKCHAIN TECHNOLOGY AND RESEARCH & DEVELOPMENT ACTIVITY

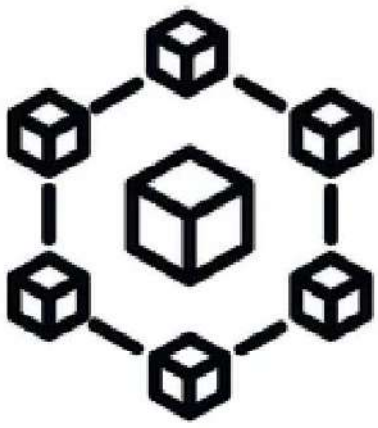
Mircea-Iosif RUS, Adrian–Victor LĂZĂRESCU, Larissa Margareta BĂTRÂNCEA

Blockchain is a database or register in which user data is stored, but also all operations that take place between users. As the name suggests, blockchain is made up of a series of virtual blocks with a unique identity, called a hash. Within the chain, each block contains information about the hash of the previous block, up to the original block of the string (also called genesis block).

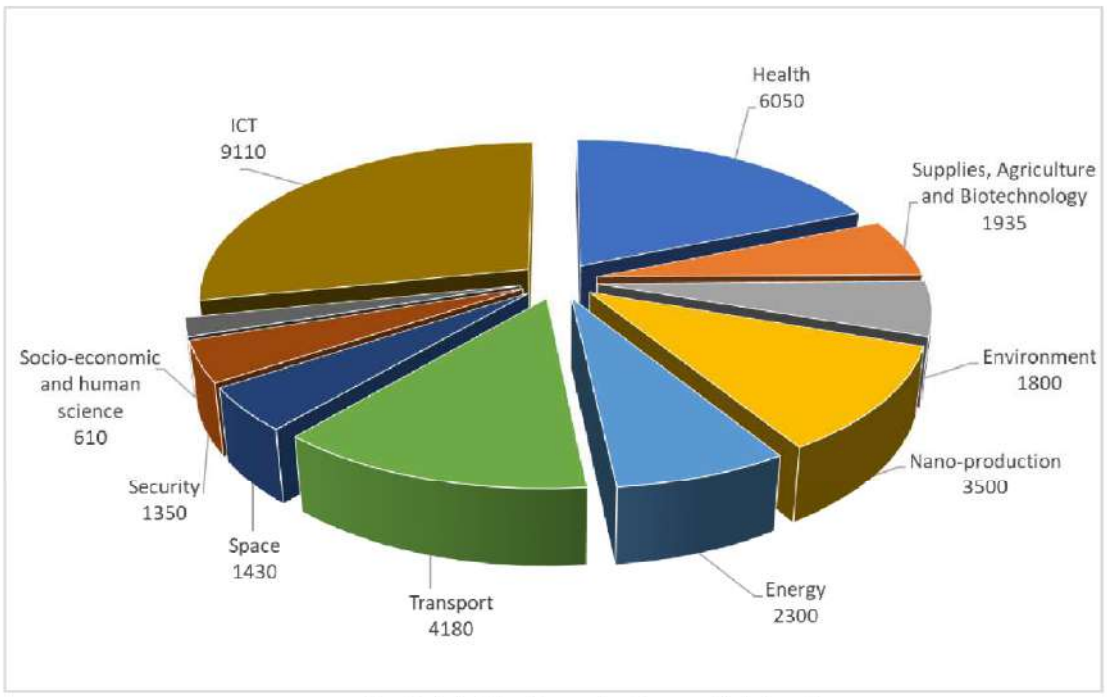
Blockchain technology, which store blocks of information that are distributed across an entire network, are considered to represent a major advance in the field, as they ensure a high level of traceability and security of transactions that take place online.

Blockchain technology has uses in all areas of activity, including research and development. Thus, since 2013, the European Commission has been financing projects in the field of blockchain technology through the research programs of the European Union FP7 and Horizon 2020.
Under the FP7 program, the European Union funded several activities through the following programs: Cooperation, Ideas, People, Capacities, Euratom and JRC. The following sub-programs were funded under the *Cooperation* program





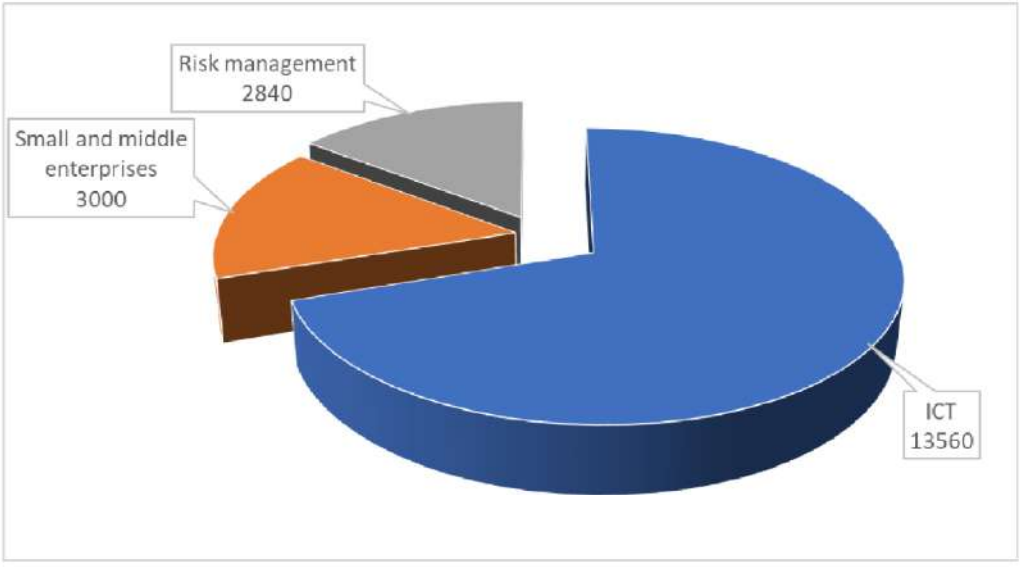
Blockchain concept



The Budget of the Cooperation Program (mil. Euros)

As can be seen, the Information and Communication Technologies (ICT) sub-program has been allocated the highest value of the total Cooperation program of 32.365 million euros.

Instead, the Horizon 2020 funding program, which followed the FP7 program, came with higher funding values than FP7. Thus, within the Scientific Excellence Program, through the Leader subprogram in the industrial field, ICT activities were also allocated the highest value of 13.557 billion euros:



The Budget of the Leader in Industrial Sector (mil. Euros)

The European Commission wants to give more visibility to blockchain technology actors and build on existing initiatives, strengthen skills in the field and address the challenges posed by the new paradigm generated by blockchain technology, such as supporting the EU industry, improving processes. economic growth and the creation of a favourable environment for new business models, including in the field of research and development. The creation of a better security system and a better protection of intellectual property are major goals in research and development, especially in the current conditions when many activities in this field take place in the online environment.

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HORIZON 2020 http://www.ec.europa.eu/horizon2020

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IT model for evaluating the cost of intermodal transport to tourist resorts in Romania

Autors: PhD SR III Antonio-Valentin TACHE, SR Cristina IVANA, PhDC SR III Oana-Cătălina POPESCU, PhD SR I Vasile MEIȚĂ, PhDC SR Gabriela VOLOACĂ

The problem

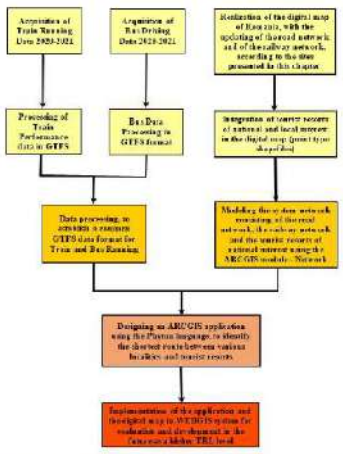
Currently, at European level, travelers and tourists do not have access to digital solutions that can allow them to plan, book and pay for their multimodal trips. Providing accessible digital ticketing and information services for multi-modal travel should, however, promote the mobility of travelers and tourists in Europe. Access to relevant data provided by travel and tourism operators and the promotion of open data policies are necessary conditions for facilitating the implementation of digital ticketing and buying services for multimodal travel. Due to this fact, the intermodal transport allows combining, advantageously on a given route, the specific advantages of each mode of transportation, such as the flexibility of road transport, the high capacity of rail transport, the low costs of shipping and the greater speed of air transport. For this reason, the aim of the project is to provide digital information services on multimodal trips, directing the tourist interest to the national resorts in Romania.

Materials and methods

From a technical point of view, the project proposes a simulation of the accessibility indicator (an indicator that expresses the combined effect of the alternative modes of transport) "Travel cost" (time) in laboratory conditions using the "cost" of moving through each cell of the represented raster by the national territory of Romania and the database on the hourly schedule of road, rail, air and naval means of transport for the main tourist resorts. The result of the project is a software application in the OpenGIS system, which uses the ArcGIS software (Network Analyst, Spatial Analyst mode), ArcGIS Server and the Python programming language, the software design concept being modular with a menu-based graphical interface so that it is easily accessible to the uninitiated user.

The computer application integrates complex data on land use, administrative-territorial elements, data on factors influencing accessibility, statistical data on the means of public transportation in an integrated GIS platform.

This generates the premises for creating an excellent IT product, very useful for tourists for calculating the fastest combined route from any point of the national territory to a tourist resort of national interest.

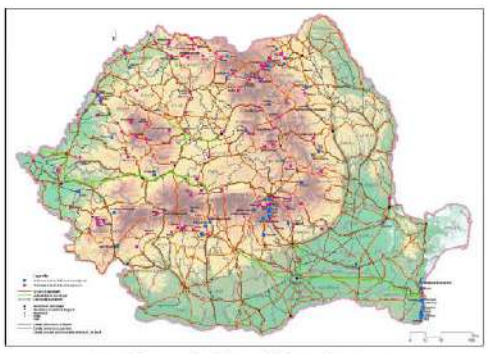


Proposed model of computer network for the evaluation of intermodal transport

The methodology of the study is based on the formation of a continuous cost surface model in trace format, using the transport nodes mentioned above. The final product will represent the time required to cross a cell depending on the slope and the means of transport used.

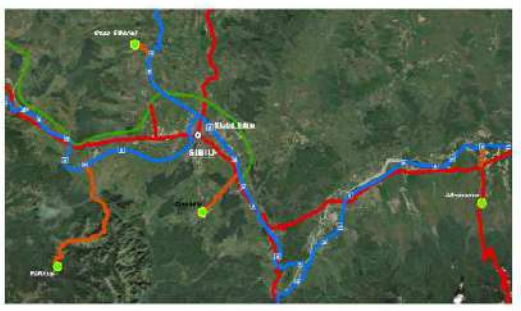
Results

The expected results of the project carried out by partners, are innovative in relation to various national and international research through the following aspects: an ideal travel cost (a perfect travel route) is created based on the combination of all transport modes (air, railway) and the travel time is calculated based on the statistical data obtained by the leading partner regarding the timetable of public transport from different cities to the tourist resorts of national interest.



Map of Romania with certified tourist resorts

The results from a technical point of view are related to obtaining and processing of data regarding the updating of the national road network and the updating of the database on the hourly chart of the means of transport (in particular, road and rail) to the stations of tourist interest.



Multimodal analysis (railway - road network) implemented in Arcgis Network Analyst

The scientific results are highlighted by the quality and quantity of the information, accessibility that they want to be evaluated, as well as the form of their presentation - qualitative maps, dynamic maps.

Conclusions

Digital platforms play an important role in bringing together end consumers and transport providers, using the effectiveness of digitization to enable new user experiences and create greater network mobility. This also gives transport providers a chance to access new customers, not just regular users and young people who are using their smartphone successfully, but all passengers, including occasional public transport users and tourists. This application is very useful for all passengers who use combined transport (railway - road network), because it benefits from the right time for traveling from any point in Romania to any tourist resort of national or local interest.

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Remarks

This study was carried out under the Program PNCDI – PN – III - P2 - 2.1 – PED – 2019 - 1216, SMART platform for assessing the cost of multimodal transport to the tourist resorts in Romania (ROSmarTTravel), Contract no. 298PED.

PNCDI - PN - III - P2 - 2.1 - PED - 2019 - 1216, SMART platform for assessing the cost of multimodal transport to the tourist resorts in Romania (ROSmarTTravel)

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GUVERNUL ROMÂNIEI

URBAN ACTIONS

A TOOLKIT PROPOSAL FOR THE REGENERATION OF PUBLIC SPACES THROUGH URBAN ACUPUNCTURE

AUTHORS PhD student, Arch. Iecdora Ungureanu, PhD student, Arch. Gabriela Voloacă, PhD student, Geogr. Andreea Popa, PhD. Conf. Habil. Arch. Urb. Vasile Meiță

INSTITUTIONS The National Institute for Research and Development in Constructions, Urbanism and Sustainable Spatial Development URBAN-INCERC
The Doctoral Programme in Urbanism at "Ion Mincu" University of Architecture and Urban Planning

identify potential places for future interventions

the toolkit should provide a guide for possible short-term intervention

identify possible solutions

this phase should include the identification of actors that can be involved in the implementation

implementation and experiment

this phase includes the implementation of the project and on-site adjusting, based on observations and on-site experience

use and analysis

the analysis is an essential part of the project, this is required in order to proceed to the next step

long term effects

based on the analysis, future actions are possible: permanent interventions, changes in the local urban normatives, etc.

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METHOD FOR OBTAINING BIOCAPSULES FOR PHOTHERMAL APPLICATIONS IN HEPATOCARCINOMA THERAPY

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"Prof. Dr. Octavian Fodor" Regional Institute of Gastroenterology and Hepatology , Cluj-Napoca, Romania;

Brevet nr 131846/28.08.2020


ROMÂNIA

DUPLICAT

ELIBERAT INVENTATORULUI

OFICIUL DE STAT PENTRU INVENTII ȘI MĂRCI

BREVET DE INVENȚIE

Nr. 131846

DESCRIPTION

The invention relates to a process for preparing a product to be applied in targeted photo-thermal therapy of pancreatic cancer. According to the invention, the process consists in that, in the first stage, citrate-stabilized gold nanoparticles are obtained, they being functionalized by covalent binding with anti-JAG-1 antibody, after which the so-functionalized nanoparticles are subjected to successive stages of centrifugation and redispersion by ultra-sound in double distilled water, for removing secondary reaction products.

Applicability

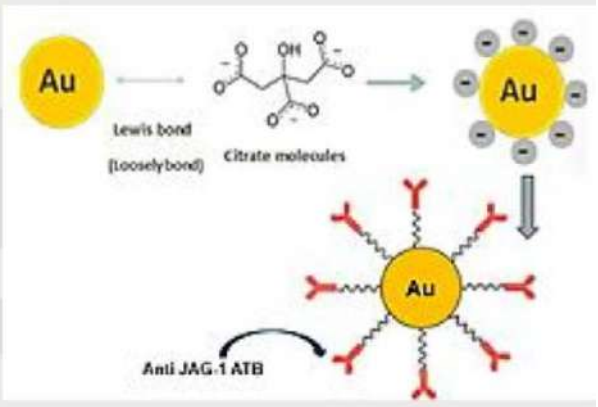
Health -targeted phototherapy of pancreatic cancer.

Application of invention/ Testing:

The invention has been developed as laboratory prototype. It is currently under evaluation of efficacy and safety.

Previous Awards

N/A



LITERATURE DATA

Notch cell signaling - proliferation, migration, differentiation , exerts direct control over some transcription factors such as SNAIL, SLUG, ZEB, specific for epithelial-mesenchymal transition

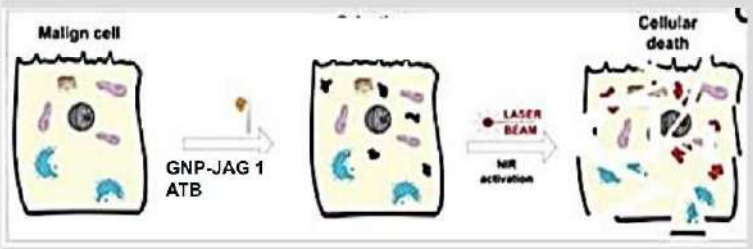
Selectivity potential

Absence of Jagged-1 expression in normal human acinar pancreatic cells, presence =limited to pancreatic cancer cells

METHOD

- The procedure according to the invention consists in that gold nanoparticles (GNP) are initially obtained in aqueous medium and stabilized with citrate.
- The functionalization of the gold nanoparticles with the anti-JAG-1 antibody, with the amino acid sequence - N-KASRGNDRNRIVLPFS- conjugated to hemocyanin from Fissurellidae (KLH), is performed in two steps.
  - In the first step, the anti-JAG-1 antibody is reduced for the exposure of thiol groups (-SH).
  - In the second step, the reduced anti-JAG-1 antibody is coupled to the surface of the GNP, (neutral pH, RT,30 min).
- Next- sucessive centrifugation and redispersion steps in bidist H2O, for removal of the secondary reaction products.

DISCUSSIONS AND CONCLUSIONS



Pancreatic Adenocarcinoma

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PROCESS FOR OBTAINING SILVER-GOLD BIMETALIC NANOPARTICLES FUNCTIONISED WITH MANNAN FOR TARGETED THERAPY OF MACROPHAGES IN TUBERCULOSIS

FLAVIU TĂBĂRAN[1,2], CRISTIAN TUDOR MATEA[2], TEODORA MOCAN[2], LUCIAN MOCAN[2]
[1] Department of Anatomic Pathology, USAMV Cluj-Napoca; [2] Regional Institute of Gastroenterology and Hepatology Prof. Dr. Octavian Fodor

The invention relates to a process for obtaining a product with antimicrobial (antituberculous) applicability with increased accumulation in macrophages. The process, according to the invention, consists in the fact that, in the first stage, synthesized silver-gold bimetallic nanoparticles (AuAgNP) by modified Turkevich method are stabilized, initially with citrate, which is then replaced with diethyl polyethylene glycol, after which it is functionalized by covalent bonding with Mannan polyglucide. The nanoparticles thus functionalized are subjected to successive stages of centrifugation and redispersion by ultrasound in double-distilled water to eliminate secondary reaction products.

Scope of application: Health.

CBI is a part of the results of the activities carried out within the research project PN-III-PI-I.1-PD-2016-1840. Acknowledgment: Dr. Lucian Barbu

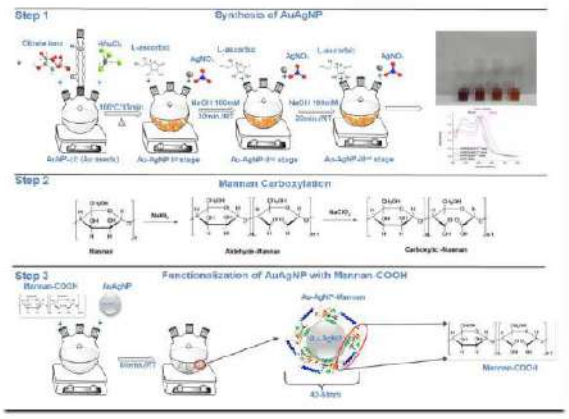

Fig. 1. Graphical representation of the protocol developed for the synthesis and functionalization of AuAgNP with mannan

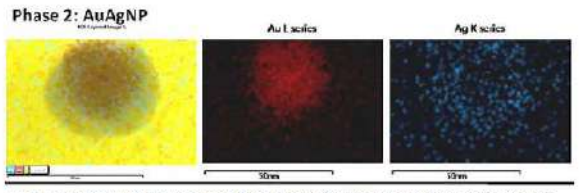

Fig.2. Chemical structure (EDX mapping) of AuAgNP synthesized particles

Fig. 3. HR-TEM images of synthesized AuAg NP

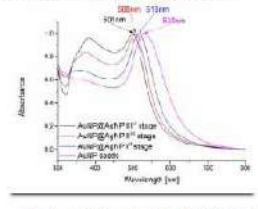

Fig. 4. UV-Vis spectra for Au and Au-Ag NP obtained.

Lophanthus anisatus L.– *Importance and Technology*

Oana Mîrzan, Margareta Naie, Maria Diana Bostan
Agricultural Research and Development Station Secuieni

CROP IMPORTANCE

From a medicinal point of view, the plant is endowed with numerous therapeutic properties, anti-stress and antidepressant, soothing the intestinal mucosa, stimulating blood circulation and enhancing immunity.This species can be grown in parks and planters as a decorative plant, highlighted by its beautifully colored inflorescences in purple blue, covering a long period of flowering, from June until the arrival of frost.
Lophanthus contains a wide range of essential oils used especially in the perfumery industry. It is rich in phenylpropane and terpenes. The phenylalyl content represents more than 50% of the total volatile oils. Other volatile compounds found in the Lophanthus plant are methyleugenol, menthol, isomentol, spatulenol. Non-volatile compounds such as caffeic acid and its derivatives, rosmarinic acid, flavones such as acacetin, tilianine, agastachosides and agastachin are also present. There are also a number of terpenoids including maslinic, oleanolic, ursolic acid and sterols such as agastol. Most chemicals have antiviral, antimicrobial, anti-inflammatory and antioxidant effects.

MORPHOLOGICAL CHARACTERISTICS

The leaves have serrated edges, a sharp tip, a slightly porous surface. The inflorescence appears in the first year, starting in June. In the inflorescence the flowers gradually open from the base. The inflorescences have sizes between 5-18 cm and are made up of overlapping vertices with an average number of 12.The flowering period is very long, it is done in stages starting with June until the arrival of frost. This species is entomophilous, much preferred by insects, especially bees.

The technology cultivation at *Lophantus anisatus* L.:

- ✓ **The culture is recommended to be established by seedling. The seed, being very small, is recommended to be sown first in the germination bed. The sowing depth must be less than 0.5 mm, special attention must be paid to the density to prevent elongation and depreciation of the seedling. In case of a high density, thinning is recommended. When the leaves have reached the beginning phase of the cross, it is recommended to be transplanted.**
- ✓ **Sowing is done in protected areas, greenhouses, solariums, cold seedlings, starting with March 1-10 and the seedling reaches the optimal age to be planted around May 1, the period when it is recommended to plant in the field.**
- ✓ **The age of the seedling should be 45-60 days. This species is planted at 70 cm between rows and 30 cm between plants / row.**
- ✓ **The care works are the common ones, specific to all species with small seeds, the plant does not have special technological requirements, nor high demands on the soil, it can be cultivated all over Romania, it is recommended to perform one or two mechanical weeding and one or two manual weeding depending on the physical condition of the land and its degree of weeding.**

ACKNOWLEGMENTS
The results were obtained as a result of the project ADER 6.2.1. - "Establishment and continuous diversification of the national collection of medicinal and aromatic plants, acclimatization and introduction into culture of new species and improvement of cultivation technologies in the mountain area."

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XIII[th] Edition, May 20-22, 2021

TEHNOLOGIA ECOLOGICĂ DE CULTIVARE PENTRU PRODUCEREA SEMINȚEI CERTIFICATĂ 1 LA SOIURILE BREVETATE DE CÂNEPĂ MONOICĂ MARCA SCDA SECUIENI

ECOLOGICAL CULTIVATION TECHNOLOGY FOR CERTIFIED 1 SEED PRODUCTION AT MONOECIOUS HEMP VARIETIES PATENTED BY ARDS SECUIENI

Diana POPA, Alexandra BUBURUZ, Elena TROTUȘ, Valentin VLĂDUȚ, Simona ISTICIOAIA,Gabriel TELIBAN

Conform estimărilor, piața alimentară bazată pe consumul vegetal prezintă un trend ascendent, cu un potențial ridicat pentru următorii ani. Astfel, cânepa reprezintă o sursă sustenabilă de proteine, cultura fiind pretabilă și recomandabilă cultivării în sistem ecologic, deoarece necesită un aport redus de inputuri și are un efect pozitiv asupra solurilor și biodiversității. Procesarea acesteia nu produce deșeuri, deoarece toate părțile plantei pot fi utilizate sau transformate și, de asemenea, are capacitate fitoremediantă. Soiurile de cânepă monoică pentru sămânță create la SCDA Secuieni au un potențial agroproductiv ridicat și se caracterizează printr-o pretabilitate ridicată la diferitele condiții pedoclimatice de-a lungul globului, cererea de sămânță depășind, astfel, arealul autohton. La SCDA Secuieni au fost derulate cercetări privind stabilirea unor verigi tehnologice în sistem ecologic de cultură, care să permită multiplicarea semințelor acestor genotipuri, cu accent pe valorificarea maximă a potențialului lor agroproductiv. Secvențele sunt aplicabile în toate zonele pretabile pentru cultivarea cânepei în sistem ecologic, urmărindu-se acoperirea necesarului de sămânță de pe plan intern și extern.

According to estimates, the food market based on vegetable consumption shows an upward trend, with a high potential for the coming years. Thus, hemp is a sustainable source of protein, the crop is suitable and recommended for organic farming, because it requires a low input and has a positive effect on soils and biodiversity. Its processing does not produce waste, because all parts of the plant can be used or transformed, and it also has a phytoremediating capacity. The monoecious hemp varieties for seed created at SCDA Secuieni (Agricultural Research and Development Station Secuieni-Neamț, Romania) have a high agro-productive potential and are characterized by a high suitability for different soil and climatic conditions around the globe, the seed demand thus exceeding the local area. At SCDA Secuieni, research was carried out on the establishment of technological links within the organic farming system, which would allow the multiplication of the seeds of these genotypes, with emphasis on maximizing their agro-productive potential. The sequences are applicable in all areas suitable for organic hemp cultivation, aiming to cover the need for seed locally and externally.

Rotația culturii. Cele mai bune premergătoare sunt leguminoasele, urmate de cerealele păioase. Pe terenurile ecologice, nu este indicată înființarea unei culturi de cânepă după specii care lasă terenul secătuit în substanțe nutritive. La rândul ei, cânepa este o bună premergătoare pentru majoritatea plantelor de cultură, întrucât lasă terenul structurat, liber de boli și dăunători. Nu se recomandă ca premergătoare porumbul, plantele furajere sau floarea soarelui. Trebuie evitată monocultura, iar în cazul culturilor semincere, cânepa va reveni pe același teren după 5 - 6 ani. De asemenea, multiplicarea seminței nu va fi amplasată în zonele infestate cu cânepă sălbatică.

Fertilizarea. Cânepa este o plantă pretențioasă la conținutul în substanțe nutritive din sol, în special în ceea ce privește cantitatea de azot. Îngrășământul de bază pentru cânepa ecologică este mranița sau compostul. Pentru reducerea rezervei de buruieni din sol, îngrășământul organic poate fi aplicat culturii premergătoare. Deoarece cânepa este considerată o cultură mare consumatoare de elemente nutritive, se pot aplica, pe parcursul perioadei de vegetație, biostimulatori admiși în sistemul ecologic de cultură, precum Terra Sorb Complex sau Aminosol.

Înființarea culturii. Sămânța trebuie să fie de calitate și să corespundă ca valoare biologică și culturală cu actul de proveniență și certificatul de calitate ce însoțește sămânța. Este recomandat ca semănatul să se facă în epocă optimă, respectiv în decadele a doua și a treia ale lunii aprilie. Semănatul prea timpuriu duce la o răsărire incompletă, cu goluri și neuniformă, plantele „îmbătrânesc" și culturile se îmburuienează. Întârzierea semănatului sensibilizează plantele la atacul puricilor și favorizează atacul moliei.

În loturile semincere, se recomandă ca distanța de semănat între rânduri să fie de 50 sau 70 cm, cu aplicarea Metodei Secuieni de cultivare, pentru facilitarea aplicării lucrărilor specifice. Metoda Secuieni constă în retezarea părții superioare a plantelor în faza de 5 - 6 etaje de frunze, cam la 25 - 27 cm de la nivelul solului. După prima retezare, de la nodurile rămase se dezvoltă lăstari care ajung la dimensiunea de 50 - 60 cm în termen scurt, moment când se aplică a doua retezare, la 15 - 20 cm deasupra primei retezări.

Norma de sămânță recomandată este de 6 - 8 kg/ha, în funcție de capacitatea germinativă și MMB, adâncimea de semănat fiind de 3 - 4 cm. Rândurile rare la 50 și 70 cm se realizează cu semănătorile pentru prășitoare tip SPC, mai indicate fiind SK-6, cu distribuitori tip Kleine cu discuri cu 30 de orificii și diametru de 2 mm, cu patine dotate cu limitatoare de adâncime pentru semințe mici.

Lucrări de îngrijire. Într-o cultură ecologică, pentru a preveni infestarea cu buruieni, se va respecta asolamentul, iar combaterea buruienilor în timpul perioadei de vegetație se va face printr-o prașilă manuală și minim 2 - 3 prașile mecanice. Pentru evitarea pagubelor produse de boli, se recomandă măsuri de prevenire ca: utilizarea semințelor sănătoase; includerea cânepei într-un asolament de 5-6 ani; cultivarea de soiuri rezistente; tratamente curative cu produse pe bază de cupru. În ceea ce privește dăunătorii, cel mai periculos este molia cânepei, care produce pagube importante la sămânță, în unii ani ajungându-se la pierderi de 25 - 30%. Pentru prevenirea moliei, se recomandă o serie de măsuri, precum: respectarea asolamentelor cu plante bune premergătoare; aplicarea agrotehnicii recomandate; semănatul în epoca optimă.

Lucrări specifice. În culturile semincere de cânepă monoică, periodic, la intervale de 2-3 zile până la sfârșitul înfloritului, producătorul de sămânță trebuie să elimine plantele mascule în faza de butoni florali, înaintea deschiderii anterelor. Eliminarea se face prin smulgere în fazele timpurii si prin tăiere până la înflorit, cât mai aproape de suprafața solului, deoarece resturile de tulpină rămase dezvoltă lăstari care cresc foarte repede și produc polen ce duce la impurificarea culturii. De asemenea, se elimină plantele monoice netipice (cu talie redusă, cu frunze aciculare, cu inflorescența rară etc.). Se verifică și perimetrul de izolare, pentru eliminarea plantelor mascule din culturile spontane. Atât purificarea biologică, cât și îndepărtarea plantelor mascule sunt lucrări manuale, dificile, care necesită cunoștințe în domeniu sau pregătirea în prealabil a personalului de către o persoană avizată.

Recoltarea. Momentul recoltării cânepei este atunci când, în treimea inferioară a inflorescenței, fructele au căpătat culoarea și luciul caracteristice soiului și se văd cu ochiul liber. Prin aplicarea Metodei Secuieni, se poate efectua recoltarea cu combina direct din lan în toate situațiile, hederul fiind ridicat astfel încât cuțitul de tăiere să ajungă la baza inflorescențelor.

Efecte socio-economice și de mediu: extinderea suprafețelor cu cânepă în sistem ecologic, sporirea producției certificate ecologic, cu efect de maximizare a eficienței economice pentru fiecare din verigile implicate (producere, multiplicare, cultivare, procesare), protejarea mediului, în special prin capacitatea fitoremediantă a cânepei și prin secvențele tehnologice non-poluante și, totodată, creșterea calității vieții în urma consumului de produse ecologice din cânepă.

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STAȚIUNEA DE CERCETARE-DEZVOLTARE AGRICOLĂ SECUIENI

TEHNOLOGIA DE CULTIVARE ȘI POTENȚIALUL INDUSTRIAL DE VALORIFICARE LA GENOTIPURILE ROMÂNEȘTI DE CÂNEPĂ MONOICĂ PENTRU SĂMÂNȚĂ, ÎNREGISTRATE ÎN CATALOGUL OFICIAL EUROPEAN AL SOIURILOR

CULTIVATION TECHNOLOGY AND INDUSTRIAL POTENTIAL FOR CAPITALIZATION AT THE ROMANIAN GENOTYPES OF MONOECIOUS HEMP FOR SEED, REGISTERED IN THE EUROPEAN CATALOGUE OF PLANT VARIETIES

Diana Popa, Alexandra Buburuz, Valentin Vlăduț, Elena Trotuș, Simona Isticioaia, Gheorghe Matei

Cânepa industrială este considerată cultura perfectă pentru bioeconomia circulară a viitorului, putând fi recoltată și utilizată pentru o gamă largă de scopuri diferite: produse alimentare, furaje, produse cosmetice, materiale de construcții, componente pentru mașini, materiale plastice bio, textile și energie. Întrucât, la nivel european, piața dedicată semințelor de cânepă, uleiului obținut din acestea, precum și produselor secundare derivate cunoaște un nou avânt, în condițiile pedoclimatice din centrul Moldovei, s-au derulat cercetări în vederea stabilirii unor soiuri de cânepă monoică pentru sămânță, pretabile acestui deziderat și a elaborării unor secvențe tehnologice aferente, care să potențeze capacitatea agroproductivă a acestora, în concordanță cu cerințele pieței europene și nu numai.

Industrial hemp is considered the perfect crop for the circular bioeconomy of the future, and can be harvested and used for a wide range of different purposes: food, feed, cosmetics, construction materials, machinery components, bioplastics, textiles and energy. Since, at the European level, the market dedicated to hemp seeds, the oil obtained from them, as well as the derived by-products, is experiencing a new momentum, in the pedoclimatic conditions in the central region of Moldova, research has been carried out in order to establish monoecious hemp varieties for seed, suitable for this desideratum and to develop related technological sequences, which will enhance their agro-productive capacity, in accordance with the requirements of the European market and not only.

Soiul. **Soiurile recomandate sunt genotipurile de cânepă monoică pentru sămânță și ulei, brevetate la SCDA Secuieni, precum: Secuieni - Jubileu, Succesiv, Zenit și Olivia. Conținutul acestora în ulei este foarte mare, putând ajunge până la 30 - 33%, cum este cazul soiului Secuieni - Jubileu. Potențialul de producție al acestor genotipuri poate atinge și 2000 kg/ha, în funcție de condițiile de cultură și agrotehnica aplicată. Începând cu anul 2016, o parte din aceste soiuri au fost testate și cultivate în numeroase țări europene (Bulgaria, Germania, Italia, Spania, Polonia, Croația, Grecia, Franța, Țările Baltice ș.a.) și nu numai (India, Belgia ș.a.).**

Rotația culturii. **Se recomandă cultivarea cânepei după leguminoase sau cereale păioase. De asemenea, poate fi cultivată şi după sfeclă sau cartof, însă dozele de fertilizare se vor majora cu 15-25%, deoarece solul rămâne secătuit în elemente nutritive. Nu se recomandă ca premergătoare porumbul, întrucât are ca dăunător comun sfredelitorul porumbului (*Ostrinia nubilalis*), plantele furajere care lasă resturi vegetale şi terenul infestat cu viermi sârmă (*Agriotes sp.*), floarea soarelui care are boli şi dăunători comuni cu cânepa, precum putregaiul alb (*Sclerotinia sclerotiorum*) şi lupoaia (*Orobanche sp.*). Nu se recomandă monocultura, pentru a se evita atacul de molia cânepei (*Grapholitha delineana*) ce poate produce pagube importante. În cazul în care monocultura nu poate fi evitată, este necesară tratarea seminței, precum și un aport suplimentar de substanțe nutritive.**

Fertilizarea. **În cultura convențională, sunt indicate îngrăşămintele complexe în raport N:P:K de 1:1:1 sau N:P - 1:1, aplicate primăvara la pregătirea patului germinativ sau la semănat, cu ajutorul echipamentelor montate pe semănători. Doza de azot se completează prin aport suplimentar la necesarul planificat. Cercetările din ultimul timp ale SCDA Secuieni au evidenţiat faptul că o creştere a dozelor de azot la 100-120 kg/ha determină creşterea producţiei de sămânță cu 25 - 30%. Cercetările derulate în perioada 2018 – 2020 la SCDA Secuieni relevă influența pozitivă a aplicării îngrășămintelor foliare/biostimulatorilor (Aminosol, TerraSorb Complex, Asfac BCO4) de-a lungul perioadei de vegetație, sporurile de producție înregistrate fiind cuprinse între 16% și 25%.**

Înființarea culturii. **Sămânţa destinată semănatului trebuie să aparțină categoriei biologice certificată 1 sau 2, având o puritate de 98%, germinaţie minimă de 75%, umiditate maximă admisă de 10% si un act care să certifice un conţinut în THC mai mic de 0,2% pentru soiul cultivat. Epoca de semănat este variabilă, în funcţie de condiţiile de climă şi sol (inclusiv rezerva de apă din sol), de sistema de maşini de recoltat, de planta premergătoare ș.a. La SCDA Secuieni, s-a semănat începând cu a doua decadă a lunii aprilie şi până la începutul celei de-a treia decade a lunii mai. Norma de sămânță recomandată la soiurile de cânepă monoică precoce și semitardive este de 12-15 kg/ha, în funcţie de capacitatea germinativă şi MMB, la o distanță între rândurile de plante de 12,5 sau 25 cm. Adâncimea de semănat este de 3 – 4 cm. Semănatul se efectuează cu semănătorile universale pentru cereale purtate (SUP-21 M sau SUP-29 M), acordându-se o atenţie sporită la reglarea corectă a adâncimii de lucru a brăzdarelor, pentru ca sămânţa să nu fie introdusă prea adânc.**

Lucrări de îngrijire. **Se recomandă ca, înainte de semănat, să se efectueze un tratament la sămânță cu Signal 300 ES 2l/t sămânță sau alte insecticide cu specificitate pentru cânepă, asigurând protecţia culturii împotriva puricilor de pământ (*Psylliodes attenuata*) timp de 60 de zile de la răsărire și contribuind la reducerea atacului larvelor de molia cânepei (*Grapholitha delineana*) din prima generaţie. Netratarea seminţei împotriva puricilor, în primăverile secetoase şi călduroase, poate compromite cultura în totalitate. Pentru evitarea pagubelor produse de agenţii patogeni care se transmit prin sol şi sămânţă, s-au obţinut rezultate bune prin tratamentul chimic al seminţei cu Maxim XL 035 FS - 5 l/t sămânță. Combaterea buruienilor monocotiledonate şi a unor specii de dicotiledonate se realizează prin aplicarea în preemergenţă a unui erbicid ca Dual Gold 960 EC - 1,5 l/ha. Pe vegetație, se poate interveni cu Fusilade - 1l/ha, Leopard 5 EC - 1,5l/ha (pentru monocotiledonate) și cu Lontrel 300 EC - 0,5 l/ha (pentru dicotiledonate).**

Recoltarea. **Momentul optim pentru recoltarea cânepei pentru sămânță este atunci când, în treimea inferioară a inflorescenţei, fructele au căpătat culoarea şi luciul caracteristice soiului şi nu mai sunt acoperite de bractee. Recoltarea se poate efectua cu combina direct din lan, hederul fiind ridicat astfel încât cuțitul de tăiere să ajungă la baza inflorescenţelor.**

Valorificarea producției. **Semințele soiurilor Secuieni-Jubileu, Zenit, Succesiv și Olivia se pot consuma ca atare, în urma decorticării (în special soiul Olivia, care are un MMB mai mare de 25,0 g) sau pot fi utilizate pentru obținerea uleiului bogat în acizi grași nesaturați (utilizat în industria alimentară, cosmetică etc.), a făinii, a pudrei proteice și chiar a berii. Fibra extrasă poate fi valorificată fie sub formă de fibră lungă, fină, de calitate superioară (în industria textilă), fie drept fibră scurtă, ca material izolant pentru case ecologice și nu numai, pentru realizarea pieselor componente ale mașinilor și avioanelor (în industria construcțiilor, industria automobilelor, industria aviatică ș.a.). Puzderia, partea lemnoasă a tulpinii, poate fi utilizată ca material de construcție și așternut pentru animale. Soiurile SCDA Secuieni sunt pretabile și pentru sectorul energetic, tulpinile și fibra putând fi transformate în brichete și peleți.**

Beneficii socio-economice și de mediu:

- ✓ elaborarea unei oferte tehnologice și de valorificare care să acopere cererea existentă pe piață
- ✓ generarea unor beneficii economice la nivelul tuturor factorilor implicați: producătorul, multiplicatorul, cultivatorul și procesatorul, în special în urma valorificării integrale a plantei (rădăcină, tulpină, fibră, frunze, flori, semințe)
- ✓ efecte pozitive de necontestat asupra mediului înconjurător

SWEET SORGHUM: *AN ALTERNATIVE FOR ROMANIAN AGRICULTURE*

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Sweet sorghum *(Sorghum bicolor* L. Moench) is an annual species, which due to its high ecological plasticity, can be cultivated in all areas of the globe, respectively in tropical, subtropical, temperate and semi-arid regions.

It is known in the specialty literature as "cane sugar from desert" or "vegetable camel" because of its resistance to drought (Olugbemi, 2017) and atmospheric heat (Basavaraj et al., 2016). For these reasons, sorghum should be considered as one of the most suitable cultures for fighting with the climate change (ICRISAT, 2015).

The current studies in sorghum area are aimed at improving the cultivation technology, so as to obtain the high yields of biomass rich in sugars and to find methods for using the juice from the stems (Srinivasa Rao și colab., 2011 a). In Romania, there is no market for sugar sorghum, because the benefits of this species are not yet known, but through research initiated at A.R.D.S. Secuieni want to promote this culture and at the same time establish the technology for cultivating it for the pedoclimatic conditions in the Center of Moldova.

RESULTS

1. The influence of the hybrid on its production and quality under the pedoclimatic conditions from A.R.D.S. Secuieni

The sugar content has varied in according to the experimented hybrid and depending on the phenophase of the plant. The Athena hybrid who has been harvested at physiological maturity achieved the highest sugar content, namely 17.6 brix (figure 1).

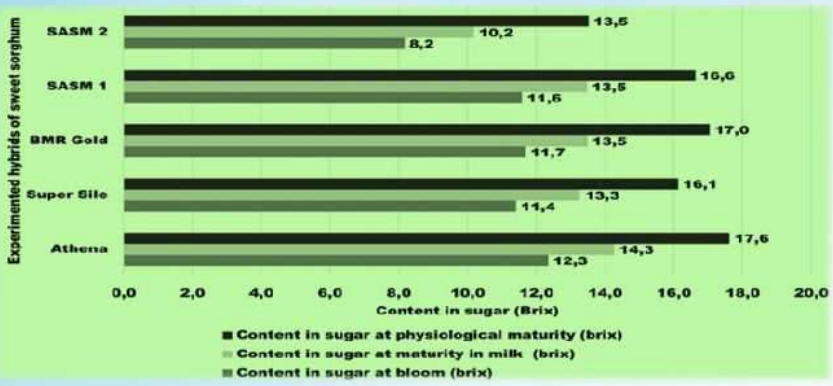

Figure 1 - The sugar content (brix) of some sugar sorghum genotypes experimented under pedoclimatic conditions from A.R.D.S. Secuieni

The biomass production varied widely depending on the cultivated hybrid. The minimum level of production was recorded in the variant sown with the BMR Gold hybrid and the maximum level from the variant sown with the hybrid SASM 1 (79.4 to ha^{-1}) (table 1).

Table 1. The influence of technological factors on the morphological properties of sugar sorghum

No.	Hybrid	Biomass production (to ha^{-1})			
		Stem	Leaves	Panicle	Total
1	SASM 1	66.7 ***	10.9 **	1.8 000	79.4 ***
2	SASM 2	64.2 ***	11.2 ***	3.0 000	78.4 **
3	Athena	53.2	10.3 *	12.7 ***	76.2 **
4	BMR Gold	35.6 000	6.5 000	2.0 000	44.1 000
5	Supersille	47.6 0	7.6 00	11.0 ***	66.2
Average hybrids		53.5	9.3	6.1	68.9
LSD 5% (to ha^{-1})		4.8	1.0	0.7	5.2
LSD 1% (to ha^{-1})		6.4	1.4	0.9	7.0
LSD 0,1 % (to ha^{-1})		8.9	1.8	1.3	9.6

2. The influence of some technological factors on the biomass production in the pedoclimatic conditions in the Center of Moldavia

In the Table 2 is observed an increase of sugar content directly proportional with the fertilization until until the applied dose of $N_{100}P_{80}K_{80}$ when it begins to decrease. At the same time, it was observed that the density of sowing of 15 g.s. sqm^{-1} is favorable for obtaining a higher sugar content.

Table 2. The influence of some technological factors on the sugar content of sugar sorghum stems

A Factor Density at sowing g.s. sqm^{-1})	B Factor Fertilization (kg a.s. ha^{-1})	Harvested at bloom (brix)	Harvested in the milk phase (brix)	Harvested at physiological maturity (brix)
10	Nefert.	10.3	11.6	15.3
	N_{50}	11.1	12.6	16.2
	$N_{40}P_{40}K_{40}$	11.8	13.4	17.1
	$N_{50}P_{40}K_{40}$	12.2	13.8	17.4
	$N_{75}P_{80}K_{80}$	13.2	14.8	18.3
	$N_{100}P_{80}K_{80}$	12.5	14.2	17.4
	$N_{150}P_{80}K_{80}$	12.8	14.6	17.7
15	Nefert.	10.7	12.3	15.8
	N_{50}	11.7	13.4	16.8
	$N_{40}P_{40}K_{40}$	12.5	14.7	18.2
	$N_{50}P_{40}K_{40}$	12.8	14.9	18.3
	$N_{75}P_{80}K_{80}$	13.5	15.4	18.6
	$N_{100}P_{80}K_{80}$	12.7	14.6	18.7
	$N_{150}P_{80}K_{80}$	13.0	14.8	18.0
20	Nefert.	10.6	12.2	15.6
	N_{50}	11.6	13.3	16.7
	$N_{40}P_{40}K_{40}$	12.5	14.4	17.9
	$N_{50}P_{40}K_{40}$	12.5	14.3	17.8
	$N_{75}P_{80}K_{80}$	13.4	15.1	18.6
	$N_{100}P_{80}K_{80}$	12.6	14.2	18.2
	$N_{150}P_{80}K_{80}$	13.0	14.7	18.0

MATERIALS AND METHODS

In order to promote the sweet sorghum and establish an innovative cultivation technology, in the period 2018 - 2019, in the experimental field from A.R.D.S. Secuieni were located three experiences, which aimed:

1. The study of an assortment of sugary sorghum hybrids, in order to identify hybrids with the highest adaptability to climate change;
2. The establishing with high efficiency of technological parameters for the sugar sorghum, to create an innovative technology in relation with new climatic conditions.

The factor pursuedet in the first (monofactorial) experience was the hybrid represented by BMR Gold, Athena and Supersille from the Euralis Seeds company, and SASM 1 and SASM 2 from the Institute of Phytotechnics Porumbeni.

The second experience was an bifactorial type A x B, where the A factor was the sowing density with three graduations: a_1 - 10 germinable seeds sqm^{-1}, a_2 - 15 germinable seeds sqm^{-1} and a_3 - 20 germinable seeds sqm^{-1}, and the B factor with fertilization with 7 graduations: b_1 - Unfertilized, b_2 - N_{50}, b_3 - $N_{40}P_{40}K_{40}$, b_4 - $N_{50}P_{40}K_{40}$, b_5 - $N_{75}P_{80}K_{80}$, b_6 - $N_{100}P_{80}K_{80}$ și b_7 – $N_{150}P_{80}K_{80}$.

In the laboratory, the sugar content was determined by using the Kruss digital refractometer, a DR101-60 model, and during the vegetation period of the sorghum, have been made biometric and specific measurements.

The maximum level of sugar content was recorded at physiological maturity, when it varied between the limits from 15.3 brix (Unfertilized x 10 g.s. sqm^{-1}) to 18.8 brix ($N_{75}P_{80}K_{80}$ x 15 g.s. sqm^{-1}) (table 2) .

The factors studied in this year have greatly influenced the biomass production achieved, wich had varyeted in very wide limits, ranging from 31.5 to ha^{-1} (Unfertilized x 10 g.s. sqm^{-1}) to 81.6 to ha^{-1} ($N_{150}P_{80}K_{80}$ x 20 g.s. sqm^{-1}). Biomass production had significant increases with increasing fertilization dose and the sowing density. Thus, in the variants sown with 20 g.s. sqm^{-1} and fertilized with doses of $N_{75}P_{80}K_{80}$, $N_{100}P_{80}K_{80}$ and $N_{150}P_{80}K_{80}$, they were very significant production increases compared with the control (average experience) (table 3).

Table 3. The influence of technological factors on biomass production at sugar sorghum

A Factor Density at sowing g.s. sqm^{-1})	B Factor Fertilization (kg a.s. ha^{-1})	Biomass production (to ha^{-1})			
		Stems	Leaves	Panicles	Total
10	Nefert.	22.0 000	4.1 000	5.4 000	31.5000
	N_{50}	25.5 000	4.8 000	6.3 000	36.6000
	$N_{40}P_{40}K_{40}$	23.6 000	4.4 000	5.8 000	33.8 000
	$N_{50}P_{40}K_{40}$	27.4 000	5.3 000	6.8 000	39.5 000
	$N_{75}P_{80}K_{80}$	29.2 000	5.8 000	7.2 000	42.2 000
	$N_{100}P_{80}K_{80}$	38.8	7.7	9.6	56.1
	$N_{150}P_{80}K_{80}$	38.3	7.5	9.4	55.2
15	Nefert.	35.9 0	7.0 0	8.8	51.7 0
	N_{50}	39.4	7.8	9.7	56.9
	$N_{40}P_{40}K_{40}$	38.0	7.5	9.3	54.8
	$N_{50}P_{40}K_{40}$	36.8	7.3	8.8	52.9
	$N_{75}P_{80}K_{80}$	41.7	8.3	10.1	60.1
	$N_{100}P_{80}K_{80}$	45.6**	9.1***	11.0**	65.7**
	$N_{150}P_{80}K_{80}$	46.4***	9.3***	11.2*	66.9***
20	Nefert.	44.6**	8.8**	10.7*	64.1**
	N_{50}	48.0***	9.5***	11.5***	69.0***
	$N_{40}P_{40}K_{40}$	43.6*	8.6*	10.5*	62.7*
	$N_{50}P_{40}K_{40}$	43.6*	8.8**	10.3	62.7*
	$N_{75}P_{80}K_{80}$	48.5***	9.7***	11.8***	70.0***
	$N_{100}P_{80}K_{80}$	55.4***	11.1***	13.3	79.8***
	$N_{150}P_{80}K_{80}$	56.8***	11.4***	13.4	81.6***
Media		39.5	7.8	9.6	56.8
LSD 5% (to ha^{-1})		3.3	0.6	0.9	4.6
LSD 1% (to ha^{-1})		4.6	0.9	1.2	6.6
LSD 0,1 % (to ha^{-1})					

CONCLUSIONS

The sugar sorghum is now having a great importance because of its use in animal nutrition and the production of biofuels.

Following the results obtained at A.R.D.S. Secuieni regarding the improvement of sugar sorghum technology, it had been concluded that:

- A great importance for the area is by choosing the hybrid ,which will have possibilities of lifting the pedoclimatic conditions in the Center of Moldavia of the hybrids SASM 1 and SASM 2, which had produced biomass production of up to 79.4 to ha^{-1} and presented sugar in stems up to 16.6 brix;
- The technological factors applied in the sorghum culture determine the biomass production and even his quality. The sowing density and appling mineral fertilization it had major influences on biomass production, which showed significant increases with increasing fertilization but even with the sowing density. In variants sown with a tenth of 20 g.s. sqm^{-1} and fertilized with doses of N_{100} - N_{150} on agrofound of $P_{80}K_{80}$, had realized the highest production, respectively 79.8 - 81.6 to ha^{-1}, which denotes that sugar sorghum prefers the density and doses of nitrogen higher.

ACKNOWLEDGEMENT. This work was supported by a grant of the Romanian Minister of Research and Innovation CCDI - UEFISCDI, project number 9/PCCDI/2018 within PNCDI III.

BEET-BERRY VEGAN KEFIR PLANT-BASED KEFIR WITH BEETROOT AND BLUEBERRY POWDER

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ABSTRACT

Millet is a plant still cultivated intensively in Romania, which makes it available in large quantities for development of plant-based dairy alternative products in the vegan niche. A number of factors related to the individual (celiac disease, disease Crohn's disease, intestinal dysbiosis) or products consumed by the population, have led to an overall increase in incidence of lactose intolerance, thereby reducing the consumption of milk and dairy products, even those which offers multiple benefits through their consumption (eg kefir). Lactose intolerance is a condition in which people have digestive symptoms — such as bloating, diarrhea, and gas — after eating or drinking milk or dairy products. Lactase deficiency and lactose malabsorption may lead to lactose intolerance, due to the lack of the enzyme lactase in the small intestines to break lactose down into glucose and galactose. Approximately 70% of the world's population has primary lactase deficiency. In this context, millet milk and other fermented products, such as vegan kefir may be an alternative for the population of Romania suffering from the aforementioned disorders.

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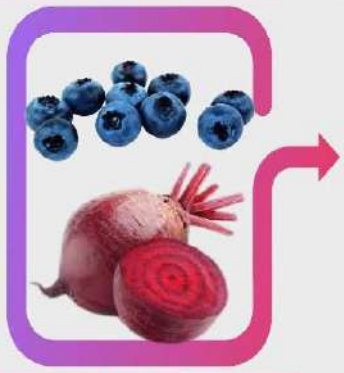
"University of Applied Life Sciences and Environment"

CONTEXT

Milk is rich in many basic nutrients and is an integral component of several countries' nutritional guidelines. However, due to the rise of lactose intolerance and milk allergies, environmental issues a growing number of customers are shifting to plant-based milk alternatives, also described called "plant milk". Of the non-dairy milks, millet milk is the is a healthy choice for those who have dairy, gluten, soy, or nut allergies or intolerances. In contrast to rice milk, millet milk has more protein, fiber, and healthy fats, thus making it more suitable for kids diet. Enriching plant-kefir with ingredients capable of conferring specific health benefits in addition to basic nutrients is an excellent way to improve the nutraceutical properties of this plant-based drink.

FABRICATION

The invention relates to the vegan products industry, in particular to the manufacture of fermented non-dairy products, namely to the process of obtaining a functional non-dairy Kefir-like product, enriched with biologically active compounds from beetroot and blueberry powder. The process according to the invention involves the use of millet milk, without preservatives or stabilizers, the addition of beetroot powder (0.1% .... 0.5%) and blueberry powder (0.5 ..... 1%), inoculation with a mix of lactobacilli cultures and probiotic cultures to start the fermentation process (*strains of Kluyveromyces marxianus subsp. Marxianus, Lactococcus lactis subsp. cremoris, Lactococcus lactis subsp. acidophilus La-5*), fermentation until the coagulation forms, cooling and storage.



MILLET MILK

- Rich in protein, fiber, and healthy fats
- healthy milk alternative

BEETROOT POWDER

- great source of fiber, folate (vitamin B9),manganese, potassium, iron, and vitamin C
- Anemia relief, increased digestion, hepatoprotection and improved brain function and growth

BLUEBERRY POWDER

- "SUPERFOOD"
- Source antioxidants, vitamins fibers and minerals

KEFIR FERMENT

- mix of lactobacilli and probiotic cultures that enable the fermentation process of kefir and helps strengthen the digestive and immune systems.

HEALTH BENEFITS

- Provides extra nutrients, a boost of energy and balance to gut microbiota and the immune system.
- Suitable for persons with dairy, gluten, soy, or nut allergies or intolerances.
- addition of beetroot and Blueberry powder to kefir may increase its functionality, providing additional health benefits, especially for those consumers who suffer from allergies and intolerance

APPLICATIONS

- Manufacturers of vegan, plant based products
- Plant Milk Market Revenue to Hit $21 Billion by 2026.

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REVIVE FUNCTIONALIZED KEFIR WITH MACA AND COCOA POWDER

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ABSTRACT

Pasteurized milk, supplemented with probiotic microorganisms from kefir offers well-known benefits, but the association with the nutrients and active substances in Cocoa and Maca also gives it its qualities a prebiotic. The fermentative capacity of kefir is enhanced by the nutrients from the two plants, and the developing the microbial populations of kefir increases the microbiological benefit of the product.

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CONTEXT

Kefir, a fermented milk drink rich in proteins, vitamins, minerals, amino acids, and microelements, can improve digestion, bone health, weight loss and reduce the symptoms of lactose intolerance. As customers seek more streamlined ways to support their active lifestyles, functional products with defined health benefits are becoming very popular. A solution for improving the nutraceutical benefits of kefir is the enrichment with components capable of conferring unique health benefits in addition to basic nutrition. Due to rising awareness of consumers towards gut microbiota and its role in immunity support, new product developments such as functionalized kefir are expected to boost the dairy industry and kefir market in the upcoming years.

FABRICATION

The invention relates to the dairy industry, in particular to the manufacture of fermented dairy products, namely to the process of obtaining functional kefir from cow milk, enriched with biologically active compounds from maca and cocoa powder. The process according to the invention involves the use of whole fat fresh cow's milk, homogenized, pasteurized, without preservatives or stabilizers, the addition of maca powder (0.1% .... 0.5%) and cocoa powder (0.5 ..... 2%), inoculation with kefir grains and fermentation until the coagulation forms, cooling and storage.

COW MILK

- **whole fat fresh cow's milk, homogenized, pasteurized, without preservatives or stabilizers**

COCOA POWDER

- **Rich in polyphenols, potent antioxidant and anti-inflammatory effects**
- **Improves digestion and reliefs stress**

MACA POWDER

- **Rich in antioxidants, vitamins, and minerals, supports energy and stamina, balance hormones and may counteract stress.**
- **Improves fertility**

KEFIR GRAINS

- **mix of lactobacilli and probiotic cultures that enable the fermentation process of kefir and helps strengthen the digestive and immune systems.**

HEALTH BENEFITS

- **Provides extra nutrients, a boost of energy and balance to gut microbiota and the immune system.**
- **Dysbiosis caused by the consumption of food additives or as a result of some anti-infectious treatments may be prevented or ameliorated using this "LIVE" product, natural and innovative, perfectly adapted for the human microbiome.**

Applications

- Manufacturers of fermented dairy products
- The European Kefir Market was valued at USD 0.42 billion in 2019 and is expected to rise at an annual rate of 8.2% through 2025, reaching USD 0.421 billion.

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Mobile plasma system for the decontamination of waters contaminated with highly toxic compounds

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State of the art

Environmental pollution with organic compounds is a topical issue internationally. These compounds, used in agriculture and other different industries, affect the environment and create long term problems. These compounds pollute the soil and water, either through intentional use or accidental propagation (military conflicts, industrial accidents, terrorist activities and so on). Despite having available a wide variety of pollutant decontamination technologies, from physical (ultrafiltration, nanofiltration, reverse osmosis, sonolysis, electrooxidation, UV light irradiation) to chemical methods, such as advanced oxidative methods (MOA), there is continuous concern for developing new decontamination methods and technologies that are more efficient and economically advantageous [1]. All of the above methods exhibit disadvantages and produce strong environmental pollution.

Plasma decontamination is a relatively new decontamination method, with high efficiency on a wide range of chemical agents in a relatively short time, minimal toxicity and low aggressiveness towards the environment, and non-corrosive [2]. Plasma sources can also be made as portable versions, and thus used directly in the location requiring decontamination.

This paper presents the results of research conducted both in the laboratory and in situ, for the depollution of aqueous solutions contaminated with different concentrations of highly toxic organic compounds, classified as simulants of chemical warfare agents (CWAs). These compounds are used in significant quantities in various industrial fields (synthetic chemical reagents) and in agriculture (pesticides). We have studied the influence of three parameters of the decontamination rate: the compound class, the concentration of the contaminated solution, and the decontamination time.

Experimental work

We have decontaminated aqueous solutions intentionally contaminated with two classes of highly toxic compounds, simulants of: neurotoxic CWAs (**Dimethyl methylphosphonate** and **Parathion**) and vesicants CWAs (**Thiodiglycol** and **2-Chloroethyl ethyl sulfide**), at concentrations of 5, 10, 20 ppm. All substances were acquired from Sigma Aldrich. The molecular structures of these toxic compounds are presented in Figure 1.

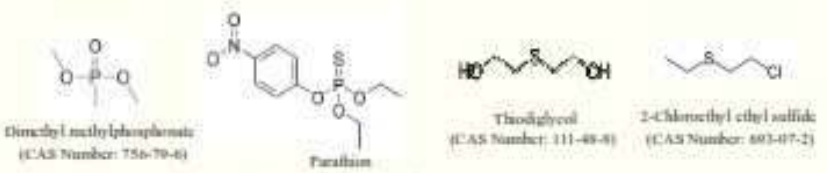

Figure 1. Molecular structure images of the target toxic compounds.

The experiments were performed with a mobile plasma system type YDBD [3] (YDBD filamentary plasma jet is obtained from a DBD filamentary plasma source dielectric barrier discharge (operated only in argon) after introducing a Y tube for the discharge of a reactive gas), at atmospheric pressure, working in radiofrequency at a power of 100 W, in a mixture of argon and nitrogen (nitrogen being the reactive gas), and decontamination times of 10 and 20 minutes (Figure 2, Figure 3).

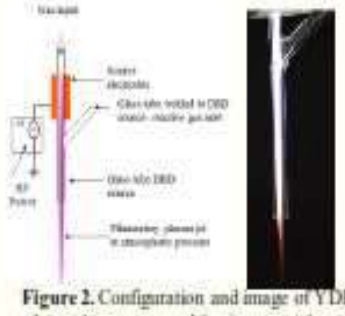

Figure 2. Configuration and image of YDBD plasma jet source working in argon/nitrogen.

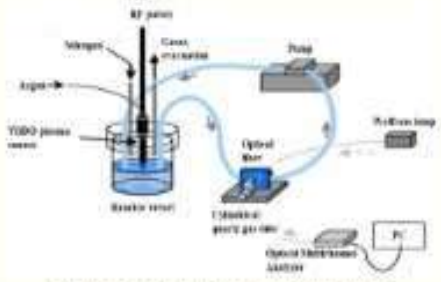

Figure 3. Experimental installation scheme.

Both the initial solutions and those obtained after the plasma decontamination were prepared by extraction with dichloromethane, concentrating the resulting extracts, and were then analysed by gas cromatography coupled with mass spectrometry. The investigations were made using a Trace DSQII model, Thermo Electron Corporation equipment with a TR5MS 30 m x 0,25 mm x 0,25 μm capillary column.

Working parameters: Helium 6.0 (ultrapure) carrying gas, debit of 1 ml/minute (36,2 cm/s), constant pressure; injection mode: splitless, 15 ml/min; temperature program of: 60 °C (2 min), 10 °C/min, 300 °C (10 min); domain: 40-650 m/z; injection volum: 1 μl.

The working conditions for the decontamination of the four contaminated aqueous solutions have been identical, both in the laboratory, and in situ: 3000 sccm argon flow, 300 sccm nitrogen flow, 100 W RF power, initial volume of treated solution: 50 mL (Figure 4).

Figure 4. Images taken during the laboratory and in situ experiments.

Results and discussions

The plasma-based treatment tests were performed in intentionally contaminated waters, prepared following the selection of specific pollutants. Multiple samples and working materials have been used (waters contaminated with neurotoxic and vesicant compounds). In our research, we are looking for a treatment recipe leading to short decomposition time and high decontamination efficiency, regardless of the type of toxic compound. After the plasma treatment, the degradation of the neurotoxic compounds led to spectacular results. Still, this was not the case of the vesicant compounds, for which the decontamination degree was lower. For the same working parameters, we observed a clear increase of efficiency through the increase in decontamination time, for all toxic compounds that underwent the plasma treatment, both in the laboratory, and in situ (Tabel 1, Figure 5).

Tabel 1. The experimental parameters and the results of the plasma decontamination.

Plasma working parameters					Neurotoxic compounds				Vesicant compounds			
Plasma source	RF power (W)	Flow argon (sccm)	Flow azot (sccm)	Initial volume (mL)	Substrate	Concentration (ppm)	Treatment time (min.)	Decomposition yield (%)*	Substrate	Concentration (ppm)	Treatment time (min.)	Decomposition yield (%)*
YDBD	100	3000	300	50	Dimethyl methylphosphonate (DMMP)	5	10	84.51	Thiodiglycol (TDG)	5	10	83.08
YDBD	100	3000	300	50		5	20	96.11		5	20	92.23
YDBD	100	3000	300	50		10	10	82.30		10	10	75.22
YDBD	100	3000	300	50		10	20	94.64		10	20	87.80
YDBD	100	3000	300	50		20	10	81.03		20	10	74.37
YDBD	100	3000	300	50		20	20	94.02		20	20	86.60
YDBD	100	3000	300	50	Parathion (PT)	5	10	96.89	2-Chloroethyl ethyl sulfide (2CES)	5	10	56.79
YDBD	100	3000	300	50		5	20	99.82		5	20	86.62
YDBD	100	3000	300	50		10	10	96.82		10	10	50.88
YDBD	100	3000	300	50		10	20	99.75		10	20	81.14
YDBD	100	3000	300	50		20	10	96.71		20	10	49.92
YDBD	100	3000	300	50		20	20	99.25		20	20	79.51

*The decontamination rate was calculated as the percentage of toxic compound consumed from the initial quantity.

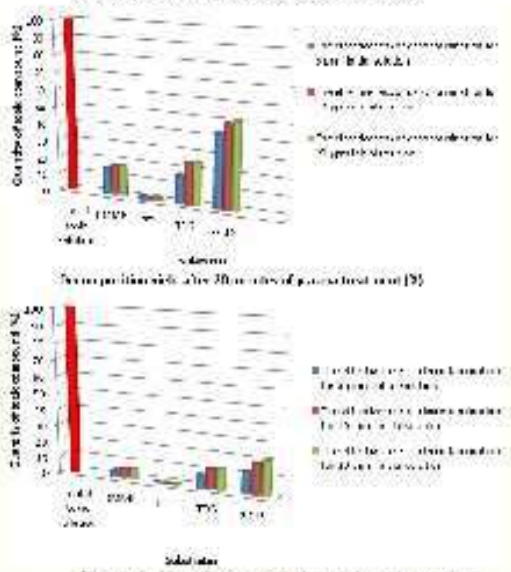

Figure 5. The efficiency of plasma decontamination.

Conclusions

The YDBD filamentary plasma source immersed in liquids is a very versatile decontamination technology that can operate both inside and outside. Besides the simplicity in achievement and configuration, this plasma source also has the great advantage of not implying additional cooling systems.

The high degree of decontamination obtained after the treatment of contaminated aqueous solutions proves the efficiency of the mobile plasma decontamination system, which could find applications in the field of environmental protection, for the depollution of surface and wastewaters, contaminated with toxic substances.

Acknowledgements: This work was supported by a grant of the Romanian National Authority for Scientific Research, CNDI–UEFISCDI project number PN-III-P1-1.2-PCCDI-2017-0637.

Keywords: plasma decontamination treatment, highly toxic compounds, depollution of aqueous solutions, environmental protection.

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Innovative combinations of renewable sources' bioactive compounds with restoring action on dermal & epidermal homeostasis

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EUROINVENT
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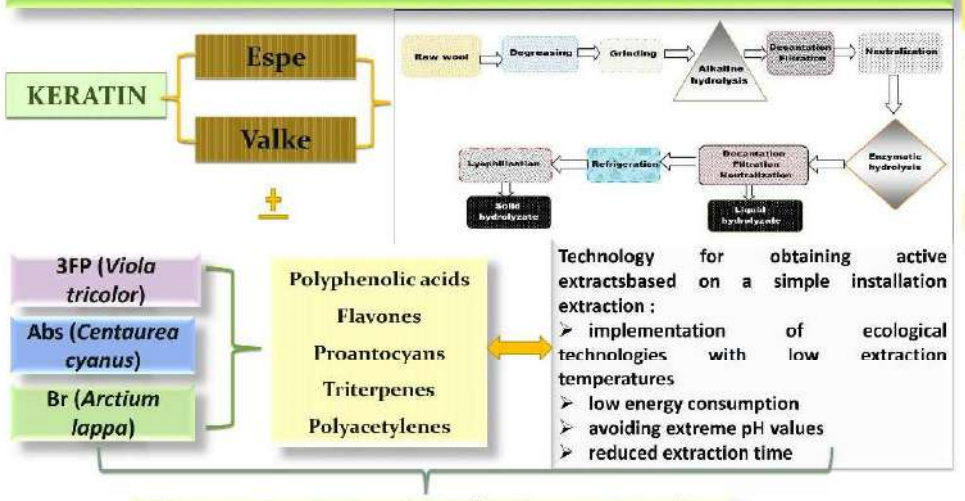
Iasi, Romania,
20-21 May 2021

ABSTRACT: In the context of the circular economy, with a focus on waste capitalization from leather industry, the studies aimed to configure innovative structural groups by associating keratin fractions from wool with plant extracts from organic farming. The applications pointed out the biomedical field, especially the delalayed healing wounds issues, one of the first aspects being the restoring dermo-epidermal homeostasis, chronically affected. Two variants of keratin fractions (**Espe** and **Valke**) obtained by original biotechnologies were selected, as well as *Viola tricolor*, *Arctium lappa* and *Centaurea cyanus* extracts, in order to accomplish their effectiveness in cell regeneration on keratinocytes and fibroblasts. The screening was performed by advanced techniques of cellular and enzymatic analysis (flow cytometry and zymography), on standardized cell lines, HS-27 and HaCaT, highlighting mechanisms of epidermal differentiation (membrane overexpression of involucrin, cytokeratin and transglutaminase related to cell sequentiality) and extracellular matrix proteins' turn-over (collagen synthesis / vs degradative enzyme activity). The results indicate innovative variants of therapeutic association designed to accelerate the intrinsic healing process through selective contributions on convergent mechanisms of skin recovery stages. They give the advantage of using bioproducts with minimal toxicity, configured on principles of maximizing biological activity through well-selected structural components: keratin fragments, polyphenols, flavones. The economic added value will be gained through more efficient raw materials sources due to capitalization of leather waste and medicinal plants ecological culture, preventing the depletion of spontaneous flora and customized agricultural technologies in order to obtain a reproducible content of active compounds.

TECHNOLOGICAL PROCESS FOR OBTAINING BIOACTIVE COMPOUNDS



➢**REEPITELIZATION BY KERATINOCYTE DIFFERENTIATION** (highlighting the layers of the epidermis: basal, spinal and corneum by the expression of keratin 5/14; transglutaminase-1 and involucrin)

➢**EXTRACELLULAR MATRIX REGENERATION** - structural protein synthesis (collagen) and degradative enzymes' modulation - matrix metalloproteinases

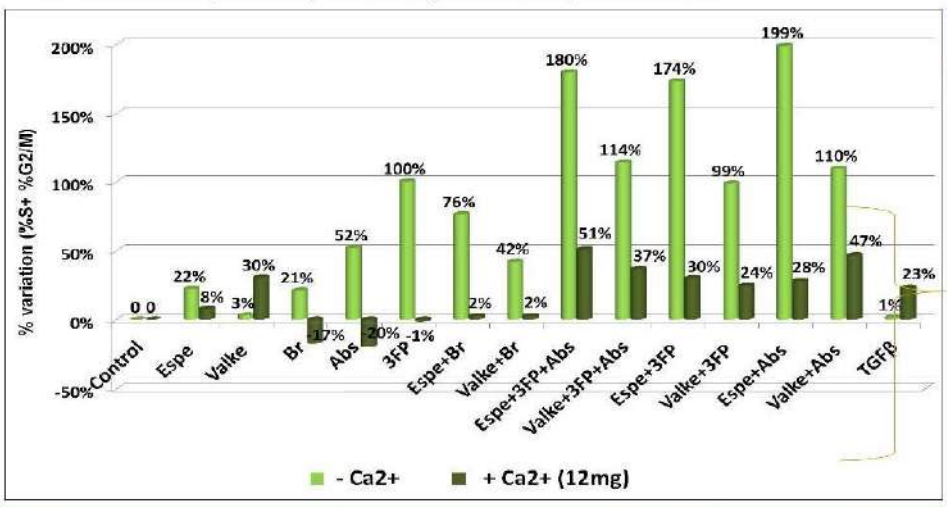
EFFICACY IN CUTANEOUS REGENERATION

I. STIMULATING KERATINOCYTE CELLULAR TURNOVER – HaCaT standardized cell line

Stimulation of keratinocytes' cellular turnover, especially in calcium-rich environments that promote differentiation. It is noticed (table I) the differentiation markers over-expression of the basal /spinous /corneum layer, corresponding with the structural pattern of active compounds of extracts. Valke has a remarkable effect on epidermal renewal cycle even when the external factors are not presents (lack of Calcium)

7 days differentiation	% variation					
	Involucrin (Corneum layer)		Transglutaminase 1 (Spinous layer)		Cytokeratine 5/14 (Basal layer)	
	- Ca^{2+}	+ Ca^{2+} (12mg)	- Ca^{2+}	+ Ca^{2+} (12mg)	- Ca^{2+}	+ Ca^{2+} (12mg)
Control	NA	NA	NA	NA	NA	NA
Espe	16%	13%	149%	10%	55%	17%
Valke	19%	21%	133%	-8%	77%	19%
Br	-70%	-25%	-74%	-16%	-55%	-27%
Abs	-36%	-12%	-42%	2%	19%	-6%
3FP	-41%	-8%	-46%	-2%	90%	-7%
Espe+Br	-5%	16%	-17%	35%	-19%	-28%
Valke+Br	2%	14%	-6%	33%	51%	-34%
Espe+3FP+Abs	7%	30%	-6%	67%	84%	53%
Valke+3FP+Abs	-2%	25%	-9%	48%	108%	43%
Espe+3FP	-1%	22%	-13%	45%	12%	10%
Valke+3FP	2%	22%	-1%	45%	14%	40%
Espe+Abs	-17%	20%	-26%	46%	26%	37%
Valke+Abs	-17%	24%	-26%	50%	43%	61%
TGFβ	152%	139%	329%	75%	107%	109%

Table I. Membrane proteins expressed in stages of keratinocyte differentiation



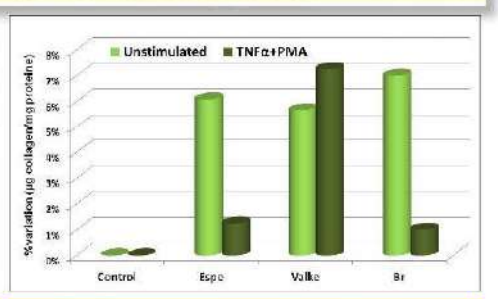
Proliferative status induced by tested compounds on keratinocytes cultured in differentiation media with different calcium concentrations

II. DERMAL REGENERATION - extracellular matrix remodeling of human dermal fibroblasts, HS27 standardized cell line

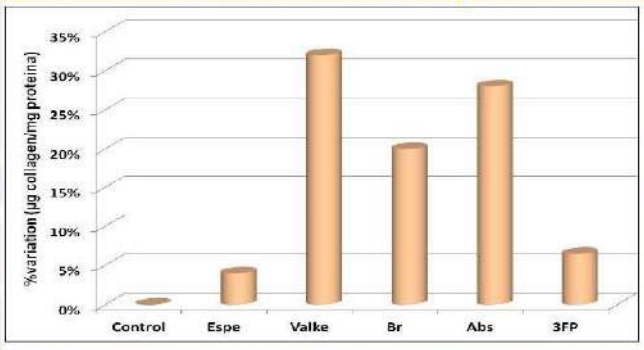
The dermal regenerative effect is expressed at the protein matrix level by maintaining the balance between the synthesis of structural proteins that ensure tissue integrity (collagen) and the activity of degradative enzymes (metalloproteinases - MMP).

A. INTRACELLULAR AND EXTRACELLULAR COLLAGEN BIOSYNTHESIS

Total collagen microscopic evaluation (specific labeling with Sirius Red / Fast Green kit) - 48h treatment, with stimulation for 24h with proinflammatory factors (TNFα + PMA)



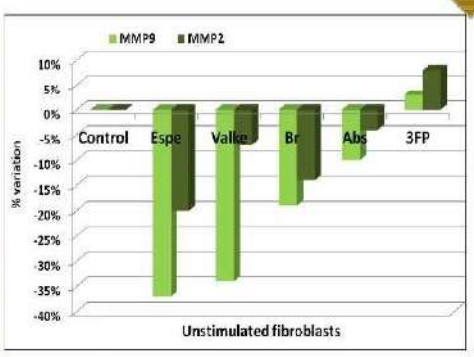
Spectrophotometric quantification of intracellular synthesized total collagen - fibroblasts cultivated under normal and proinflammatory conditions

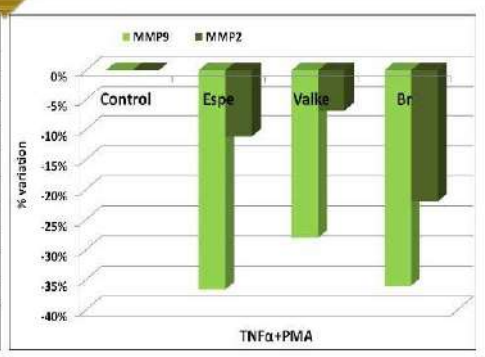


Valke, Arctium lappa and Centaurea cyanus extracts stimulates dermal collagen biosynthesis, both in basal growth conditions and in the presence of proinflammatory factors, thus contributing to the remodeling of skin tissue.

B. EVALUATION OF MMP 2 AND MMP 9 ENZYMATIC ACTIVITY

The zymographies highlighted **Espe and Valke as major inhibitors of MMP2 and MMP9 activity** in normal and stimulated fibroblasts cell line, preventing the degradation of the skin tissue through "*in situ*" preservation of the extracellular matrix of the affected area





STRUCTURE – FUNCTION CORRELATIONS
FOR THE BIOACTIVES COMPOUNDS
Synergistic effects of plant extracts and keratin fractions, in particular for Valke

CONCLUSIONS/ SIGNIFICANCE OF RESEARCH RESULTS

Complementary cellular effects suggesting the intrinsic healing process acceleration and the recovery of the functional pathways

- Lack of remanent pesticides in raw materials of phytopharmaceutical products
- ECOLOGICAL FARMING OF PLANTS
- INNOVATIVE TECHNOLOGIES
- SELECTIVE EXTRACTION PROCESSES
- ACTIVE COMPOUNDS SEPARATION
- KERATIN FRACTIONS FROM WOOL
- RECYCLING OF WASTE FROM LEATHER INDUSTRY
- PATENTING - Patent Application IN PROGRESS
- PERFORMANCE IN DRUG-DEVELOPMENT
- Economic added value

Improvement of circular economy

ACKNOWLEDGEMENT
The study was performed as part of the project: PTE 5/2020: „ Algoritm de valorificare a reziduurilor entomologice si de pielarie in sisteme multivalente pentru regenerare de tesut cutanat" - BIOTEHKER

Installation for removal of organic pollutants from wastewater based on photocatalysis and biological processes

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GENERAL INFORMATION

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STATE OF THE ART

The project is based on the need identified by DFR Systems SRL to remove three of the disadvantages of conventional biological treatment, namely: low efficiency, large amount of sludge resulting from the biological treatment stage and high retention times. These disadvantages can be eliminated by creating within the project of an installation for removing organic pollutants from wastewater based on photocatalysis and biological processes that are based on the introduction into the technological flow of purification of:

- a further stage of degradation of organic pollutants based on photocatalysis. This process could lead to an increase in the treatment yield in a very short time and to a decrease in the amount of sludge formed within the biological step;

- a much more efficient bacterial population in the process of degradation of organic pollutants in water.

Finally, a pilot of the plant for removing organic pollutants from wastewater based on photocatalysis and biological processes will be designed and implemented. The objective of the project is to improve / increase the efficiency of removal of organic pollutants from wastewater to CO_2 and H_2O by introducing two stages of degradation with synergistic effect, as follows:

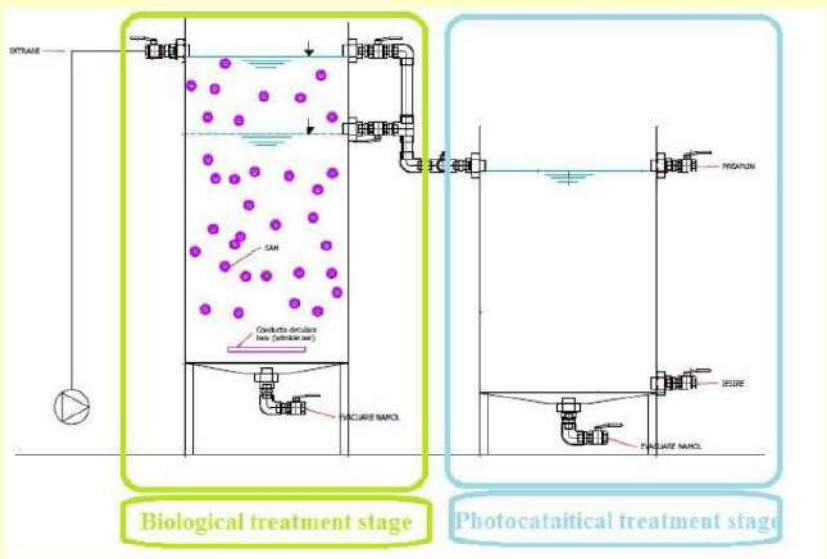
1) photocatalytic stage - which is based on the degradation of organic pollutants by photocatalysis performed by semiconductor nanoparticles of TiO_2 under the action of UV radiation;
2) biological stage - which is based on the degradation of organic pollutants with the help of microorganisms, by improving the technology with fixed biofilm - biofilm carriers existing in the treatment plants of DFR Systems S.R.L.

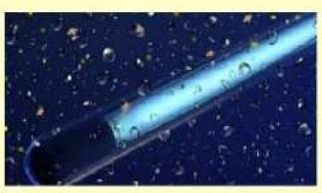
Photocatalytic step - following the technological improvement, the UV equipment already owned by DFR Systems SRL, currently used for water disinfection, will be improved / refurbished to ensure the photocatalytic step by depositing TiO_2 nanoparticles semiconductor on supports that cover the walls of the equipment. Thus the nanoparticles semiconductor of TiO_2 (as a catalyst) in the presence of UV radiation will ensure a high degradation of organic pollutants. TiO_2 semiconductor nanoparticles act as a catalyst, and the catalysis process carried out under the action of UV radiation is called photocatalysis.
Biological step - will be carried out in the present biological treatment equipment based on technology with fixed bacterial biofilm - Mobile Artificial Support (SAM) whose biodegradation efficiency will be improved within the project. This technology is based on the development and fixation of complementary populations of aerobic bacteria, mostly nitrifiers such as Nitrosomonas and Nitrobacter, on an intensively aerated plastic support, eliminating the need to recirculate activated sludge. SAM consists of small round pieces made of special plastic, with a density close to that of water. This allows SAM to float freely "between the waters", and due to the permanent movement of the revolution and the round shape, not to allow the adhesion of the sludge being a non-collapsible environment - self-cleaning. It should be noted that only 1 m^3 of SAM provides an exposure and fixation area for microorganisms of 850 m^2.

ORIGINALITY AND INNOVATION

Currently, both nationally and internationally there is no installation that uses a technology based on the process of degradation of organic pollutants in water by photocatalysis performed by semiconductor nanoparticles (eg TiO_2) activated by UV radiation.
Also, the innovation of the water treatment process is also due to its efficiency due to the existence of two stages of removal of organic pollutants instead of a single stage, thus considerably increasing the treatment efficiency.
The innovation brought to the biological treatment process is based on:
- Increasing the specificity and degree of biodegradation of organic pollutants by choosing bacterial strains according to their specificity of biodegradation of organic pollutants. The biodegradation system is versatile, and different bacterial strains can be used depending on the specific pollution conditions.
- Bacterial density that plays a role in streamlining the degradation process. The increase of bacterial density and efficiency is ensured by the innovative design (size, shape) of the mobile artificial support on which they are fixed, intensifying the purification process and preventing the formation of large amounts of activated sludge (almost insignificant) which would involve additional costs. treatment and storage.
The innovation and necessity of this installation is also given by the considerable reduction of the footprint on the ground compared to the classical wastewater treatment installations.
Also, the innovation in the biological treatment stage is given by the analysis of aerobic and non-pathogenic bacterial strains, both Gram positive and Gram negative, in order to identify bacterial strains with specificity and increased biodegradation capacity of organic pollutants present in wastewater. Bacterial strains selected with specificity and high biodegradation capacity will be incubated in the presence of SAM to analyze their adhesion capacity and biofilm formation. The adhesion capacity will be quantified by analyzing the bacterial density before and after the interaction with SAM.

RESULTS





ACKNOWLEDGMENTS
This work was supported by a grant of the Romanian Ministry of Education and Research, CCDI - UEFISCDI, project number PN-III-P2-2.1-PTE-2019-0628, within PNCDI III

Multi-channel electrochemical probe for monitoring the evolution of sediments

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GENERAL INFORMATION

Project No. 62 PTE/2020 - SEMSED

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EQUIPMENT DESCRIPTION / UTILIZATION

Sediments are an indicator and recorder of environmental quality. In treatment technologies, sediments show the state of operation. Sediment monitoring is important because it shows the state of the ecosystems and of the treatment systems and especially how they evolve. Also, based on these collected data, evolution predictions can be made and remedial measures may be taken. The SEMSED project will advance a new eco-technology for monitoring the sedimentary environment, from laboratory to industrial level; an electrochemical probe with the ability to analyze sediments autonomously with hundreds of electrodes at sub-millimeter resolution. This well will be able to be placed in fresh or salt water and will monitor changes in chemical composition in sediments from ports, canals, lakes, estuaries, biofilters in aquaculture, sapropelic sludge as well as sediments from decanters and treatment plants. A remarkable performance of this probe will be its ability to operate autonomously for many months without maintenance and without moving mechanical parts, and also that it can be reprogrammed and tracked online. The aim is to achieve the following performances: between 128 and 512 working electrodes, hundreds of measurements performed with each electrode, good mechanical resistance of the probe to torsion, impact and bending, resolution <1 mm between electrodes, total probe length between 13 - 50 cm, low electrical resistance of circuits, low electrical noise, corrosion resistance and protection of the probe in short circuit and under pressure in the underwater environment.

Within this project, the following will be designed and built: dedicated software for data control, management and communication (**Fig. 1A**) and multi-electrode probes composed of channel selectors and electrode packets (**Fig. 1B**).

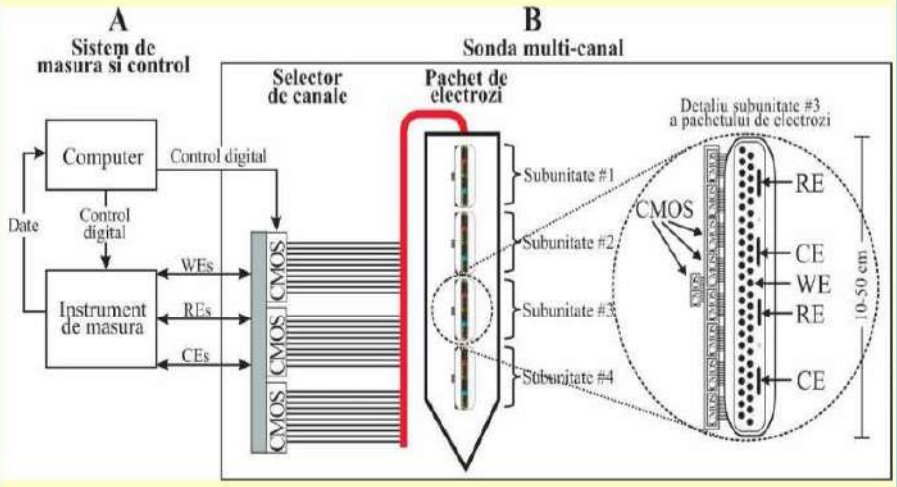

Fig. 1. Architecture of a monitoring system for electrochemical profiles in sediments. (A) Measurement and control system. (B) Multi-channel probe consisting of a channel selector and an electrode package. WEs = Working electrodes. REs = Reference electrodes. CEs = Auxiliary electrodes. This configuration contains 256 WEs, 8 REs and 8 CEs, but the number of WEs can be higher or lower, between 64 and 512.

ORIGINALITY AND INNOVATION

Cyclic voltammetry (CV) is a three-electrode method in which the potential is varied linearly between the two extremes back and forth, using a potentiostat. There are many variants of CV. The results depend on the scanning speed, the electrode surface, the reference electrode potential and various physical and chemical parameters. The multi-channel probe can make CV and redox potential measurements.

The multi-channel probe is revolutionary in its high-dimensional analysis capability. This eco-technology allows long-term monitoring of the condition and evolution of sediments (deposition, erosion, oxidation, reduction, contamination). Currently there are only tools on the market that describe either profiles or local changes, but both only at very high costs. The instrument proposed by the research project has a very large number of electrodes (more than any other product on the market), between 128 and 512. For comparison, multi-channel equipment on the market can make measurements with 8-16 electrodes at a cost very high. The probe electrodes are arranged in a vertical layer pack structure. The vertical resolution of the multi-channel probe will be <1 mm (an excellent resolution relative to the state and evolution of electrochemical profiles in sediments). The multi-electrode probe can be very long, up to 50 cm, allowing the monitoring of the evolution of sediments in which the interfaces have large fluctuations in height. The channel selector is unique on the market and based on multiplexers - analog switches of CMOS (Complementary Metal Oxide Semiconductor) type of low voltage with low resistance, low noise, high speed and can be digitally controlled by a computer.

The electricity consumption of the probe allows the supply in the field of renewable solar / wind resources or by coupling with low voltage submerged electrical networks and induction submerged power supply. Most CV systems on the market use liquid reference electrodes that are very vulnerable to breakage. The multi-electrode probe will use solid state reference electrodes produced by electro-deposition of polypyrene on platinum. The new wells are easy to adapt to become part of autonomous systems, such as "underwater electrical grids". The new equipment will expand the range of monitoring capabilities for several categories of users (fish farmers, treatment plants, canals, shipping lanes and ports).The experimental model at UCV has the following components (**Fig. 2**): electrode package, 1 reference electrode and 1 auxiliary electrode); digitally controlled channel selector for electrodes; measuring instrument and computer.

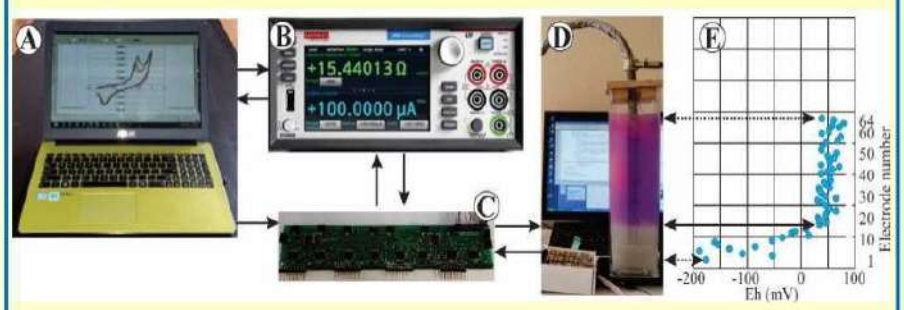

Fig. 2. Laboratory experiment with the SPEAR 64 multi-channel instrument produced by UCV in collaboration with USC. (**A**) Computer. (**B**) Electrochemical measuring instrument. (**C**) Channel selector. (**D**) Electrode package inserted into an experimental gel with an aerobic / anaerobic interface (O2 / H2S). (**E**) Example of Eh redox potential reading results using all working electrodes. The dots in (**E**) show the position of the highest and the lowest electrode, respectively. The solid arrow between (**D**) and (**E**) shows the location of the O2 / H2S redox interface, where the Eh of the solution changes from the oxidizing state to the reducing state.

ACKNOWLEDGMENTS
This work was supported by a grant of the Romanian Ministry of Education and Research, CCDI - UEFISCDI, project number PN-III-P2-2.1-PTE-2019-0198, within PNCDI III

Water treatment plant for small domestic applications

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Subsidiary contract type D, no. 7223/27.05.2020 (SMIS 105558)

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EQUIPMENT DESCRIPTION / UTILIZATION

Relevance / necessity of deferrization-demanganization water treatment plant

At the level of 2019, there were still major gaps between the rural and the urban areas in Romania in terms of connection to the public water supply system. Just over 3 million people living in rural areas, out of a total of about 9 million inhabitants, were in 2019 served by the public water supply system. That is, approximately 16% of the Romanian population or 35% of the rural population.

This situation leads to the identification of other local water supply sources such as direct supply from groundwater reserves. However, due to the pollutants found in these waters, pre-consumption treatment is required. Groundwater with a very large natural bottom, especially for iron and manganese ions, is found especially in areas such as the Moldavian Plateau and the Getic Depression. In this context, the authors propose the construction of a pilot water treatment plant with the reduction of iron and manganese compounds.

Feasibility

The water treatment plant is intended to be one with increased efficiency in the elimination of iron and manganese-based pollutants in the conditions of small investment, operating and maintenance costs.

Thus, the following main treatment steps are proposed:

- efficient **aeration** without the use of oxidation reagents such as chlorine. It is desired to achieve aeration only by injecting air into the mass of water. The best types of air diffusers will be chosen so that the mass transfer of oxygen from air to water is maximized. The possibility of using an air diffuser designed by DFR Systems and protected by patent application no. A / 01027 / 03.12.2018 entitled "Air diffuser used in wastewater treatment" will be analysed;
- **filtration** and **catalytic oxidation** on new, cheap, existing materials / produced in Romania. Advanced oxidation processes have been shown to be very effective in the advanced treatment of wastewater containing non-biodegradable and highly toxic organic compounds.
- **sedimentation**. The elimination of solid suspensions generated in the treatment process or existing in the groundwater body will be reduced / eliminated by means of a final settling process. As decanting equipment, the possibility of making vertical decanters or longitudinal, lamellar decanters will be analyzed. DFR Systems SRL holds 2 patents in the field (RO 130154 / 30.07.2018, "Lamellar decanter" and RO 126399 / 30.07.2014, "Final decanter related to a dissolved air flotation installation").
- **final disinfection**. Fine disinfection is necessary to eliminate all microorganisms and pathogens, so that the treated water is used by the pollution in conditions of maximum safety. During the installation, the use of ultraviolet light for disinfection will be analyzed.

The water thus treated will reach the final consumer. The treatment plant will have a minimum ground footprint, even analyzing the location of underground / buried treatment steps.

ORIGINALITY AND INNOVATION

In order to build the deferrization-demanganization water treatment plant, a laboratory-level installation is designed, built and tested. The treatment steps are tested first as a unit, then as a whole. University POLITEHNICA of Bucharest designed the components of the water treatment plant within the experimental deferrization-demanganization stages. Thus, the oxidation operation with air and other oxidizing agents was tested on the experimental laboratory model performed, in order to identify the efficiency in terms of oxidative action on iron and manganese ions (activity performed mainly by DFR Systems SRL).

During the oxidation stage, different ways of water dispersion were tested - **figure 1.**

Figure 1. Models of water dispersion nozzles for oxygenation

The aeration installation consists of a device with holes on two levels: Level 1 - Perimeter holes ø = 2 mm, with 31 holes; Level 2 - Vertical holes in the bottom of the device. A series of experiments were performed, by varying the water flow and the height of the water distribution device. There were 2 points for measuring the oxygen concentration, 2 oximeters were used. Tables 1 and 2 show some results obtained from the oxygenation process.

Table 1 - Experimental results
Q = 680 L/h, H = 1,4 m

Timp, [minute]	Oxigen dizolvat, [mg/L]	
	Oximetrul 1	Oximetrul 2
0	5,11	5.52
1	7.52	7.66
2	7.57	8.02
3	7.78	8.01
4	7.59	8.16
5	7.61	7.98
6	7.67	8.55
10	7.81	8.50
12	8.01	8.33
13	8.01	8.41
14	8.00	8.51

Table 2 - Experimental results
Q = 320 L/h, H = 1,4 m

Timp, [minute]	Oxigen dizolvat, [mg/L]	
	Oximetrul 1 (albastru)	Oximetrul 2 (mov)
0	5,11	5.52
2	7.66	7.60
3	7.5	7.75
4	7.79	7.80
5	6.89	7.66
6	6.90	7.60
7	6.73	7.50
8	7.22	7.73
9	7.15	7.67
10	7.13	7.68
11	6.71	7.71
13	7.57	8.12
15	7.30	7.41

The water treatment plant will also be equipped with a slow sand filter. Thus, on a support of porous plates will be found a layer of gravel, with a grain size of 7 - 15 mm, which has above a layer of sand, 1 - 1.25 m high, with a particle size of 0.5 - 1 mm. The application of the solution with slow filtration of water (**figure 2**) was considered because the flow is low.

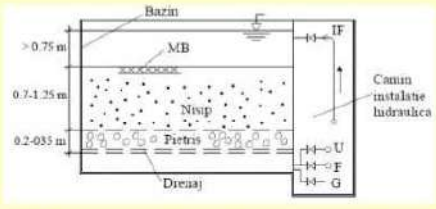

Figure 2. Slow sand filter that will be part of the deferrization-demanganization water treatment plant

ACKNOWLEDGMENTS

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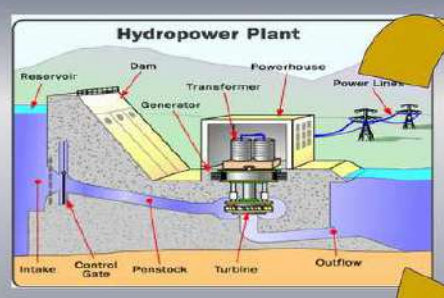
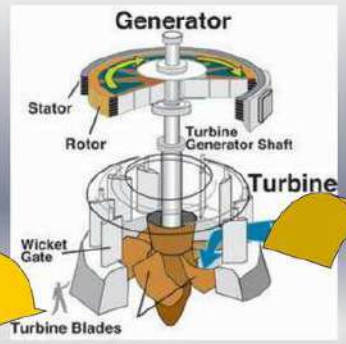
PNEUMOHIDRAULIC PLANT DESIGNED FOR DRIVING THE SERVOMOTORS OF THE DIRECTOR DEVICE AND PALLETS OF THE ROTORS OF THE KAPLAN AND FRANCIS TURBINE WITH PROGRAMMABLE LOGIC CONTROLLER

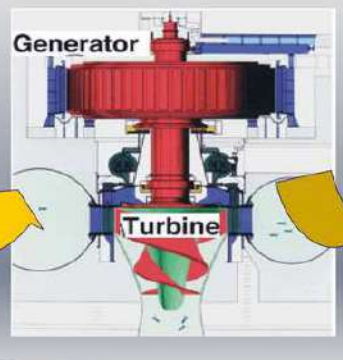
Patent No. 120423

Authors: DAIA Florian Petre, TIRIPLICA PETRE, TIRIPLICA Ion, NEMTOIU Simona Greta

The designed plant makes up a new working notion and a modern constructive solution of the "Group of Oil under Pressure (GUP)" afferent to the hydraulic turbines. It is based upon a modern working notion, where the functions designed for supervising the pneumo-hydraulic magnitudes and the control functions of the implementing elements, too, are provided by a Programmable Logic Controller . It is made up by using the most up-to-dated hydraulic and pneumatic components, providing this way a high safety and reliability in operation.







The pneumohydraulic plant designed for driving the servomotors of the director device and the palettes of the rotor of the turbines Kaplan and Francis with programmable logic controller shall be specially used in Hydroenergetics, for the hydroelectric power stations aiming to provide for the working fluid (oil under pressure) for driving the hydraulic turbines .
It is proper to be used in any industrial field where, in the manufacturing course, the oil under pressure is required for driving the diverse members of the mechanic equipments.

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- does not affect the quality of environmental factors'
- does not affect the viability of floristic and faunistic elements from the natural and artificial eco-systems
- the ingredients are biodegradable, they do not acummulated in the soil or in the Planetary Ocean

Original Composition
due to the nature of its constitutions which are:
- compatible
- synergists
- mutual enhancers

ABSTRACT

The chemical formulation registered at OSIM under the name of Biodez A5 is part of a special, modern class of **PURE OXYSANITIZING BIOCIDES**, which is characterized by two distinct features, namely:

1. **Not harmful (toxic, allergenic, caustic for human and animal healt**
2. **Does not affect the environment**

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APPLICATIONS

- **Agriculture**
- **Horticulture**
- **Food industry**
- **Animal husbandry**
- **Industry of agri-food processing**

INDUSTRIAL IMPLEMENTATION

- **Original technological model that does not cause pollution or contaminated waters**
- **Working solutions may be nebulized**
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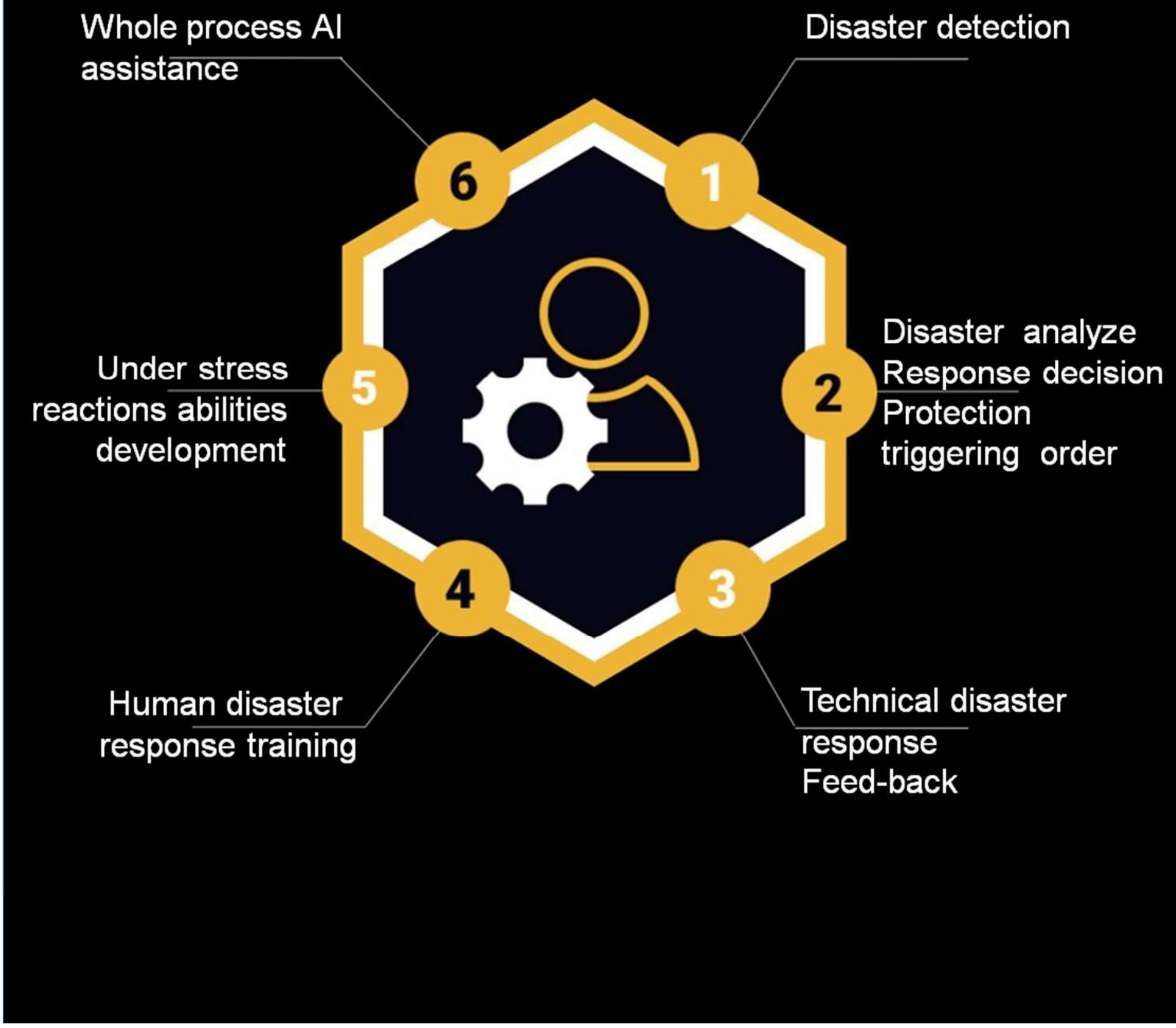
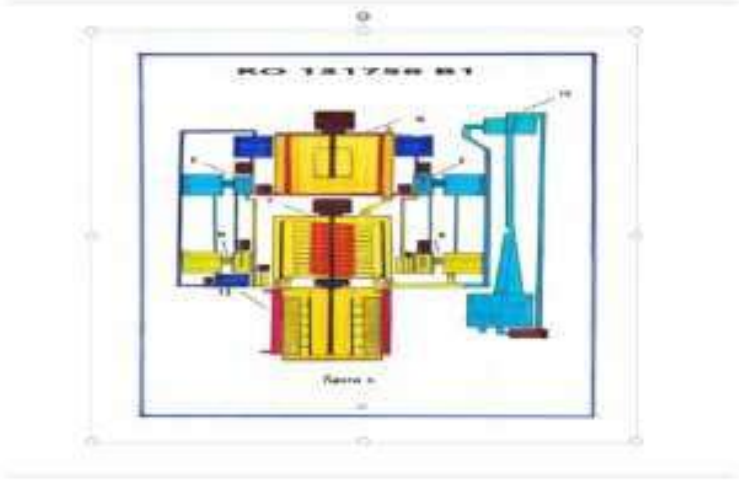


MONAZITE CRUDE (MATERIAL ORE)

CHEMICAL REACTOR PROCESSOR ISOTOPIC RO131756



FUEL CANDU WITH THORIUM 232 DIOXIDE

Chemical reactor processor isotopic

Ion Cristescu

-

Patent RO 131756 B1 /2020

Sole author: prof. univ. habil. dr. ing. Constantin CROITORU, ASAS/Școala doctorală IOSUD–UDJG

Natural food acidifier and process for preparing the same: Patent no. RO 131638 / 30.01.2018

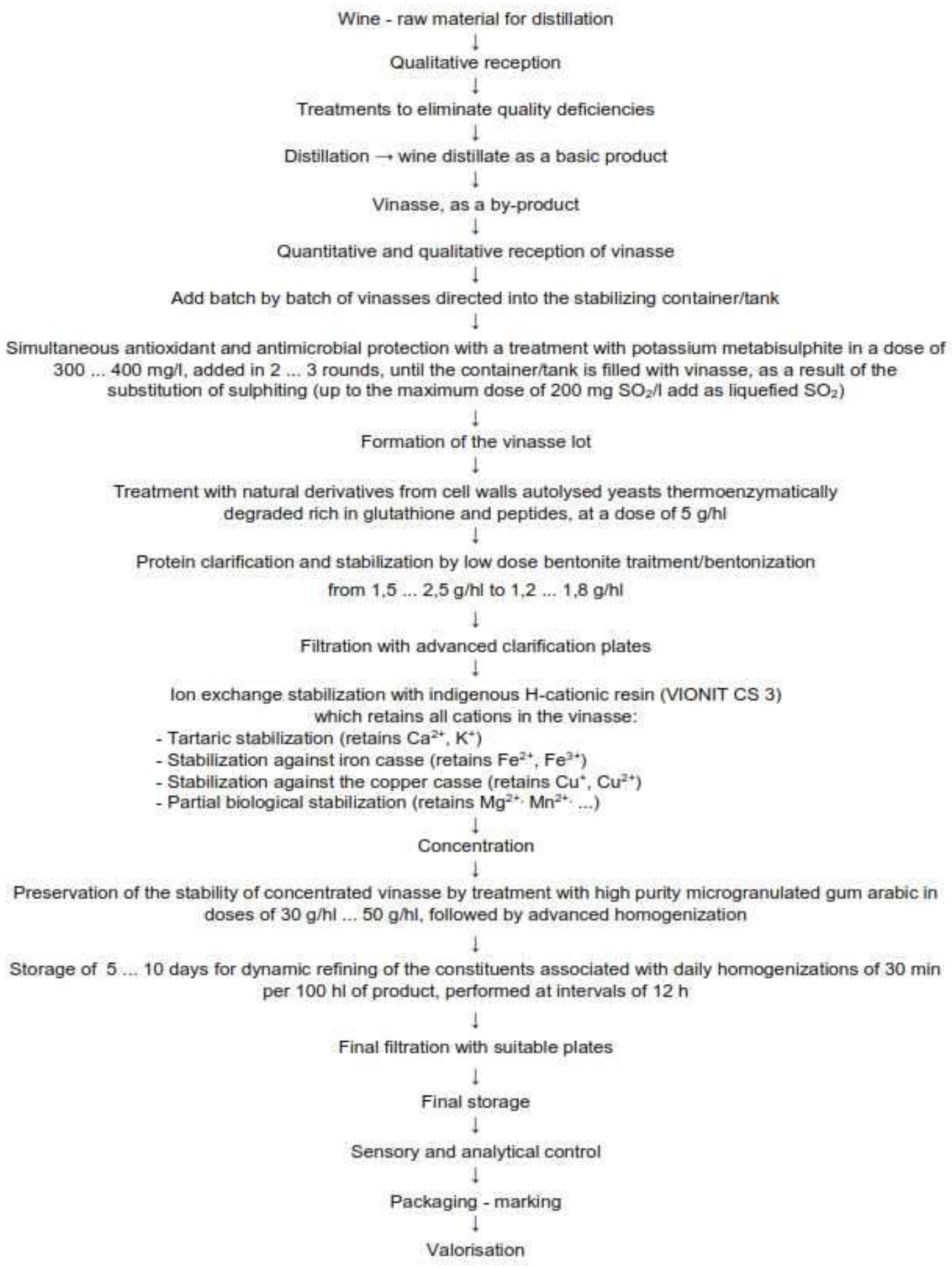


Fig. 1 – Improved technological scheme for obtaining a natural food acidifier from vinasse, according to the invention

Sole author: prof. univ. habil. dr. ing. Constantin CROITORU, ASAS/Școala doctorală IOSUD–UDJG

Process for elaborating natural distillates of stone fruits: Patent no RO 131640 / 30.01.2018

Stone fruits (cherries, apricots, peaches,...) unfit for fresh consumption or for food industry

↓

The stone fruits processing stage:

• Establishment of fruit collection points, transport for processing, quantitative and qualitative reception
• Washing the fruits simultaneously with their treatment with an aqueous solution of 2 component product based on potassium metabisulphite and ascorbic acid in a dose of 10 g/hl that simultaneously ensures their antioxidant and antimicrobial protection.
• Processing by passing the fruit through a pasatrice/ kernel separators with obtaining the mash/pulp fruits and the kernels
• Enzymatic treatment for a duration of 8 ... 10 h with 4 ... 5 g/hl mash/pulp fruits of pectolytic preparation in order to extract the precursors of varietal aromas and free varietal aromas, to increase the yield in extracted juice
• Separation of the juice from the enzyme mash/pulp fruits by static and dynamic draining
• Reconstitution of the initial mash/pulp fruits by some equivalents additions over the resulting drained mash/pulp fruits

↓

The prefermentative stage of separate collection and preparation of mash/pulp fruits as such, of the juice and of the reconstituted of drained mash/pulp fruits:

• pH correction with 5 % aqueous solution of organic acids (tartaric, malic and citric) up to pH of 2,9 ... 3
• Correction of the total SO_2 concentration up to 60 ... 80 mg/l
• Addition of a proportion of 5 ... 10 % kernels of the total resulting quantity

↓

Fermentation stage of prepared juice, mash/pulp fruits and reconstituted mash/pulp fruits:

• Identical but separate inoculation with the same homogeneous aqueous suspensions of selected *Saccharomyces cerevisiae* yeasts in doses of 5 g/hl, (first strain, to increase the acidity of the fermentative medium, the second strain to release varietal aromas from precursors by enzymatic hydrolysis), administered at intervals of 3 ...5 days.
• Administration of a nutritional mixture at a dose of 10 g/hl consisting of 7 g/hl primary ammonium phosphate and 3 g/hl natural derivatives from cell walls autolysed yeasts thermoenzymatically degraded rich in glutathione and peptides with the aqueous suspension of the first strains and an additional nutrient from the same natural derivatives at a dose of 5 g/hl with the aqueous suspension of the second strain
• Daily monitoring of alcoholic fermentation processes in order to avoid exceeding the critical temperature limit of 20 °C
•Minitoring the fermentation process by sensory examination and analytical control of density and alcohol.

↓

Postfermentative stage with related treatments applied to fermented products:

• Ensuring antioxidant protection by sulphiting with 70 ... 100 mg/l SO_2 depending on pH and duration of temporary storage until distillation
• Enzymatic treatment with a duration of action of 3 ... 4 weeks, with 5 g/hl special product with ß - glucosidase activity that releases free varietal aromas from their precursors

↓

The stage of distillation and natural flavoring of crude distillate and middle distillate

• Distillation of fermented products enriched in free natural flavors with the production of raw distillates, in installations in which the temperature of the cooling water feeding the condenser is 8 de 10 °C
• Maceration for 2 ... 3 days in the raw distillates of a proportion of 10 % compared to the volume of these stone fruits distillates with strong aroma established by comparative olfactory examination.
• Redistillation of raw flavored distillates with separation of forehead, middle and tails, mixing of foreheads and tails with a new batch of fermented juice and/or fermented mash/pulp fruits (as such and/or reconstituted of drained) or with a new batch of raw flavored distillates
• Sensory examination of the resulting middle distillates
• Improving the olfactory profile of middle distillates by adding a proportion of 1... 2 ‰ alcoholic extract relative to the total volume of treated distillate, which was obtained by maceration for 2 days of whole fruits with strong aroma established by olfactory examination comparison in a hydroalcoholic solution of 40 % vol. rectified food alcohol from cereals or fron stone fruits in a volume ratio of 1: 2.5.
• Recovery of partially depleted stone fruits used in the natural flavoring of crude distillates and middle redistilled fractions by collecting them, separating the kernels when passing through a pasatrice/ kernel separators, diluting with water the mash/pulp fruits resulting in a 1: 3 volume ratio between solid and liquid, homogenization, alcoholic fermentation, distillation and use of crude disillate resulting from the antioxidant protection of the foreheads and tails

↓

The accelerated maturation step of the middle distillate:

•Treatment with oak chips with strong preroasting and small size in a dose of 4 g/l acting on a period of up to 4 weeks
• Homogenizations performed every 2 days for at least 30 minutes /Final sensory and physico-chemical control

↓

Aged stone fruit distillate with superior sensory properties and a high degree of innocuousness

Fig. 1 - Technological scheme of the patented elaboration process of natural stone fruit distillates

1