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NATIONAL EXHIBITORS

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NATIONAL EXHIBITORS

VOLUME 2

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Nanospun Collagen Rabbit Glue and Antimicrobial Agents Compositions and Method of Obtaining Them

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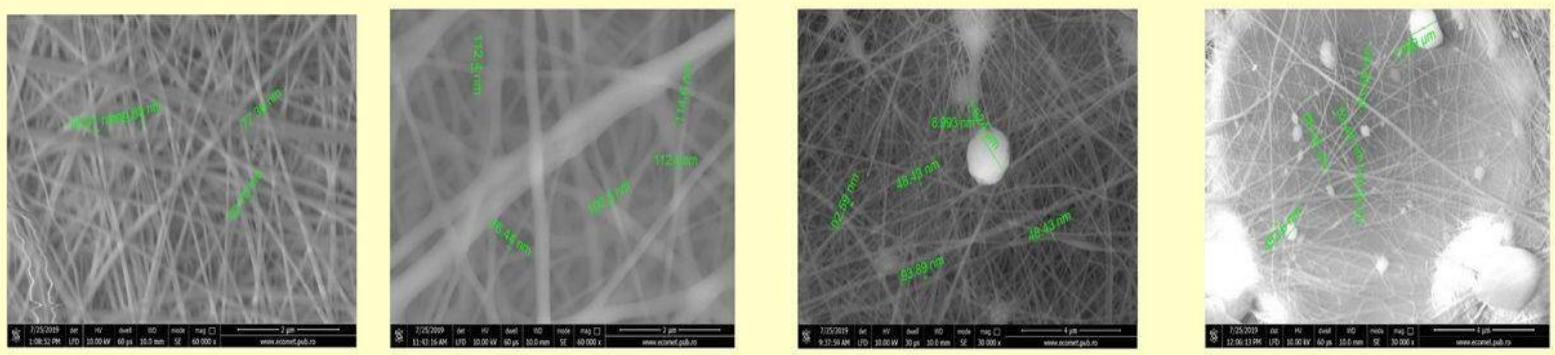
PATENT DESCRIPTION

The paper relates to a composition of antimicrobial nanofibres and a process for obtaining it used for making non-active medical dressings for wounds treating. The process consists in the electrospinning of the mixture of rabbit skin glue in the form of granules, water, acetic acid solution and different water soluble antimicrobial agents such as ZnO NPs, TiO_2 NPs doped with nitrogen and AgNPs and chitosan for use as raw materials for producing of antimicrobial nanofibres. The electrospun nanofibres were subsequently characterized using scanning electron microscopy (SEM). Antimicrobial activity was performed against *Escherichia coli,* and *Staphylococcus aureus* bacteria and *Candida albicans* pathogenic fungus.

RESULTS



a) b) c) d)

Figure 1. Images of collagen rabbit nanofibres obtained by scanning electron microscopy
a) Collagen rabbit glue nanofibres); b) Collagen rabbit glue/ZnO NPs nanofibres; c) Collagen rabbit glue/ TiO_2-N-AgNPs nanofibres; d) Collagen rabbit glue/chitosan nanofibres

Table 1. Log reduction in the number of viable microorganisms against the value obtained for the inoculums for collagen-based nanofibres

Microorganism / Sample	Log Reduction			
	6 h	24 h	7 d	14 d
Collagen nanofibres				
Escherichia coli	3	2	-	-
Staphylococcus aureus	2	4	-	-
Candida albicans	-	0.5	0.45	
Collagen/ZnO NPs nanofibres				
Escherichia coli	-	0.1	-	-
Staphylococcus aureus	-	0.3	-	-
Candida albicans	-	2	1.65	

Microorganism / Sample	Log Reduction			
	6 h	24 h	7 d	14 d
Collagen/TiO_2-N-Ag NPs nanofibres				
Escherichia coli	-	-	-	-
Staphylococcus aureus	-	-	-	-
Candida albicans	-	-	1.08	
Collagen/chitosan nanofibres				
Escherichia coli	-	0.5	-	-
Staphylococcus aureus	-	1	-	-
Candida albicans	-	1	1.15	

CONCLUSIONS

Nanofibres obtained by electrospinning process showed a diameter in the range of 42.66 nm-114.6 nm, pores with a diameter of about 100 nm. The results indicated both collagen glue and collagen glue loaded with TiO_2-N-AgNPs and chitosan formulations as suitable as antimicrobial agents and the potential use of antimicrobial and biocompatible nanofibres for non-active (whitout antibiotics) dressings, wound healing and tissue engineering is recommended. The method represents an efficient, ecological and biocompatible alternative for the use of more expensive native collagen, toxic solvents, surfactants or synthesis polymers and antibiotics.

ACKNOWLEDGEMENTS: The work was funded by POC Program, Grant no. 49/05.09.2016, Project ID P_37_649.
Patent no. RO00525/2020(A0)

ORTHOPEDIC DEVICE FOR CORRECTION OF THE TALIPES CALCANEUS / TALIPES CALCANEOVALGUS DEFECT

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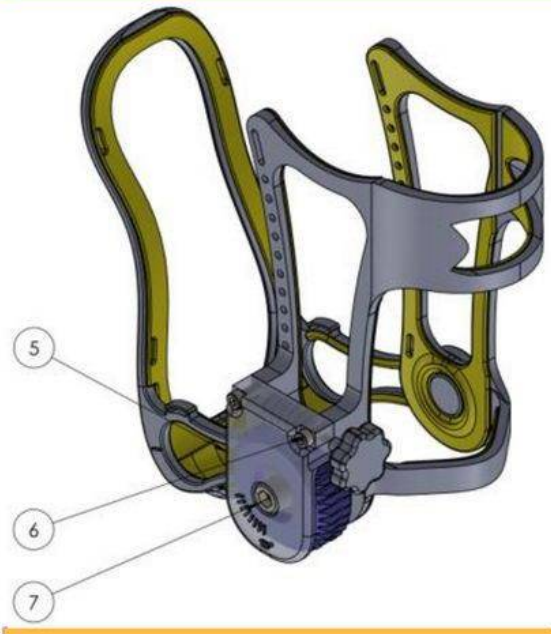
PRESENTATION

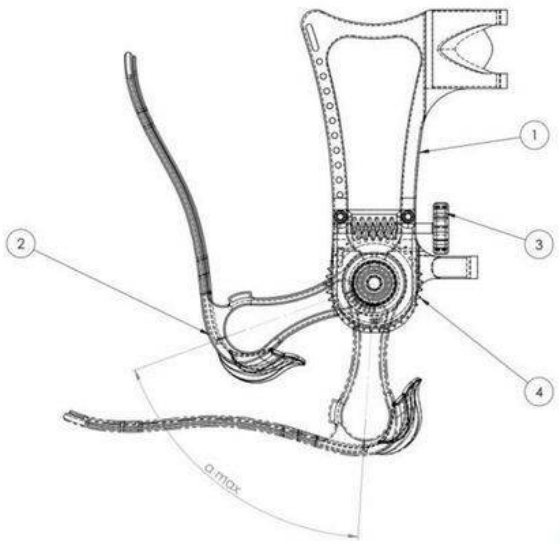


The invention relates to an orthopedic device for the correction of a malposition of the foot expressed by the defects talipes calcaneus and talipes calcaneovalgus, particular variants of Talus valgus, and to the process for obtaining it.

The orthopedic device for Talipes calcaneus / Talipes calcaneovalgus defect correction, is composed of a fixed subassembly, which is fixed to the leg of the foot, a movable subassembly, which is attached to the foot of the defective foot, a snail-snail gear and a graduated cap, which is fixed with the help of screws with clogged head.

ADVANTAGES

- Shorter time to correct the talus Valgus defect for the babies.
- The fixed and mobile subassemblies are custom made with additive technologies such as SLS, using anatomical data taken from DICOM images, which are then transformed into STL and GCODE files, and then sent to a 3D printing equipment.
- The device is equipped with profiled anatomical structures to ensure perfect sealing of the affected areas and ensure anatomical compliance;



PROBLEM SOLVED

❖ By using the device the patients avoid to immobilize the foot for a long time and the repeated visits to the orthopedic doctor.

❖ Prevents immobilization of the foot in gypsum and frequent visits to the orthopedic doctor.

❖Ensures patient comfort and compliance by providing variable angle along its mobile assembly;

❖Has a three step manufacturing procedure, which can be tailored in correlation with the patients' medical condition.

METHOD AND SYSTEM FOR ANONYMOUS COLLECTION OF POSITION AND MOBILITY INFORMATION EMPLOYING BLUETOOTH AND ARTIFICIAL INTELLIGENCE

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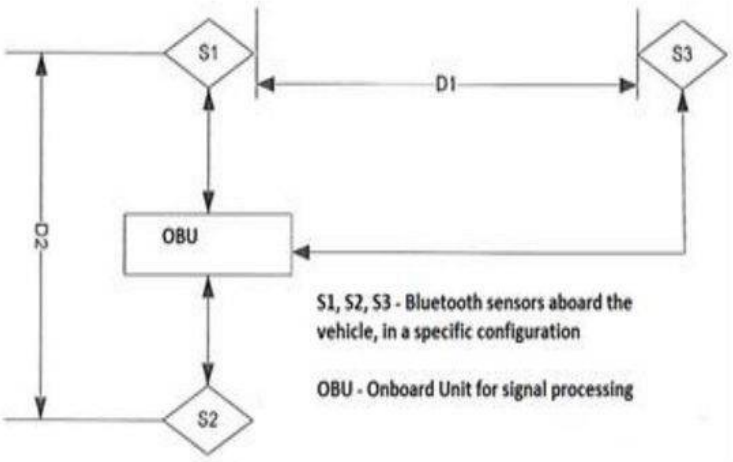
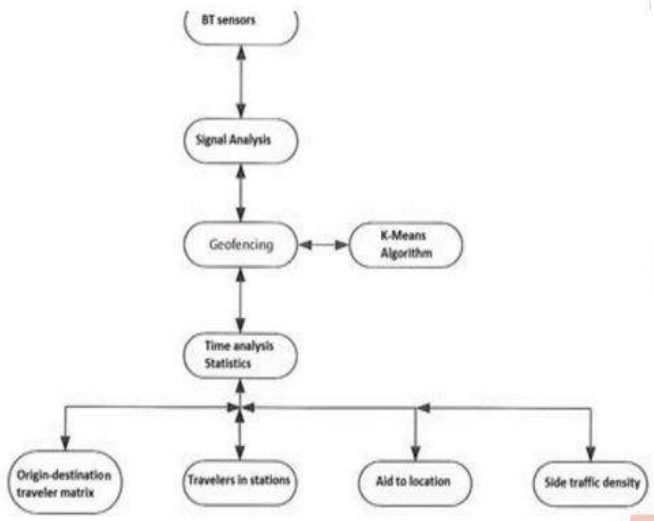
PRESENTATION



The invention relates to a method and system for anonymously collection of information regarding position, mobility of travelers in a public transport system and collateral traffic density. It employs a dedicated configuration of Bluetooth sensors installed in a public transport vehicle, an onboard unit for signal processing and a specific software employing artificial intelligence module for time and space classification of detected bluetooth nodes.

ADVANTAGES

- Provides an aid for public transport management: dynamic allocation of vehicles, location of vehicles, re-routing, estimating the number of transported travelers and detection of collateral traffic density;
- It is modular and can be adapted to the public transport vehicle structure, it has low energy consumption and zero emissions;
- Does not need any infrastructure device or network; adaptable for the future Internet of things;
- All modules are low energy and can be supplied from the vehicle's power supply



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 in accordance to the public transport company requirements;
- Ensures proper visualisation of the recorded information and improves in accuracy in time.

Biocompatible Medical Device and Method of Making Same

US Patent Application 38170047/2019

Ruxandra Vidu, Augustin Semenescu, Ileana Mariana Mates, Cristian Dragos Vidu

ABSTRACT:

Abstract. Traumatic brain injury is the leader in the ranking of mortality and invalidity. The surgical repair of a defect of the skull by cranioplasty has been practiced since ancient times, when materials of non-biological origin were used for this purpose. New materials and processes are sought to improve osseintegration of implants. Like any surgical procedure, cranioplasty involves complications that may be related to the surgical technique and/or to the patient's tolerance to the material used. This patent describes a biocompatible medical device that include two supported meshes for providing mechanical strength and osseointegration properties of the implant, and a multiplayer porous material in between them that is loaded with the required bioactive antibacterial compound to promote a controlled and sustained release of the pharmaceutical agents at the site of surgical intervention. To increase osseointegration, meshes are designed with an open structure and coated with biocompatible materials such as hydroxyapatite.

The composition gradient in the multilayer porous material is attained by loading successive layers of porous material with different amounts of bioactive materials and then stacking them to create a gradient of composition across the porous material.

The present invention describes method(s) to place, fix and fasten the medical device to the bone structure. More particularly, the present invention relates to a method for accelerating the transport of the incorporated drug from the inner layers to the outer edge of the outer layer. The present invention describes a clamping system that provides a fast attachment of the biocompatible medical device to the bone structure and a rapid placement of the three layers of material with different properties: i.e. the two meshes that promote osseo-integration of the implant and one multilayer porous material loaded with bioactive compounds having a gradient composition to control the release of the drugs incorporated in the porous material.

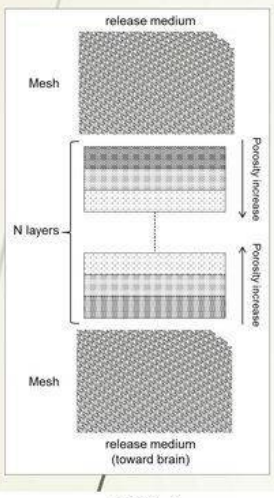


FIG. 1

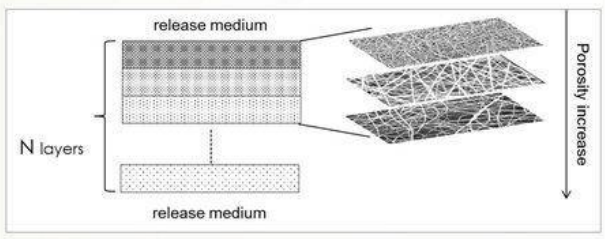
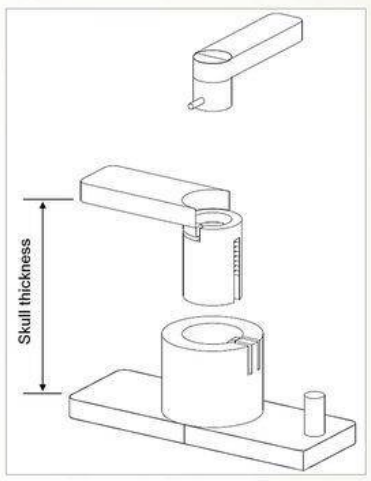


FIG. 2



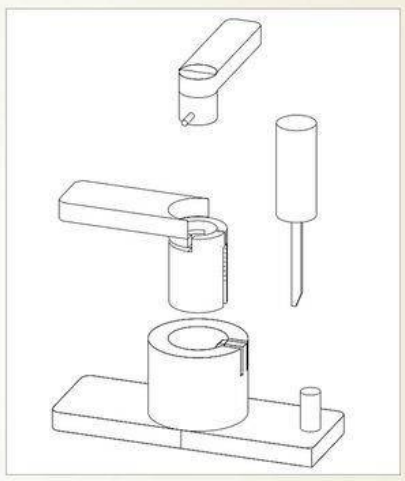


FIG. 3

BRIEF PRESENTATION OF THE INVENTION

This patent describes a biocompatible medical device (Figs. 1-2) and a clamping device (Fig.3) that sets and attach the implant to the bone. The medical device include two supported meshes for providing mechanical strength and osseointegration properties of the implant, and a multiplayer porous material in between them that is loaded with the required bioactive antibacterial compound to promote a controlled and sustained release of the pharmaceutical agents at the site of surgical intervention.

This invention presents a clamping device that allows fixing the biocompatible medical device to the defect (FIG.3). The clamps further allows fixation such that the biocompatible medical device is placed and remains in position when the holding force between the fastener and the implant is reduced. The biocompatible device may not be custom made pre-operatively; instead the meshes and the multilayered porous material may be cut on the spot to fit the anatomic shape of the defect. The clamp-like mounting piece is pre-assembled at the extended position in a fast and secure way to the bone, while the actual assemble of the successive layers is hold in place by the fastening mechanism. The main function of this system is to fix the medical device to the bone structure, and to support and connect the meshes used in the implant for remodeling and restoring bone tissue such as cranial implants. Mashes may have a flat or a convex/concave surface to fit the original shape of the skull. As illustrated in FIG 3, the clamping system consists of three pieces: the lower piece, the upper piece and the middle piece.

- **the lower piece** has a cylindrical part that sits on a support. The cylindrical part has a notch that corresponds to the exterior groove cut into the cylindrical part of the middle piece. The support of the middle piece has a knock on which the first mesh is placed.
- **the middle piece** helps adjust the height of the clamp to fit the thickness of the skull and supports the upper mesh. The middle piece has an external groove on the cylinder that helps adjust the height of the clamp. The bar that has the role to fasten the clamp to the bone structure.
- **the upper piece** fastens together the clamp to the bone structure and to the biocompatible medical device. The upper part has a lever and a knob that fix in place the clamp system. The upper lever comes over the upper mesh when the level is rotated to a closed position.

Assembling the device:

The attachment of the implant to the skull includes attaching the clamping system to the edge of the cranial orifice at different points, creating a base for attaching the lower mesh. First, the lower and the middle pieces are pre-assembled at the maximum extension length, and then mounted at the edge of the skull and then tightened up until it is secured at the edge of the skull. This is possible because both part have a gear rack-like system that allows the two parts to be tightened up but do not allow them to move so that the assembly remains fixedly attached to the edge of the skull orifice. Then the first mesh is placed and hooked to the knock. The lower piece has a hook on the side of the support that is oriented away from the skull, which has dual roles, i.e. to fasten the clamp to the skull and to attach the first mesh. After the lower mesh is placed, the multilayered porous material can be placed on the first mesh. This layer has anti-microbial properties with slow release of the drug. Then the top mesh is placed and the upper piece is inserted and rotated to the ideal position for gripping and immobilizing the mesh. n some embodiments, the attachment of the implant is reversible such that the implant may be removed if complications, such as bleeding, occur.

Advantages:

- it decreases the surgical craniotomy time by simply pressing the clips and insert the plates
- the two meshes doesn't have to be costumed made
- the surgical procedure is more efficient due to the easiness of mounting operations including attaching the clips, laying the bottom mesh, laying the intermediate material, laying the upper mesh and fixing the upper mesh
- the clamping system has a minimum height profile that helps to reduce the protrusions
- the clamping system does not involve any invasive procedure for clamping the implant, such as drilling and screw clamps
- easy placement of the gradient loaded multilayered porous material in between the meshes
- a good contact interface of the upper mesh at the surface of the skull.

Novel, Multifunctional Medical Device For The Conservative Treatment Of Common Benign Anorectal Disorders (OSIM)

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ABSTRACT

Our novel, multifunctional medical device is an effective conservative treatment for the common, benign anorectal disorders. This new design can be used by specialized personnel within a healthcare facility or directly by the patient in the home setting, both for managing acute episodes and for long-term treatment. A key improvement over all currently known designs, our medical device is uniquely capable to exert a complex therapeutic action mediated by the combined, local application of (1) mechanical compressive effect, (2) cryotherapy and (3) a suitably formulated medication treatment, which now can be precisely dosed and selectively released in the different regions of the anorectum.

PRESENTATION

Benign disorders of the anorectum, such as pruritus ani, hemorrhoidal disease, proctitis and anal fissure, are low-mortality, high-morbidity medical conditions, that cumulatively afflict upwards of 75 % of the general population [1]. The burden of benign anorectal pathology is high both for the patient and the society at large and is a result of the recurring, occasionally intense discomfort, embarrassment, missed workdays and the significant financial impact of managing a progressive, chronic medical condition. The market for treatments of anorectal disorders is estimated to grow at an impressive rate over the next 20 years [2]. Nevertheless, despite the plethora of therapeutic strategies currently available, a significant percentage of the patients will still progress towards advanced-stage pathology requiring invasive medical procedures such as sclerotherapy and / or anorectal surgery.

Clinical practice shows that benign anorectal pathology is complex and marked by multiple and overlapping attributes (symptoms, pathological findings, clinical manifestations and affected anorectal regions). Known conservative treatment strategies for anorectal disorders such as medicated formulations and medical devices typically address distinct symptoms or clinical manifestations of anorectal disease, ignoring its overlapping nature [3-5]. As a result, the effectiveness of known conservative treatments is generally low [6].

Our novel design addresses the overlapping, complex nature of benign anorectal pathology, while allowing for customized strategies, that are tailored to a particular individual's circumstances. This innovative device (Fig. 1.) is comprised of two components that are assembled before use. The first component is designed for the long-term storage and precision dosing of incremental volumes of a suitably formulated medication for topical administration. The second half of the medical device is the delivery component, which is physiologically designed for anatomic insertion into the anorectum (Fig. 2.), where it simultaneously delivers mechanical, compressive support against the hemorrhoidal cushions, cryotherapy and the precisely dosed topical medication. This component is further comprised of a crown for insertion in the anal canal and a base which delivers cold therapy and medication to the perianal region. The delivery component is hollow and the inner chamber is filled with a heat-transfer agent, such as a mixture of ethylene glycol – water. A plunger slides through a shaft inside the base and crown to accommodate the appropriate volume of medication and then to deliver it inside the anal canal.

The two components are assembled in the vertical plane by means of a protrusion at the top of the storage component. Next, the user rotates the base of the storage component in a stepwise manner and thus raises its inner elevator forcing a precisely dosed volume of medication upwards into the previously cooled delivery component. If needed, additional medication can then be transferred to the wall of the crown and inner wall of the base. The patient assumes a prone or lateral recumbent position, inserts the crown in the anal canal until the base touches the perianal region and presses the plunger to release the medication into the anorectum. This position is maintained for the prescribed duration to allow for proper delivery of combined mechanic support, cryotherapy and medication. The delivery component is washed for subsequent reuse with detergent and periodically with aqueous solution of TAED and $Na_2CO_3 \cdot 1.5\ H_2O_2$.

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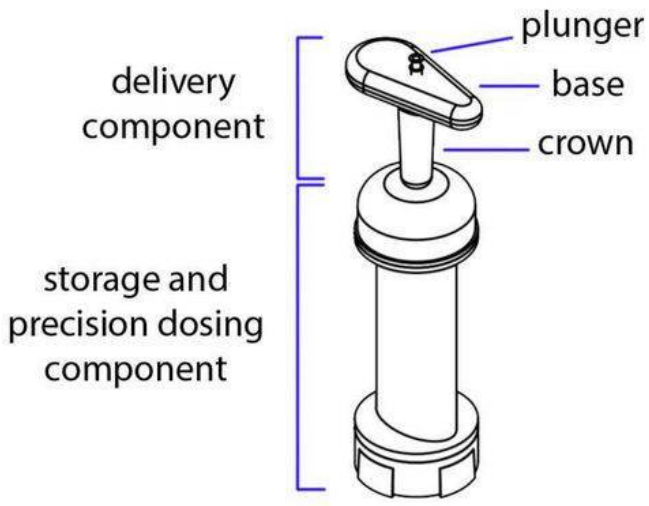

Fig. 1. - Assembled multifunctional medical device

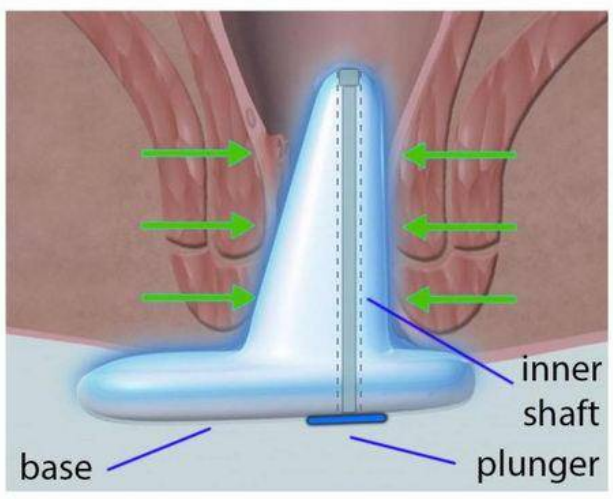

Fig. 2. - Delivery component after anatomic insertion

Semisolid Formulation for Combination Topical Therapy of Common, Benign Anorectal Disorders

OSIM A00726 / 2019

Suciu Alexandru[1,2], Semenescu Augustin[1*], Ficai Anton[1], Suciu Ioan Alexandru[2]

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ABSTRACT

Our novel, semisolid formulation is an effective and affordable combination topical therapy for the common, benign anorectal disorders. This flexible approach to formulation affords customized treatments that can be tailored to a patient's specific clinical findings. At the same time, our formulation yields complex therapeutic solutions that effectively address the overlapping nature of benign anorectal disease (Fig.1.) preventing its progression towards advanced-stage pathology.

PRESENTATION

Common, benign disorders of the anorectum include hemorrhoidal disease, pruritus ani, proctitis and anal fissure. Although non life-threatening, these are very high-morbidity medical conditions, that afflict more than 75 % of the general population [1]. Advanced-stage benign anorectal pathology typically requires invasive medical procedures such as anorectal surgery and / or sclerotherapy, that are marred by severe, potentially irreversible side-effects. However, the early stages of these disorders can be effectively managed with conservative treatments [2].

Clinical practice shows that benign anorectal pathology is highly complex and marked by multiple and overlapping attributes (Fig.1.):

1. Multiple symptoms such as edema, hematochezia, pain, prolapse, tenesmus, itching, etc., two or more of which can be often present simultaneously.
2. Pathological findings (inflammation, oxidative stress, pathogen proliferation, deepithelialization and tissue damage) could coexist during the same episode.
3. Clinical manifestations of benign anorectal pathology (hemorrhoidal disease, anal fissure, pruritus ani, proctitis), two or more of which could overlap in the same patient.
4. Anorectal pathology can affect the anal canal, distal rectum, perianal region or all three anatomical segments simultaneously.

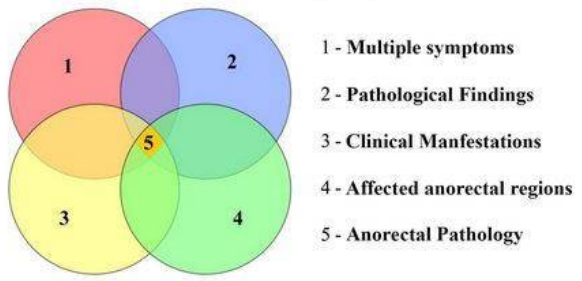

Fig. 1. - The complex nature of anorectal pathology

Existing conservative treatment strategies for anorectal disorders such as medicated formulations and medical devices typically address distinct symptoms or clinical manifestations of anorectal disease, ignoring its overlapping nature. Consequently, the effectiveness of currently available conservative treatments is generally low [3].

Our strategy to overcome the limitations of known conservative treatments relies on the concept of synergy within a medicated ointment formulated for the combination topical therapy of anorectal disorders. Synergic combination therapy is best suited to address the complex nature of a particular disorder as it maximizes effectiveness and patient compliance while minimizing side-effects, by combining compatible active and inactive pharmaceutical ingredients from different classes into a single dosage form [4]. Ointments are better suited to treating anorectal disorders as compared with oral formulations or other semisolid forms such as suppositories or foams, because ointments allow for optimal, selective topical release of therapeutic agents in all three regions of the anorectum, especially when used with a suitable applicator [5].

A typical embodiment of our novel formulation for combination topical therapy of anorectal disorders (Fig. 2.) incorporates varying ratios of active and inactive ingredients such as: antispastics (nitroglycerin trinitrate, diltiazem, nifedipine), anesthetics (lidocaine), antipruritics (menthol, camphor), retinoids, tocopherols, ascorbic acid, hyaluronic acid, usnic acid, $C_{10} - C_{12}$ fatty acids and their glycerides, partially hydrolyzed collagen, propolis, *cera alba*, *mel depuratum*, plant extracts. Other pharmaceutically acceptable inactive ingredients such as solvents, thickening agents, emulsifiers, gelling agents, pH adjusters, elastomers, humectants, chelating agents, pigments may be incorporated, as needed.

The effectiveness and safety of our formulation have been proven clinically in our medical practice [6]. We plan to conduct further clinical studies to optimize and assess embodiments of our formulation strategy when used synergically with our novel, multifunctional medical device for the conservative treatment of anorectal disorders.

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6. Suciu, I. A., Suciu, A., *Alexdor Medical written, photo and video archive*, 2014-2020. Unpublished data.

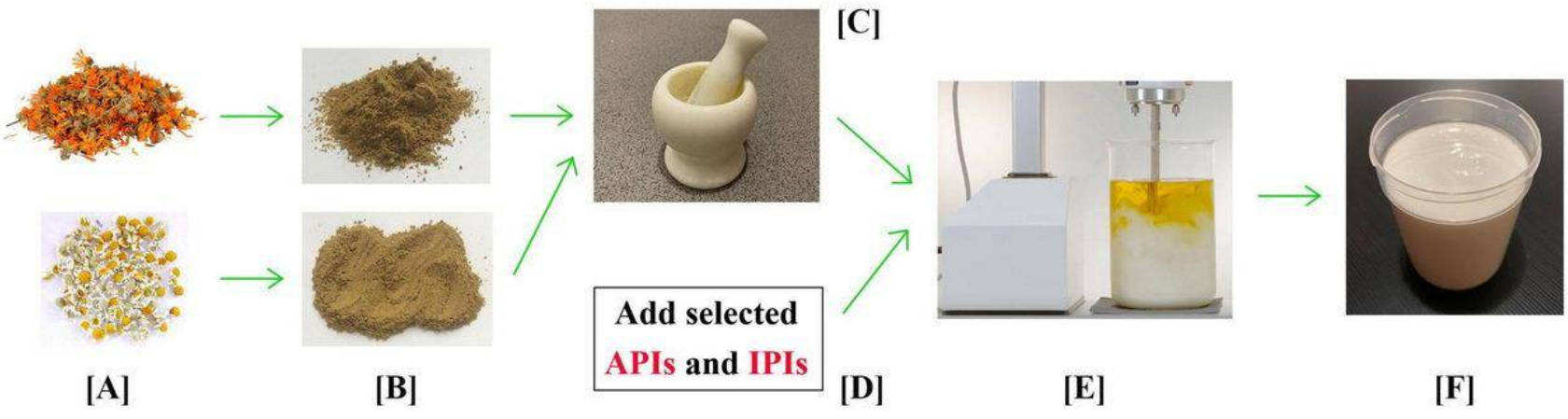

Fig. 2. – Formulation of a medicated semisolid formula. Selected plant materials [A] are converted to solid extracts [B] and the particle size is adjusted via trituration [C]. Suitable active and inactive pharmaceutical ingredients are also incorporated [D]. High-shear mixing [E] affords one possible embodiment of the novel semisolid formulation [F].

Patent application A/00798/ 2019

COMPOSITIONS AND PROCESS FOR TREATING PAPER, PARCHMENT OR OTHER WRITING MEDIA, FOR REMOVING PATHOGENS SUCH AS FUNGI, MOLD OR BACTERIA

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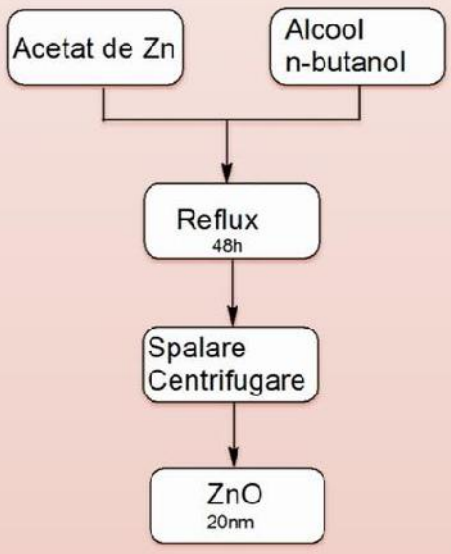
Introduction

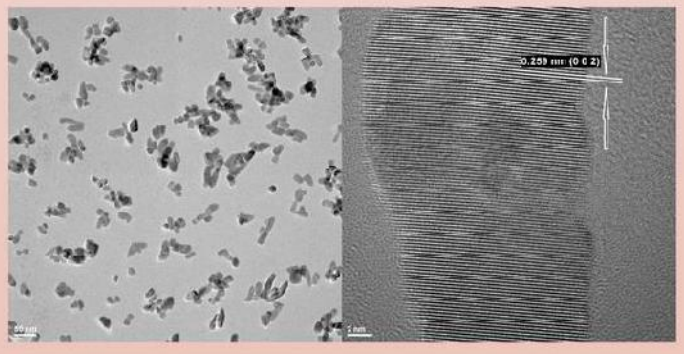
The present invention relates to the production of innovative compositions consisting of ZnO nanoparticles loaded with natural extracts, for the treatment of cellulosic (manual or industrial paper) or protein (parchment) support of documents affected by pathogens (fungi, molds or bacteria). One of the 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 powder formed of ZnO nanoparticles loaded with natural extracts such as essential oils performs a deep cleaning of the cellulosic or protein support (nanoparticles can penetrate the thickness of the sheet of paper, parchment, etc.). It also ensures an increased resistance of the support to subsequent attacks, as some of the nanoparticles will remain in the structure of the sheet of paper or parchment

Obtaining method

ZnO is one of the few zinc compounds recognized as safe (GRAS) by the U.S. Food and Drug Administration. Its intrinsic bacteriostatic property promote it as a topical wound dressing in combinations with other substances like chitosan, polylactic acid, cellulose, hydroxyapatite and antibiotics. The antimicrobial activity of ZnO is known for some time, but the exact mechanism is still under debate. There are some evidences that the antimicrobial activity of ZnO is dependent of size and presence of light, but the data are contradictory regarding which strains are more susceptible: Gram-positive or Gram-negative ones. The presence of light indicates also that the photocatalytic activity is involved into the promotion of the antimicrobial activity, the literature being abundant about this effect. ZnO nanoparticles synthesis was done by forced solvolysis. 2.1950g $Zn(Ac)_2 \cdot 2H_2O$ were solved in 25 mL 1-buthanol and heated 48h under magnetic stirring. The ZnO nanoparticles were washed with methanol and water, and dried at 120°C.

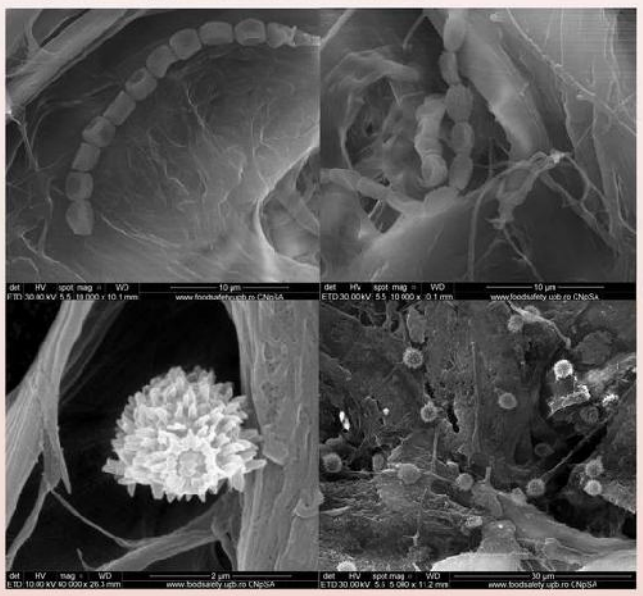


The proposed technical solution is the use of a powder consisting of ZnO nanoparticles loaded with natural extracts (essential oils) which possess antimicrobial activity. Both ZnO nanoparticles and the natural extracts used show antibacterial and antifungal activity, both in the presence of light and in the dark. In the first stage of the treatment, the powder will be evenly distributed with a brush on the surface of the document. The antibacterial and antifungal action of ZnO in the first stage is explained by its photocatalytic activity. ZnO naoparticles loaded with natural extracts, which remain trapped in the cellulosic / protein texture of the paper or parchment will ensure a residual antimicrobial activity, which will prevent the reappearance of pathogens.



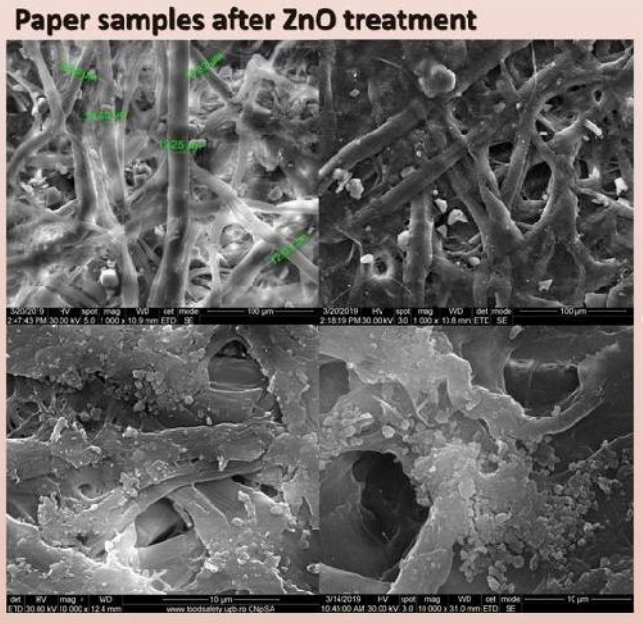
TEM and HRTEM for ZnO NPs

Paper samples before treatment



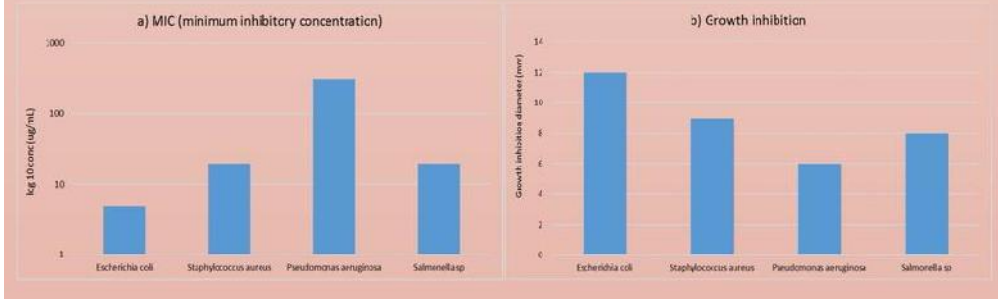
Infested paper from XVI-XVIII

Paper samples after ZnO treatment



Treated paper with ZnO nanoparticles trapped among fibers

Quantitative assay of the ZnO antimicrobial activity



Advantages of the novel solution types

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 components of the essential oils ensure both antimicrobial/antibiofilm properties, but also a better adhesion of the nanoparticles to the cellulosic surface of the paper. The antibacterial and antifungal activity of ZnO in the dark follows different mechanisms from the presence of light, and manifests itself at a slower rate, but which is sufficient to prevent the reappearance of molds. The natural extracts used in these powders have antimicrobial activity regardless of the presence or absence of light and have a synergistic action with ZnO nanoparticles ensuring elimination of bacteria and fungi. In this regard, the present patent application proposes a powder composition based on ZnO nanoparticles loaded with natural extracts so that there will be several classes of substances with antimicrobial activity, synergistic, for a better elimination of pathogenic microorganisms.

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

Patent applications

COMPOSITIONS AND METHOD FOR TREATING MATERIALS FOR THE DEVELOPMENT OF (MEDICAL) PROTECTIVE DEVICES WITH ANTIVIRAL AND ANTIMICROBIAL ROLE

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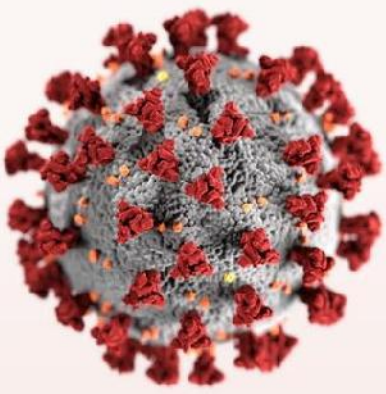
Abstract

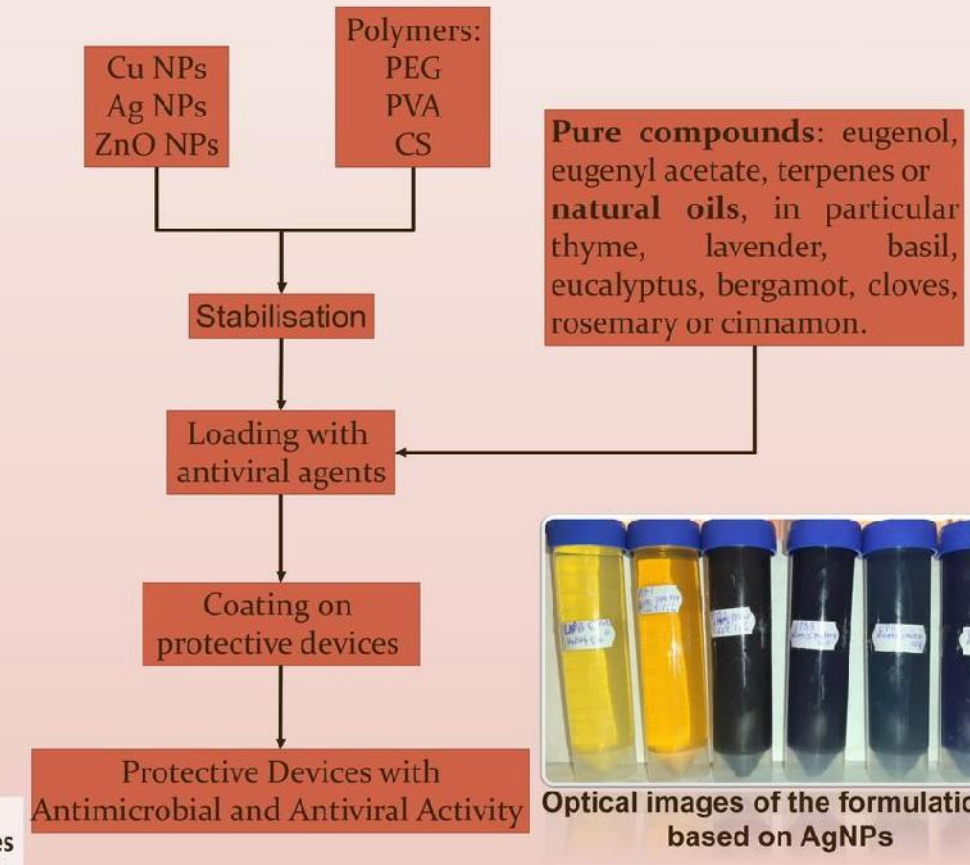
The present invention provides the technology for modifying protective devices (masks, overalls, gowns, gloves, visors) by applying a polymeric layer loaded with Ag nanoparticles (of various shapes and sizes from spherical nanoparticles to triangular, truncated triangular, hexagonal, cubic, cylindrical, etc.), Cu, ZnO, etc. stabilized with suitable agents and loaded with antiviral / antimicrobial substances based on pure components such as eugenol, eugenyl acetate, ..., oils or extracts with low volatility to ensure long-lasting action. In the case of masks, in particular, to avoid inhalation of high amounts of volatile components with irritating / inflammatory effects the volatility and irritability should be considered. In the formulations to be applied on the protection devices, the nanoparticle content can reach 1-2%; antiviral / antimicrobial components also 1-2% while the polymer content varies in the range of 0.1-100% the difference being solvent. The technology can also be applied on the raw material from which the protection devices are obtained, following the thermoforming to be performed with the raw material that already contains the antiviral / antimicrobial components and through this process their embedding in the material takes place.



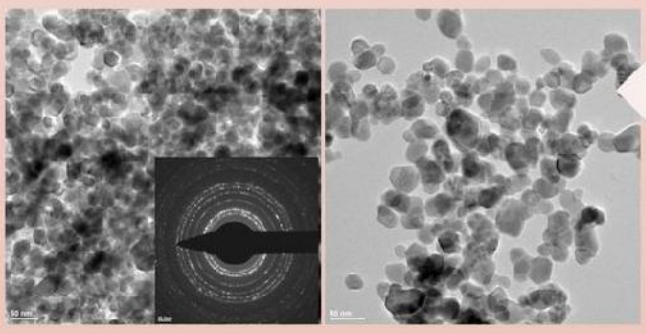
Context

Worldwide, there is an increasing need of manufacturing efficient protective devices, preferable with antimicrobial and antiviral activity! The usual masks are efficient for bacterial penetration, bacterial cells usually having 0.5 – 5μm but limited or no efficiency against viruses which, are usually, from 5 to 300nm in diameter. SARS-Cov-2 is, for instance a small virus of about 125nm which easily pass through the most protective masks. In this context, it is necessary to develop new masks with smaller pores – but inducing problems in breathing or to increase the time needed to pass through these filtrating material (by improving the virus – material interaction) and during this time, to assure the loss of the infectiousness!

Treating protocol for the development of (medical) protective devices with antiviral and antimicrobial role

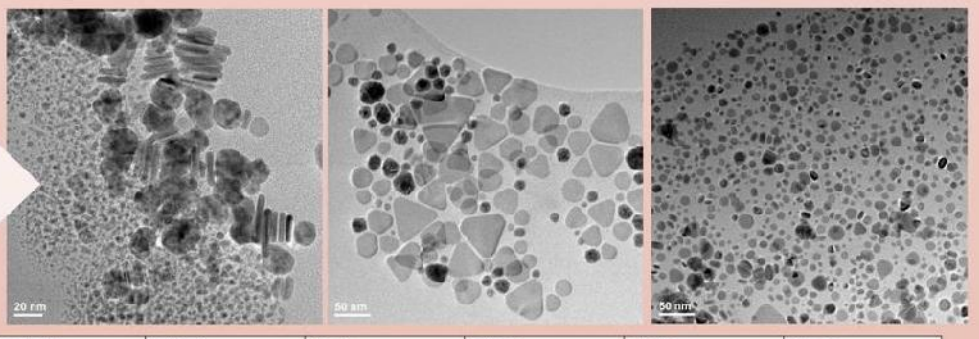


Optical images of the formulations based on AgNPs



TEM images for ZnO NPs

TEM images for Ag NPs



Quantitative assay of the ZnO antimicrobial activity

Bacterial strain	150 μg/mL	75 μg/mL	37.5 μg/mL	18.75 μg/mL	9.38 μg/mL	4.69 μg/mL	2.35 μg/mL	1.17 μg/mL	0.09 μg/mL
L. monocyt. 318	0.085	0.059	0.067	0.063	0.065	0.062	0.086	0.122	0.336
S. aureus ATCC 25923	0.090	0.083	0.080	0.083	0.086	0.239	0.942	1041	1170
Bacillus cereus	0.071	0.069	0.075	0.070	0.075	0.072	0.084	0.098	0.902
E. coli ATCC 25922	0.066	0.077	0.070	0.077	0.605	0.488	0.579	0.753	0.960
P. aeruginosa ATCC 27853	1146	1276	1295	1252	1327	1235	1255	1382	1301

An *In Vitro* Study of the Influence of *Curcuma longa* Extracts on the Microbiota Modulation Process, In Patients with Hypertension

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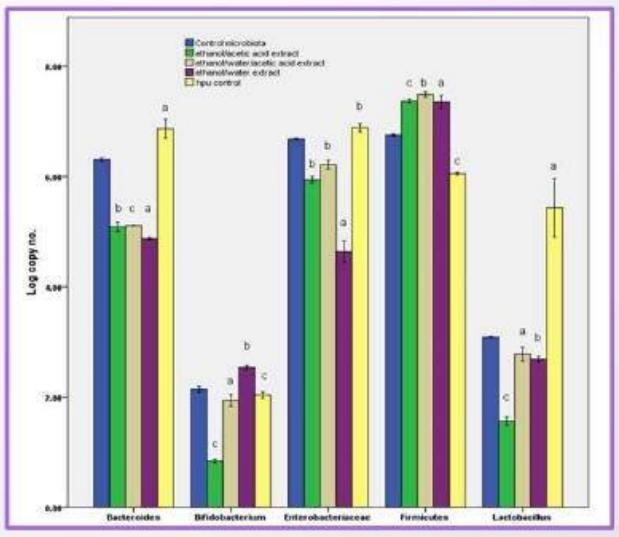
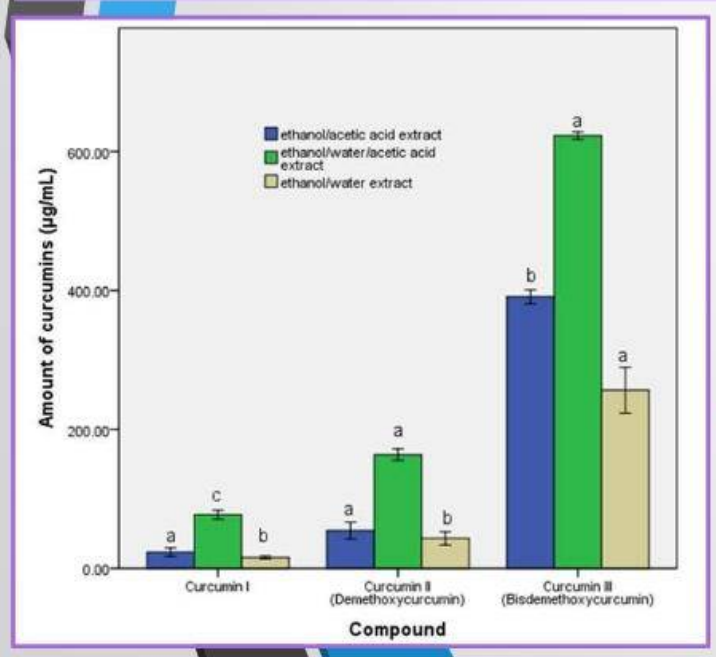
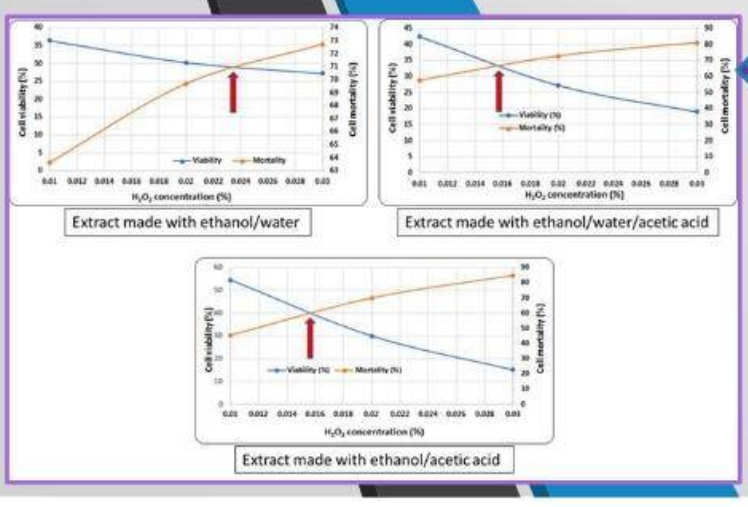
Abstract. The multiple causes of cardiovascular diseases signify a major incidence and developmental risk of this pathology. One of the processes accountable for this pathologic development is the instauration of dysbiosis and its connection with an inflammatory process. Low antioxidant colonic protection encourages the progression of inflammation, with cardiovascular dysfunctions being a secondary consequence of the dysbiosis. Curcumin is one of the bioactive compounds displaying promising results for the reduction of an inflammatory process. The present study aims at demonstrating the capacity of three extracts drawn from Curcuma (C.) longa through an in vitro simulation process, for microbiota modulation in patients with hypertension. The acidic pH in the extraction process determined a high curcumin content in the extracts. The major phenolic compound identified was curcumin III, 622 6.88 g/mL for the ethanol/water/acetic acid extract. Low EC50 values were associated (0.2 g/mL for DPPH scavenging activity) with the presence of curcumin isomers. A metabolic pattern became evident because the relationship between the short-chain fatty acids acted as a clinical biomarker. The curcumin present stimulated the formation of butyric and propionic acids. Microbiota activity control included a high degree of curcumin degradation and biotransformation in the other phenolic compounds. This developmental process was supported by the progression in the enterobacteria with a corresponding escalation in the pH level. The metabolomic pattern demonstrated a performance similar to the administration of dietary fiber, with the positive effects being dose-dependent.





ColHumB
Microbiota Fingerprint



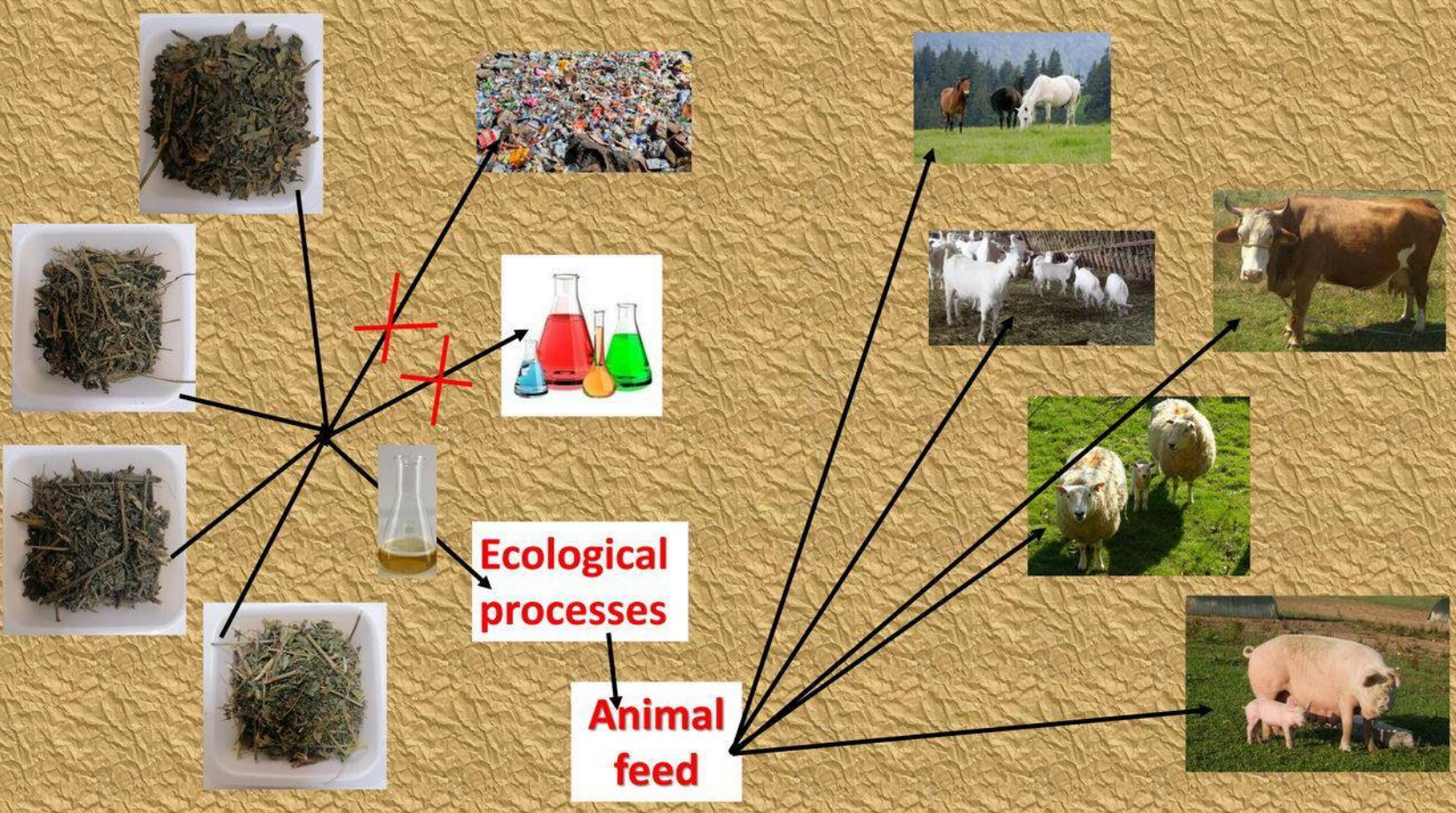
Conclusions:

Our study proved that the inhibitory concentrations towards more strains were reached by the administration of curcuma extracts. The in vitro experiments proved that the poor bioavailability does not mean that the curcumin was not metabolized by the gut bacteria. The effects of the C. longa extracts were correlated with the antioxidant potential and fingerprint microbiota modulation. The results showed a decrease in the microbiota dysbiosis for the ethanol/water/acetic acid extraction. The large curcumin quantity was correlated to a decrease in the unfavorable strain. The property of the curcuma extracts in reducing the oxidative stress is dependent upon their ability to enhance the antioxidant potential at the colon level. Valorisation of the favorable strains will result in a lowered inflammatory process, which is dose-dependent.

Ecological process of obtaining animal feed from a mixture of aromatic and indigenous medicinal plant waste resulting from aqueous, alcoholic and hydroalcoholic extractions.

Alina ORTAN[1], Narcisa BABEANU[1], Sorin AVRAMESCU[1], Simona SPÎNU[1], Cristina DINU-PIRVU[1], Milen GEORGIEV[1]
[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Bucharest, Romania

The present invention relates to the ecological process of obtaining animal feed from a mixture of aromatic and medicinal plant waste (*Origanum vulgare* L., *Apium Graveolens* L. 1753, *Momordica Charantia* L., *Salvia officinalis* L.) obtained after alcoholic, hydroalcoholic extraction or aqueous. The invention consists of developing an ecological process for obtaining animal feed and reduction of the quantities of waste from various industrial branches, by transforming them into raw materials for another industrial branch. The proposed method does not involve the use of chemical synthesis raw materials, does not have a negative effect on the environment and human health, is inexpensive and reduces the amount of waste of native medicinal and aromatic plants obtained from different types of extraction (alcoholic, hydroalcoholic and aqueous) with potential for pollution.



Acknowledgements: The authors gratefully acknowledge the support obtained through the project SusMAPWaste, SMIS 104323, Contract No. 89/09.09.2016, from the Operational Program Competitiveness 2014-2020, project co-financed from the European Regional Development Fund.

UNIUNEA EUROPEANĂ

Instrumente Structurale 2014-2020

Fibrous material support from oily plants with antioxidant properties, enriched with biologically active compounds obtained from aromatic and medicinal plants waste after extraction and method of obtaining it

Patent - A0026/22.01.2020

Alina Ortan[1], Narcisa Babeanu[1], Sorin Marius Avramescu[1], Simona Spinu[1], Manuel Drugulescu[1], Milen Georgiev[1]

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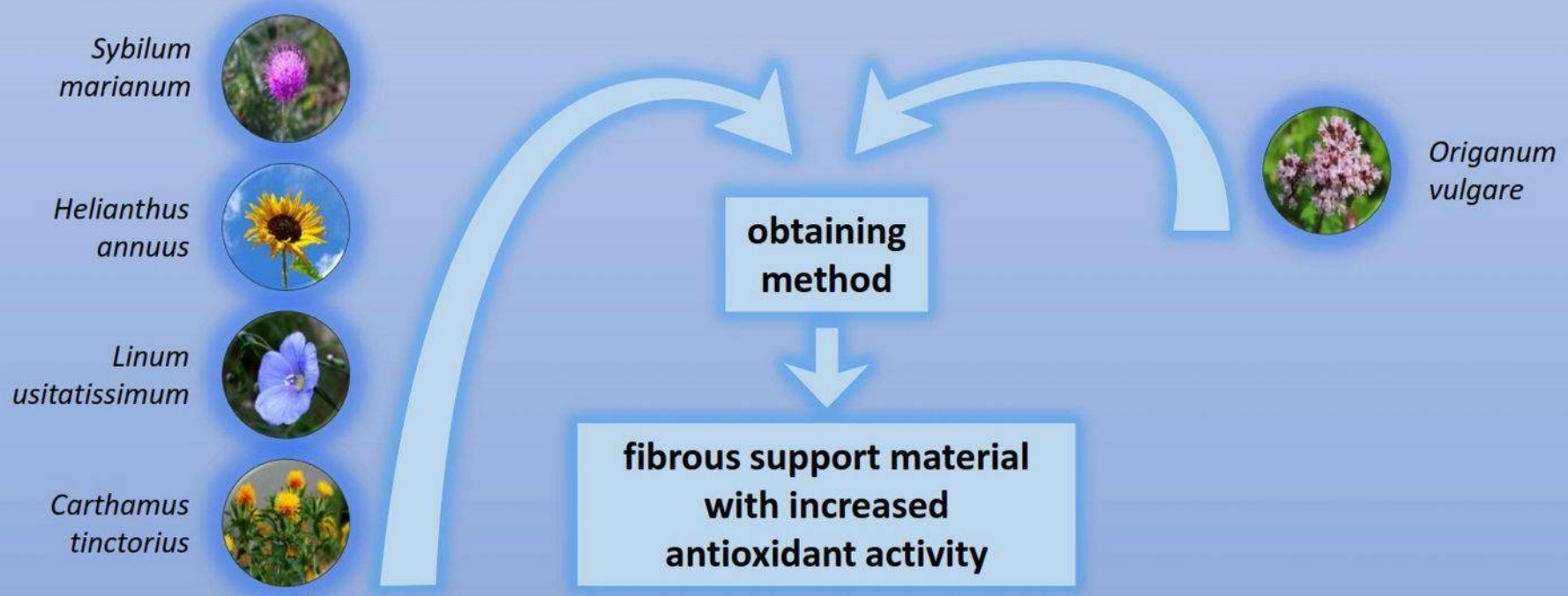
Summary

This invention refers to a fibrous support material of oil plants (*Silybum marianum* L., *Helianthus annuus* L., *Linum usitatissimum* L., *Carthamus tinctorius* (Mohler, Roth, Schmidt & Boudreaux, 1967), enriched with biologically active compounds obtained from waste extracts of *Origanum vulgare* L. from aqueous extractions, from different industries or research activities, in order to increase its antioxidant activity and the method of obtaining it. The proposed solution uses cheap materials that result as residues from different industries (food, pharmaceutical, etc.), does not require toxic and/or dangerous substances and solvents, and has no negative action on the environment and human health.



ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support obtained through the project SusMAPWaste, SMIS 104323, Contract no. 89/09.09.2016, from the Operational Program Competitiveness 2014–2020, project co-financed from the European Regional Development Fund.

Standardized extracts of *Melissa officinalis* L. - method for obtaining and potential therapeutic

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[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Bucharest, Romania

Microwave assisted extraction (MAE)

The present invention relates to a vegetable extract obtained from a species of the genus Melissa, with concomitant antioxidant and animicrobial properties. According to the invention, the extract has a total phenolic content of 14.5...16.5 mg equivalent gallic acid / 1 g dry extract, antioxidant activity determined by the DPPH test of 80 ... 90%, and the antimicrobial activity determined by measuring the inhibition zone of 11...15 mm for Staphylococcus aureus and 9...12 mm for Escherichia coli. The process according to the invention involves the use of the microwave assisted extraction method, using as solvent absolute ethylic alcohol, the ratio of plant material: solvent of 1: 3...1: 6, extraction time 10...35 min, microwave power 700...1000 W, without stirring, followed by concentration at the rotary evaporator and freeze drying. The plant extracts are obtained through a process with good extraction efficiency of the active principles, the product obtained is ecological and natural, it presents simultaneously two types of therapeutic action: antioxidant and antimicrobial, it has potential applications in natural treatments for topical use, which does not involve the use synthesis substances against which high resistance has developed over time.

Antioxidant activity

Antimicrobial activity

Natural treatments

Acknowledgements: The authors gratefully acknowledge the support obtained through the project SusMAPWaste, SMIS 104323, Contract No. 89/09.09.2016, from the Operational Program Competitiveness 2014-2020, project co-financed from the European Regional Development Fund.

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Title

SOIL STABILIZATION WITH PLASTIC WASTE MATERIALS (PET)

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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

AMPLIFIER FOR WATERJET CUTTING MACHINES

Inventor/s - Contact

Cornel Ciupan, Emilia Ciupan, Rareş Adrian Petruş

Patent/ Application number

Patent Application Number: RO131458B1/30.10.2019

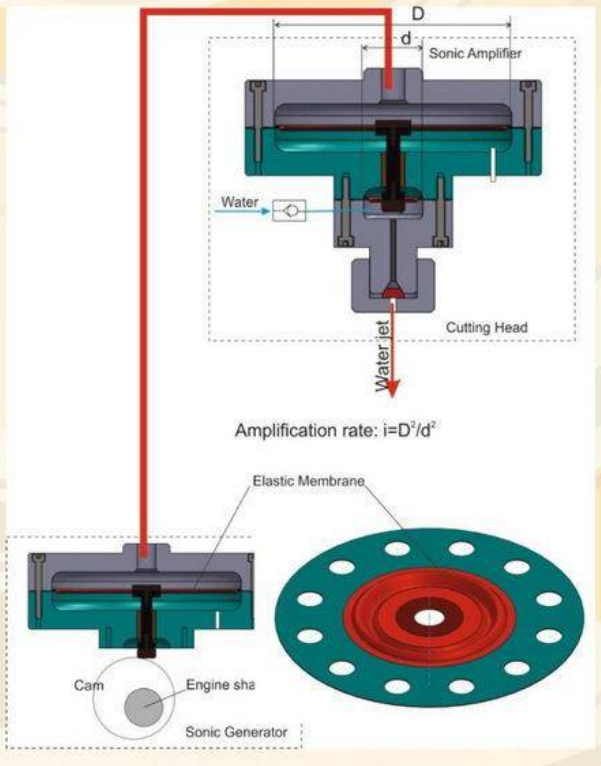
Short presentation

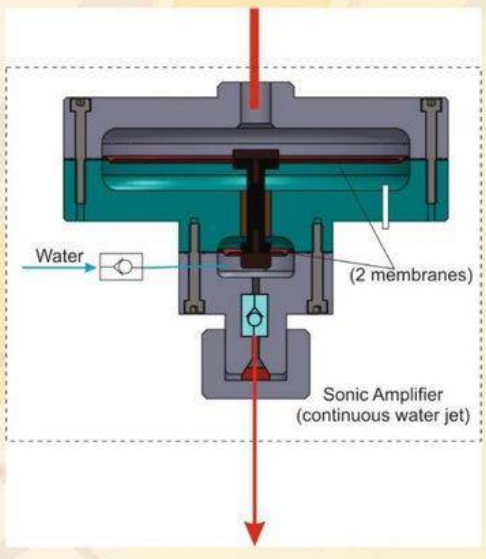
The patent offers a new solution for an abrasive water jet cutting machine with the intensifier included in the cutting head. The novelty consists of sonic transfer through pressure waves. The technical problem solved by the invention consists in the development of an intensifier system that avoids the passing of the working fluid into the high pressure chamber, which operates at high pressures without loss of flow and offers high energy efficiency and reliability. The system consists of a generator which transmits pressure waves to a sonic intensifier that can be mounted directly in the cutting head. The water jet cutting system comprises a sonic generator with the purpose of transforming mechanical energy produced by the motor into pressure waves, that are transmitted by means of a hydraulic fluid to the cutting head, where it makes high pressure water.

Applicability

The system is recommended for waterjet cutting machines and offers the following advantages: simple design and manufacturing; high reliability and easy maintenance; high volumetric efficiency due to no flow losses around the seals; possibility of making membranes from materials resistant to corrosion or to different chemical agents, depending on the specific application.

Images





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Title

DEVICE FOR NOISE CONVERSION IN ELECTRIC ENERGY

Inventor/s - Contact

FILIP NICOLAE PhD

Patent/ Application number

PATENT OSIM: 128582/29.11.2019

Short presentation

The device for converting noise into electricity, according to the invention, is composed of a panel containing several electromagnetic and piezoelectric transducers, each transducer being provided with a convergence guide, conical in shape, which has the role of transforming the spherical waves captured in flat waves, having the effect of increasing the power of the mechanical vibrations that are discharged on the transducers and producing electrical signals that are collected by a multichannel system with rectifier circuits with double alternation to an accumulator or to a consumer, the broad spectrum of absorption and conversion of the noise obtaining -se is differentiated by the conical elements and the translators used in a painting.
When recovering noise and obtaining electricity, the following sequence of phenomena is detailed: the conversion of the acoustic signal into mechanical vibration and the conversion of mechanical vibration into electrical signal.

Applicability

Alternative energies, by recovering an energy waste and transforming it into green energy; reducing the noise pollution of the environment; development of autonomous systems for traffic information,

Images

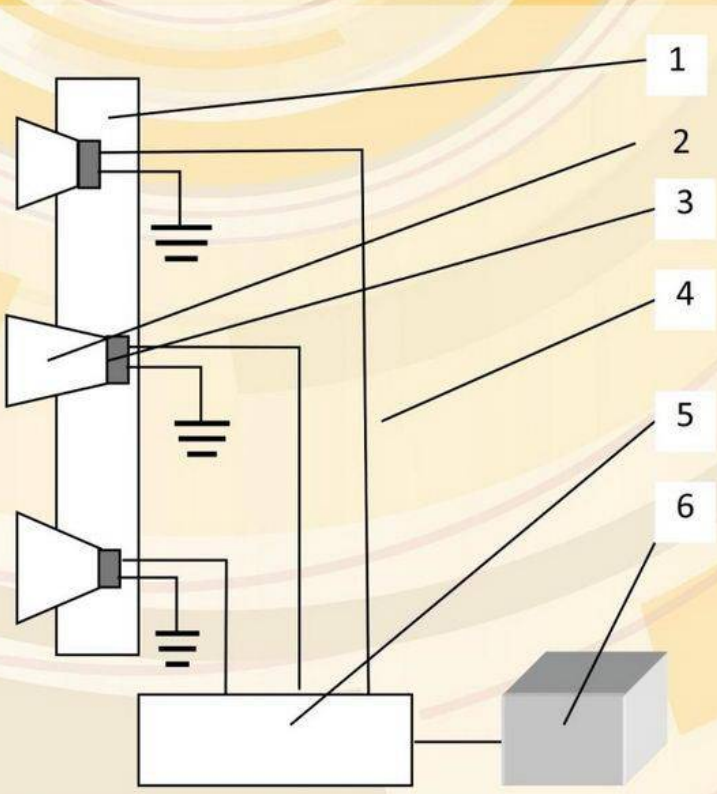

Fig. 1. Schița dispozitivului pentru recuperarea şi conversia zgomotului:
1 - suport matrice senzori;
2 – ghid de convergență;
3 – traductor semnal;
4 – conexiune placă de achiziție,
5 – placa de achiziție semnal electric cu 11 canale de intrare,
6 – acumulator – consumator curent.

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Title

METHOD AND EQUIPMENT FOR THE ELECTROSTATIC SEPARATION OF NONCONDUCTIVE GRANULAR MATERIAL MIXTURE

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Laur Calin (Laur.Calin@ethm.utcluj.ro)

Patent/ Application number

PATENT OSIM: RO 128979 B1/2019

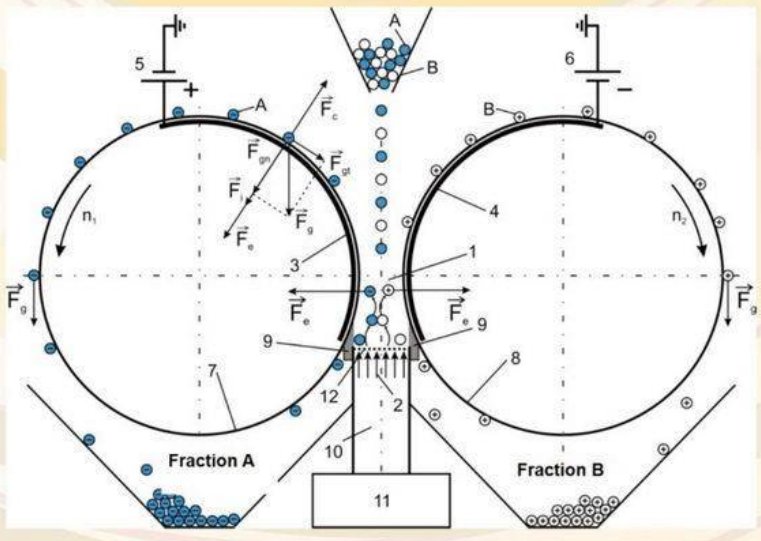
Short presentation

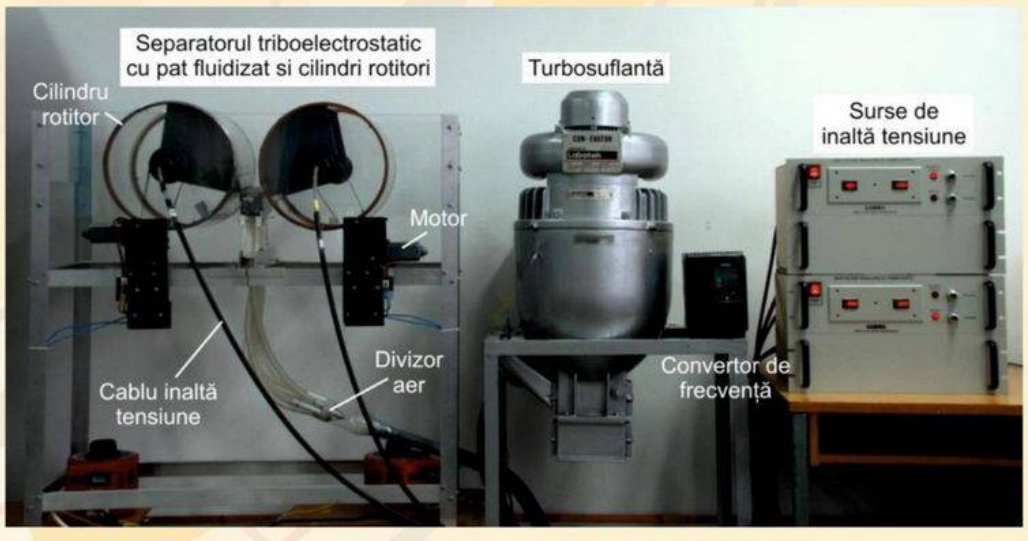
In order to separate in electrostatic field granular mixtures of non-conducting materials, we use a common tribocharging and separation chamber. The components of the granular mixture get electric charge of opposite sign in fluidized bed and are deflected in opposite directions due to the electrostatic field obtained by two high voltage electrodes of circular type. The charged granules are removed from the separation chamber by two insulating cylinders rotating in opposite directions and are collected as separated fractions.

Applicability

The invention is intended for the field of plastic waste recycling, especially from waste of electric and electronic equipment, but can also be applied for the preparation of non-conducting mineral materials, in the food industry, pharmaceutical industry, etc.

Images





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Title

CAPACITOR DC-LINK ARRANGEMENT

Inventor/s - Contact

TEODOSESCU PETRE DOREL, VINTILOIU IOANA, POP ADRIAN CORNEL, RUSU TIBERIU,
POP-PIGLESAN FLORIN-ADELIN, DARAMUS MIHAI-ALEXANDRU
petre.teodosescu@emd.utcluj.ro

Patent/ Application number

PATENT EPO: EP3300462B1/11.12.2019

Short presentation

The present invention provides a capacitor DC-link arrangement, in particular for high current ripple applications. The capacitor DC-link arrangement comprises a substrate such as a PCB-based substrate, a first terminal and a second terminal which are both arranged on the substrate, a plurality of ceramic capacitor elements, wherein: each of the ceramic capacitor elements is connected as well to the first terminal and the second terminal, the plurality of ceramic capacitor elements are connected in parallel, and the ceramic capacitor elements are arranged and connected in a similar current path and in particular in the same resistance current path.

Applicability

The patent can be applied on every electronic circuit that needs a high capacitance filtering and high current ripples.

Images

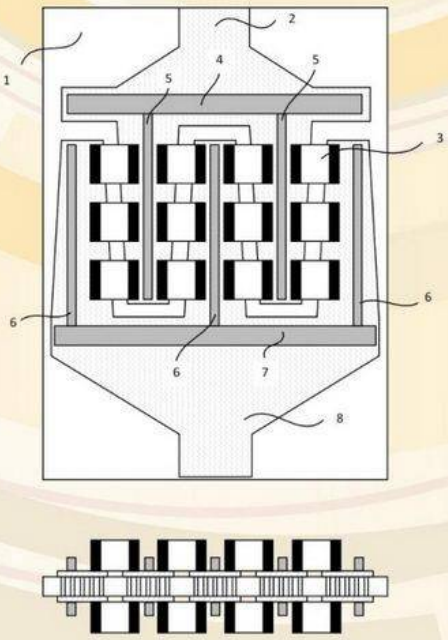

Fig. 1. Model 1

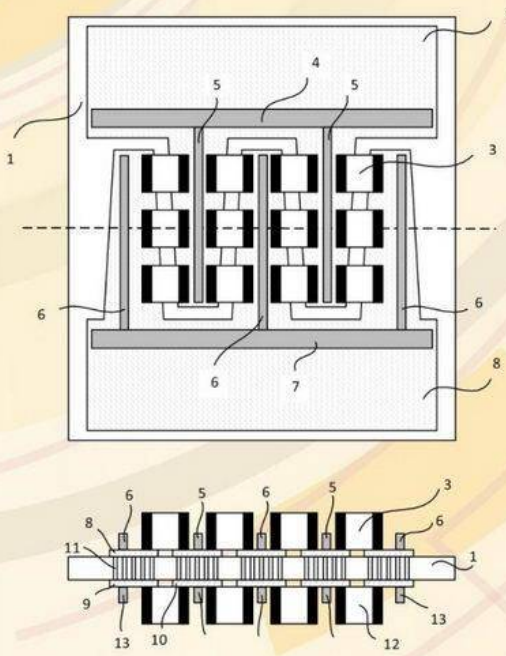

Fig. 2. Model 2

1 - PCB material
2 - Positive top copper layer
3 - ML-Ceramic capacitors – top layer
4 - Straitening horizontal bar- positive top layer
5 - Straitening vertical bars – positive top layer
6 - Straitening vertical bars – negative top layer
7 - Straitening horizontal bar- negative top layer
8 - Negative top copper layer
9 - Negative bottom copper layer
10 - Positive bottom copper layer
11 - PCB through hole via
12 - ML-Ceramic capacitors – bottom layer
13 - Straitening vertical bars – negative bottom layer
14 - Straitening vertical bars – positive bottom layer

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Title

ELECTRONIC DEVICE FOR LED LIGHTING SYSTEMS

Inventor/s - Contact

Teodosescu Petre Dorel, Sabău Mădălina Sabina, Székely Norbert Csaba, Bojan Mircea, Marschalko Richard
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Patent/ Application number

PATENT OSIM: RO131169B1/28.06.2019

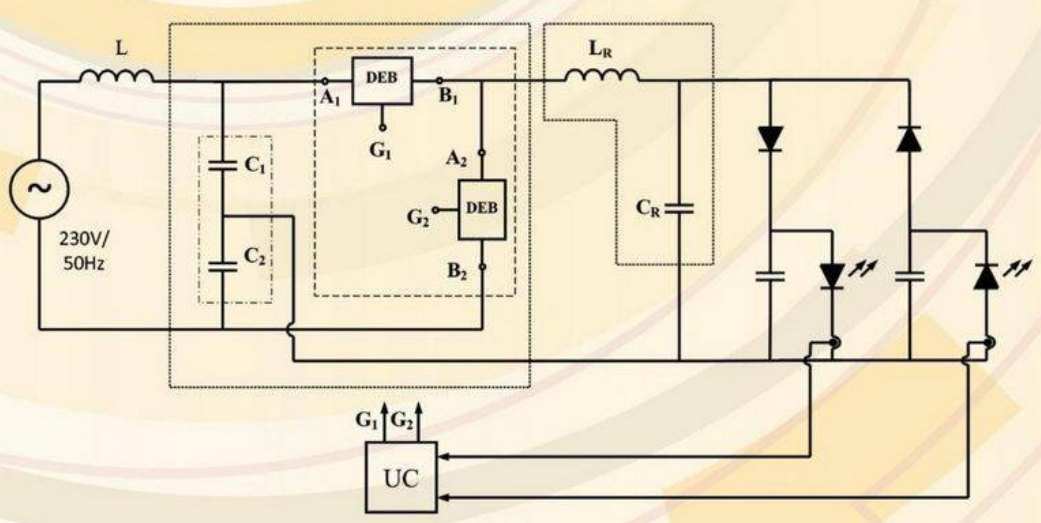
Short presentation

The invention relates to an electronic device for controlling light emitting diodes - LED used in lighting systems. According to the invention, the device comprising a single electric energy conversion stage, without rectifier circuit on the input side, consists of an input filter, an alternating current converter, which consists of a capacitive divider and a half-bridge electronic circuit comprising two bidirectional electronic devices, enabling the direct connection to an alternating voltage source and the generation, at the output, of high frequency alternating voltage signals, which supply a resonance circuit LC, a LED load and a control circuit generating control signals for the converter.

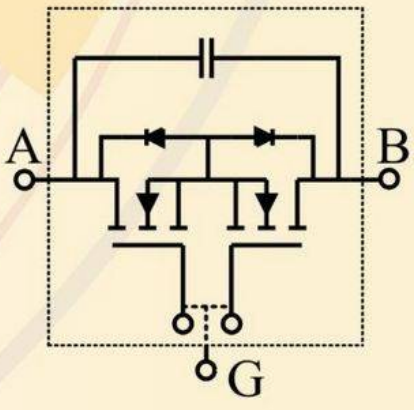
Applicability

The patent can be used in most LED lighting devices that are based on constant current control and high power factor.

Images



Electronic schematic of the converter



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Title

ORIENTATION MODULE WITH MODULAR STRUCTURE AND MULTIPLE BENDS

Inventor/s - Contact

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Patent/ Application number

Patent OSIM RO129923 B1/30.08.2019

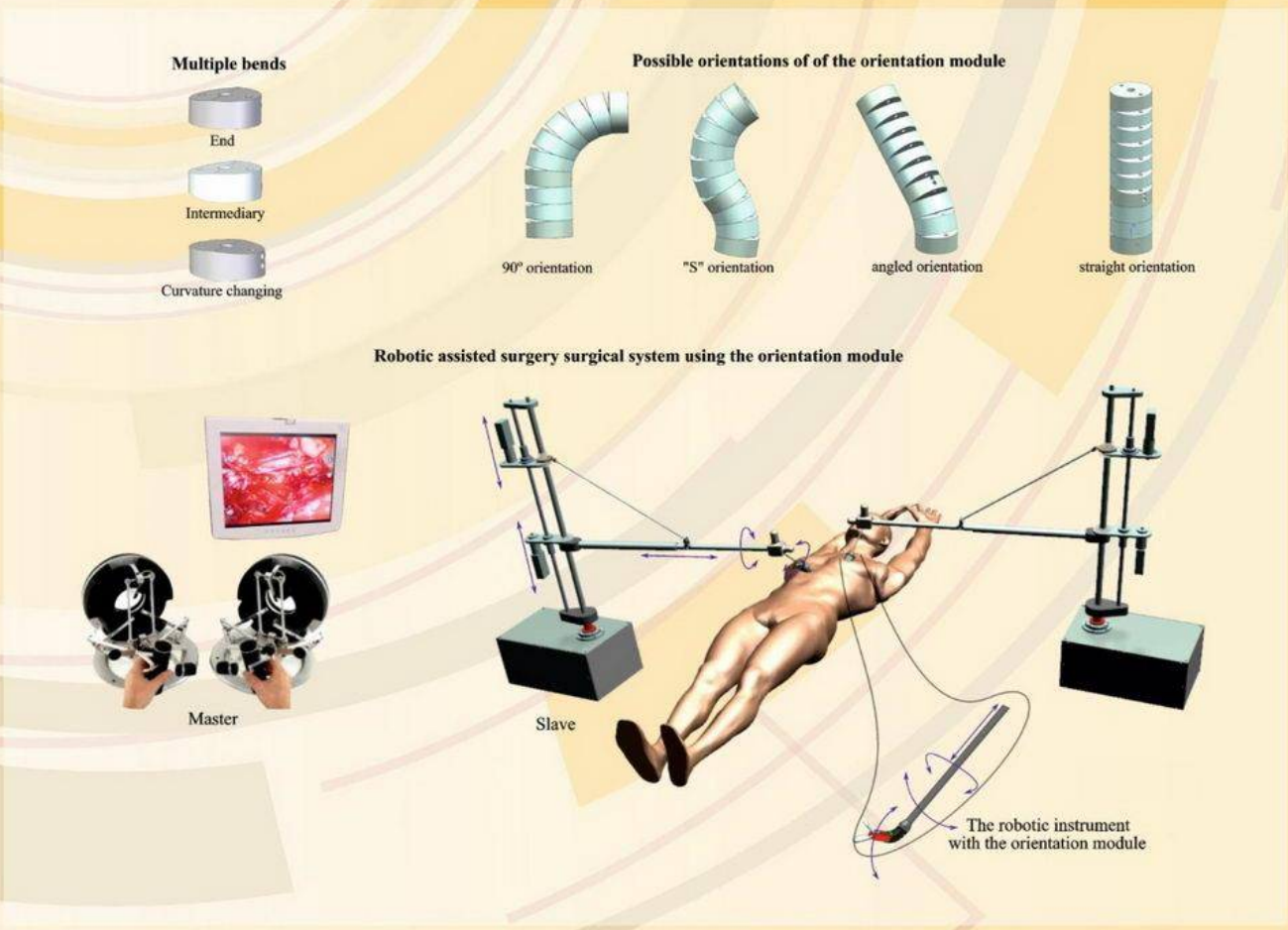
Short presentation

The patent refers to an orientation module with modular structure and multiple bends useful for surgical instruments. The solution offers multiple possible configurations which can be customized based on the specific needs of a certain procedure. The solution intends to increase the workspace of the instruments providing a solution for the avoidance of areas or elements which block the direct access towards the surgical field. This solution can be integrated also in the structure of instruments which allow the orientation of the active tool. Consisting of only four different components, and a very simple construction, the patent can be implemented for any type of instrument dimensions.

Applicability

Minimally invasive surgery, exploratory surgery.

Images



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Title

PORTABLE DEVICE FOR THE REHABILITATION OF THE UPPER LIMBS

Inventor/s - Contact

Giuseppe Carbone[1,2], Elio Matteo Curcio, Diego Mazzei, Doina Pisla[2]
[1]DIMEG-University of Calabria, Italy giuseppe.carbone@unical.it
[2]CESTER-TU Cluj-Napoca, Romania

Patent/ Application number

102020000003563 Italy

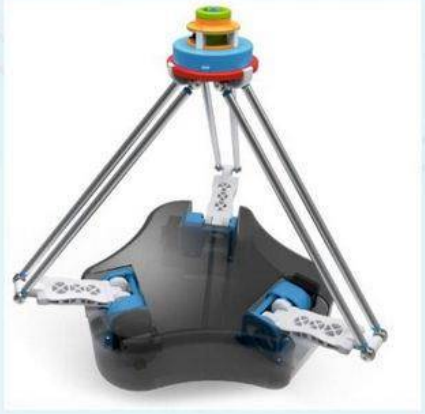
Short presentation

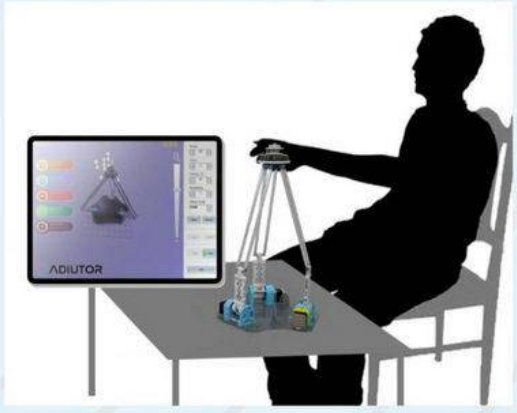
This patent proposes an electrically powered portable device, for the rehabilitation of the upper limbs with reduced dimensions and weights. The proposed system allows to perform automated and/or semi-automated three-dimensional assisted exercises. The device is characterized by a lightweight structure, equipped with a simple kinematic mechanism, aimed at assisting the work done by the physiotherapist during the rehabilitation phases in the clinics and/or at patients' homes. The device has a movable base, which can be placed on any flat surface and, accordingly, the device can be easily portable and re-positioned on any table or desk of daily use. The proposed device is equipped with a specific sensorized interface that allows to identify the user's intentions of movement in the Cartesian directions as well as to monitor and record the rehabilitation session for an assisted execution of the exercises. The device can be equipped with a video interface, which can be used for an autonomous or semi-autonomous interaction by the user, for example, through the implementation of interactive gaming tasks with manipulative targets of increasing difficulty. In addition, it can be equipped with a remote control and telemonitoring interface by an operator, in order to have historical clinical data of the patients, to carry out clinical assessments of the rehabilitation progress and for tuning and tailoring the rehabilitation plan.

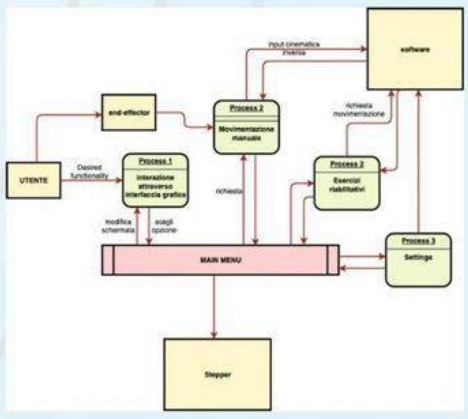
Applicability

This patent proposes a device for the rehabilitation of the upper limbs allowing automated and/or semi-automated assisted exercises at home.

Images







Acknowledgements - The paper presents results from the research activities of the project ID 37_215, MySMIS code 103415 "Innovative approaches regarding the rehabilitation and assistive robotics for healthy ageing" co-financed by the European Regional Development Fund through the Competitiveness Operational Programme 2014-2020, Priority Axis 1, Action 1.1.4, through the financing contract 20/01.09.2016, between the Technical University of Cluj-Napoca and ANCSI as Intermediary Organism in the name and for the Ministry of European Funds.

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Title

METHOD OF OPTIMIZING AN EXPERIMENTAL DESIGN FOR POLYMER CONCRETE USING VORONOI DIAGRAMS

Inventor/s - Contact

Mihai Ciupan

Patent/ Application number

Patent Application Number: A10003/25.01.2020

Short presentation

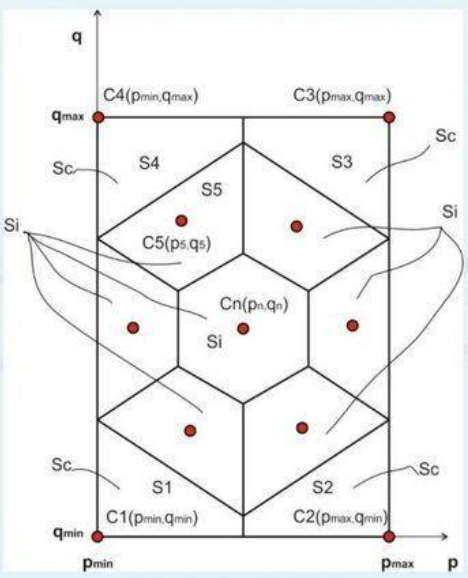
The patent application regards a method of optimizing a two-factor experimental design focused on determining the properties of polymer concrete (mineral casting) in order to find the optimum material formulation for a given application. The invention solves the problem of maximizing the information regarding one of the properties of the material (the dependent variable) using only a limited number of tests defined by the independent variables (p; q). Variable p is the percentage of resin from the total formulation mass and q is Funk and Dinger's equation coefficient.

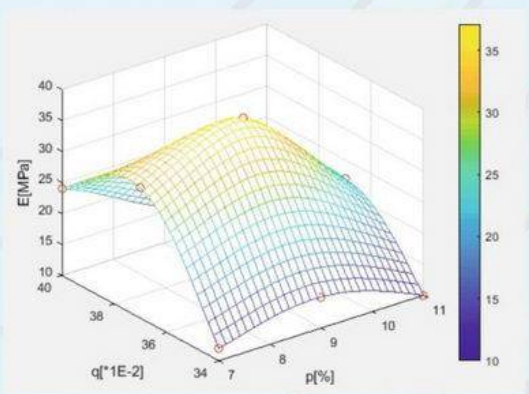
The method consists of the following steps: choosing the independent variables and their rectangularly shaped value domain, choosing 4 points (C_1, C_2, C_3, C_4) in the corners of the rectangle, choosing the remaining n-4 points (C_5 to C_n), in a random way on the surface of the rectangle, calculating the Voronoi diagram for the points and then moving points C5 to Cn inside the rectangle until the corner surfaces are all equal to one another (S_1=S_2=S_3=S_4) and the inner surfaces are all equal to one another (S_5=S_6=...=S_n).

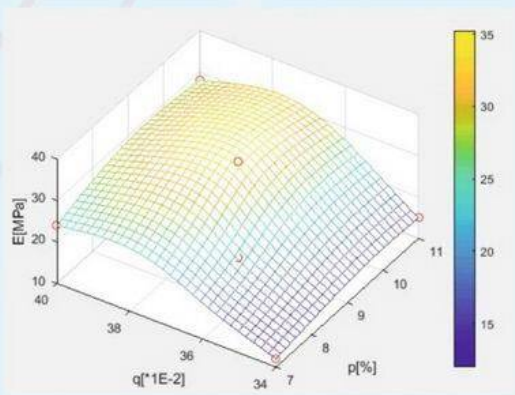
Applicability

The method can be applied for optimizing the experimental design by maximizing the information gained using a limited set of tests and has the following advantages:
- the flexibility of choosing the exact number of tests to be carried out;
- maximizing the information gained from a given number of experimental conditions;
- the possibility of conducting the experiment in more stages and using the information from one of stages to narrow the domain of interest for the others.

Images







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Title

ECO- INNOVATIVE CONCRETE BASED ON CEMENT AND RECYCLED WASTE GLASS AND PET (POLYETHYLENE TEREPHTHALATE) FOR APPLICATIONS IN CONSTRUCTION "BESTiPET"

Inventor/s - Contact

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Henriette SZILAGYI [henriette.szilagyi@incerc-cluj.ro],
Gabriel PIRGARIU [Gabi.Pirgariu@gmail.com]

Patent/ Application number

PATENT APPLICATION OSIM: A 00542/09.09.2019

Short presentation

The invention relates to the obtaining of a NEW ECO-INNOVATIVE, SUSTAINABLE CONCRETE, based on cement and recycled waste in the form of artificial glass aggregate and PET flakes (polyethylene terephthalate), as raw material, which successfully replace the non-renewable natural aggregates (waste involving high storage and storage costs). The ECO-INNOVATIVE CONCRETE was made within the research-development-innovation project - "CHECKS OF INNOVATION" 266 CI / 2018 in order to develop the smes, where the beneficiary company, NEW NCR RECICLARE S.R.L. becomes the final recycler. the beneficiary of the research having the main activity object: collection, recovery of the waste and concrete products manufacturing, obtained the Technical Approval NO. 001SC-02/635-2019 for alveolar concrete blocks for the purpose of commercialization..

Applicability

IN THE FIELD OF CONSTRUCTIONS SUCH AS, FOR EXAMPLE, ALVEOLAR BLOCKS, BRICKS, BOLTS, ETC.

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Title

AUTOMATED MEDICAL INSTRUMENT FOR INSERTING MULTIPLE NEEDLES ON LINEAR AND PARALLEL TRAJECTORIES IN INTERSTITIAL BRACHYTHERAPY CANCER TREATMENT

Inventor/s - Contact

Gherman Bogdan, Bîrlescu Iosif, Burz Alin, Pisla Doina
E-mail: Doina.Pisla@mep.utcluj.ro, Bogdan.Gherman@mep.utcluj.ro

Patent/ Application number

PATENT APPLICATION OSIM: A00806/28.11.2019

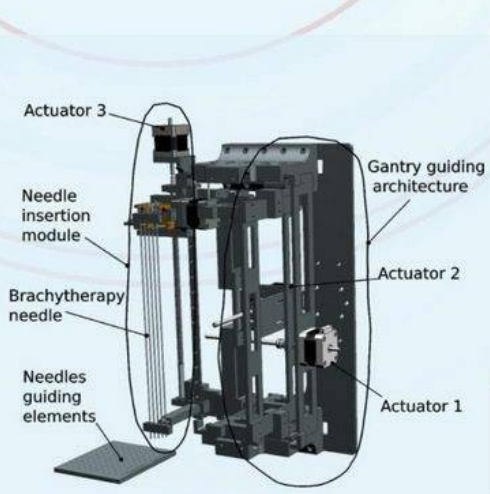
Short presentation

The present innovation is a medical robotic instrument designed to insert percutaneously multiple needles on a straight trajectory in brachytherapy procedures for liver cancer treatment. The instrument has 3 degrees of freedom, having a serial kinematic chain of type PPP and a specially designed gripper. It uses Gantry architecture to position the brachytherapy needle in the XOY plane, using the actuators 1 and 2. The brachytherapy procedure usually requires the precise placement of up to 6 brachytherapy straight needles inside the tumor in a matrix form (which helps avoiding needles collisions), using the actuator 3, at a distance of 10mm from each other (both on OX and OY axes). The size of the treated tumors determines directly the required number of the needles. These are taken from the needles rack, which is attached to the robotic instrument, one by one using the needle gripper, which is designed specifically for this application. The first needle is placed (approximately) in the middle of the tumor, followed by the others, using the pre-planned trajectories. The robotic instrument can also be used for intratumoral drug release.

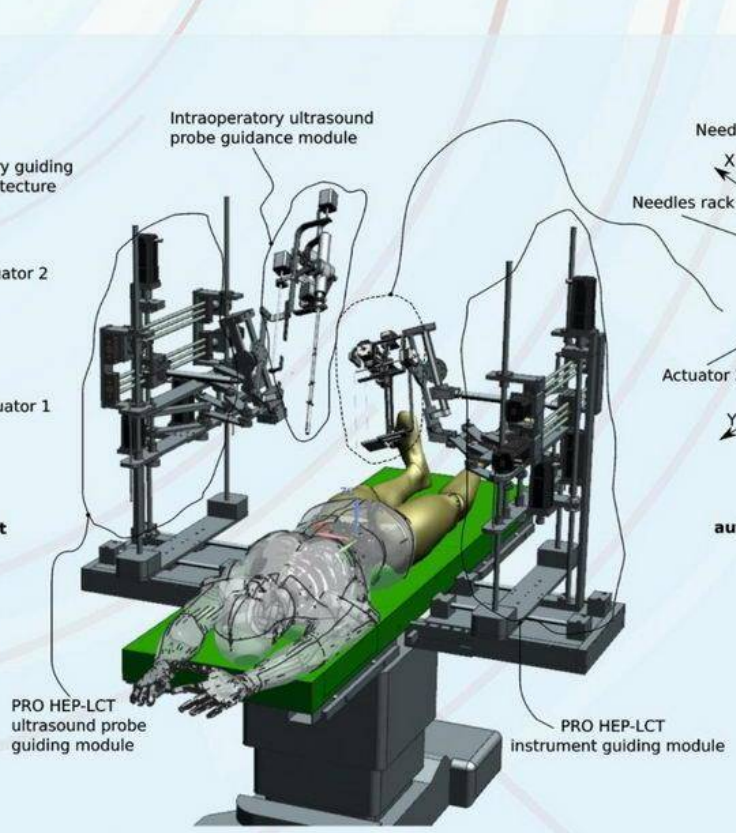
Applicability

Medical robotics, Cancer treatment, Brachytherapy, Intra-tumoral drug release.

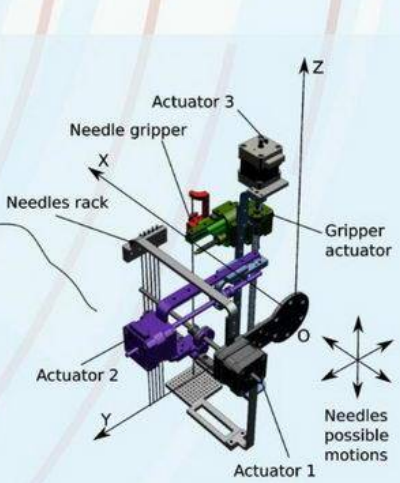
Images



Patent application of the automated medical instrument



Robotic assisted brachytherapy for liver cancer treatment using the automated medical instrument



Final CAD design of the automated medical instrument

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Title

SANDWICH PANEL BASED ON HEMP SHIVES AND FIBERS, AND THE MODALITY OF OBTAINING IT, APPLICABLE IN THE BUILDING SECTOR

Inventor/s - Contact

IȘTOAN Raluca, TĂMAȘ-GAVREA Daniela-Roxana, MANEA Daniela Lucia, VASILE Ovidiu

Patent/ Application number

PATENT APPLICATION OSIM: a2019 00237/15.04.2019

Short presentation

The invention relates to a sandwich panel based on hemp shives and fibers, and the method to obtain it, which has the applicability in the construction sector. The sandwich panel is designed with three layers: a core and two sheets. The low-density core is obtained from hemp fibers and a cement binder, while the thin skin-layers which cover the core on each side are prepared from hemp shives and hydrated lime-cement binder. The panel is used as a partition element with significant acoustic and thermal properties while is responding to several sustainability requirements. The panel was analyzed in four ways: (a) without perforations, (b) with perforations of 1 cm diameter and 10% degree of perforation, (c) with perforations of 1 cm diameter and 20% degree of perforation (d) with perforations of 1 cm diameter and 30% degree of perforation.

The physical characteristics of the sandwich panel are:

- (a) without perforations: sound absorption coefficient α_{max} = 0.56 at 350 Hz, thermal conductivity λ = 0.068 [W/mK], density ρ = 413 [kg/m^3].
- (b) with perforations: sound absorption coefficient α>0,80 on the range frequencies between 650 - 1080 Hz, with α_{max}=0,97 (810 - 860 Hz)
- (c) with perforations: sound absorption coefficient α>0,80 on the range frequencies between 970 - 1350 Hz, with α_{max} =0,85 (1090 - 1200 Hz)
- (d) with perforations: sound absorption coefficient α>0,80 on the range frequencies between 880 - 1740 Hz, with α_{max} =0,95 (1140 - 1250 Hz)

Applicability

The problem solved by the invention is to obtain an accessible sandwich panel based on hemp shives and fibers. The raw materials obtained from the hemp and used to design the panel are considered waste, which is collected from the removing process of hemp textile fibers. The design of this low-cost panel was define to the use of common and accessible mineral binders, which allowed the panel to obtain acoustic and thermal performances.

Images

Figure 1. Sandwich panel based on hemp shives and fibers

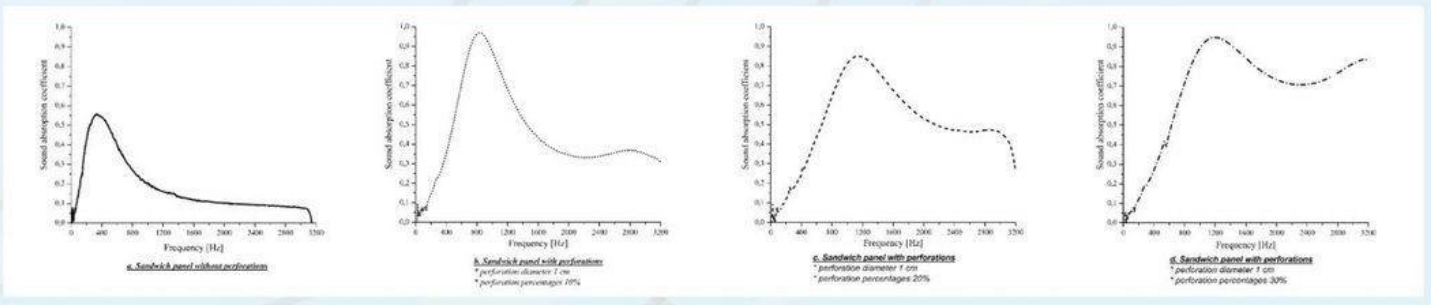

Figure 2. Sound absorption coefficient of the sandwich panel
(a) without perforations, (b) with perforations of 1 cm diameter and 10% degree of perforations,
(c) with perforations of 1 cm diameter and 20% degree of perforations, (d) with perforations of 1 cm diameter and 30% degree of perforations

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Title

COMPOSITE PLATES OF NATURAL FIBERS AND PROCESS USED FOR OBTAINING IT

Inventor/s - Contact

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2. Manea Daniela Lucia, Professor at Faculty of Civil Engineering, Technical University of Cluj-Napoca, daniela.manea@ccm.utcluj.ro

Patent/ Application number

PATENT APPLICATION OSIM: A 00084/18.02.2020.

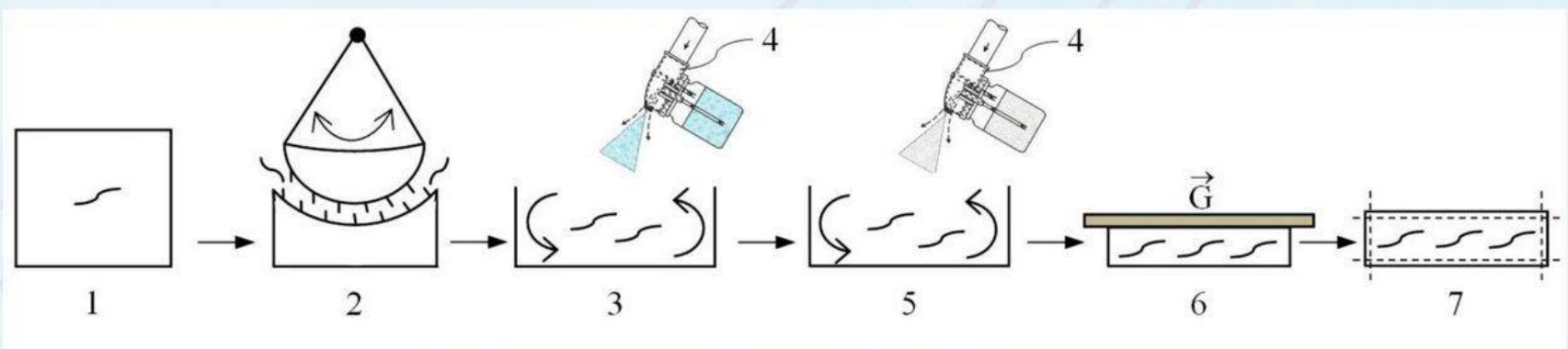
Short presentation

The invention relates to obtaining composite plates made from natural fibers of sheep's wool intended for the thermal insulation of constructions that meet the defining regulations for a thermal insulation material, and the process for obtaining them. Composite boards are made from a mixture of sheep wool fibers, mixed with glue (adhesive) and various binders (clay, Portland cement, plaster, hydrated lime, hydraulic lime NHL 3.5, balls lime, washable lime, starch , bone glue and rosin). By removing the disadvantages of the wool-based insulation products, which comes in different forms (mattresses or rollers), the innovative character of this invention consists in ensuring dimensional stability of the insulating material. The process of obtaining the plates consists of wool fiber loosening, wool dosing, hydrating it by spraying water into wool mass in an equal amount to wool mass, dosing the adhesive and binder, water, spraying the mixture into wool mass, pouring the mixture In printing, the compression of the composite plate for 24 hours, its decofraction and the compression interval of 48-72 h.

Applicability

The problem solved by the invention is the creation of wool-based composite plates with low thermal conductivity and density, using a process for obtaining low energy consumption. Natural wool fiber composite tiles are viable natural alternative to synthetic fibers, intended for thermal insulation of buildings and can be easily applied, thus helping to increase the energy efficiency of buildings.

Images



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Title

THERMAL MANAGEMENT PASSIVE DEVICE FOR A BATTERY THAT EQUIPS AN ELECTRIC VEHICLE

Inventor/s - Contact

MARIASIU FLORIN EMIL, VARGA BOGDAN OVIDIU
TECHNICAL UNIVERSITY OF CLUJ-NAPOCA, AUTOMOTIVE ENGINEERING AND TRANSPORT DEPARTMENT, florin.mariasiu@auto.utcluj.ro

Patent/ Application number

PATENT APPLICATION OSIM: A/00448/2019

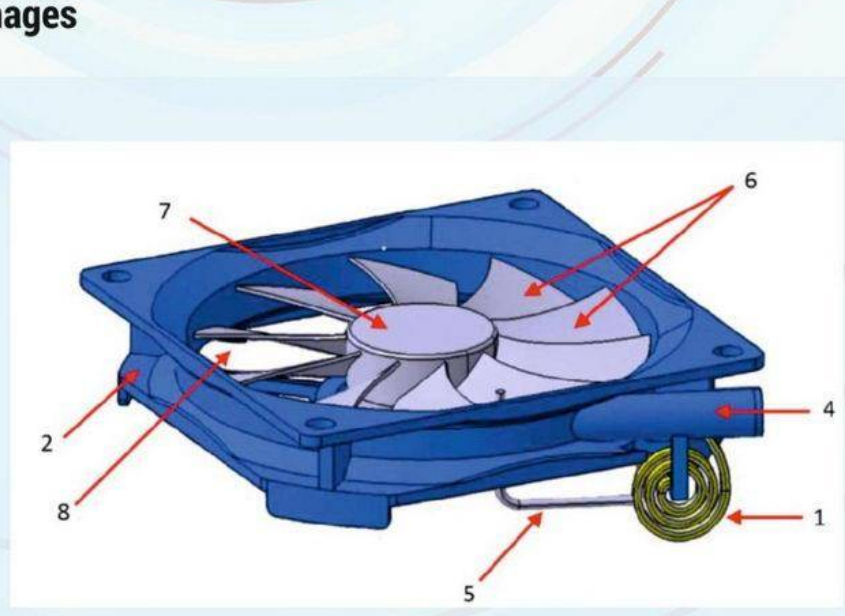
Short presentation

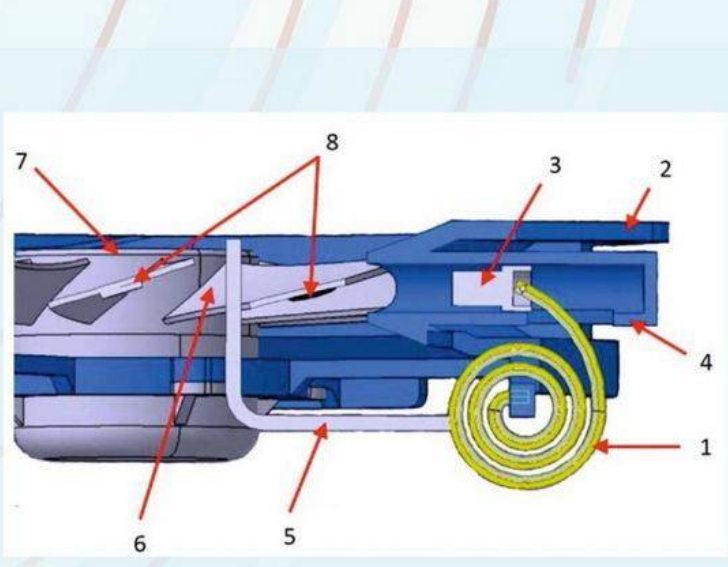
The problem of achieving a proper thermal management of a battery that equips an electric vehicle, is given by the process of thermal demand (heating) of the electrochemical cells that form the battery, during the operation of the electric propulsion group of the electric vehicle. Battery thermal stress is directly related to the required electric power required by the powertrain to achieve dynamic parameters (speed, acceleration, torque to the wheels, etc.) required by operating conditions. The invention relates to a passive device for performing the thermal management of a battery that equips an electric vehicle, by automatically maintaining the temperature (within predetermined limits) inside the housing of a battery that equips an electric vehicle using the interaction between two opposite magnetic fields.

Applicability

Different energy sources, batteries, electric of hybrid vehicles, thermal management systems and/or devices

Images





1-bimetallic spring; 2-ventilator case; 3-primary magnet; 4-guidance;
5-mobile arm; 6-blade; 7-rotor; 8-secondary magnet.

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Title

PASSIVE DEVICE FOR VENTILATION OF A BATTERY EQUIPPING AN ELECTRIC VEHICLE

Inventor/s - Contact

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TECHNICAL UNIVERSITY OF CLUJ-NAPOCA, AUTOMOTIVE ENGINEERING AND TRANSPORT DEPARTMENT, florin.mariasiu@auto.utcluj.ro

Patent/ Application number

PATENT APPLICATION OSIM: A/00449/2019

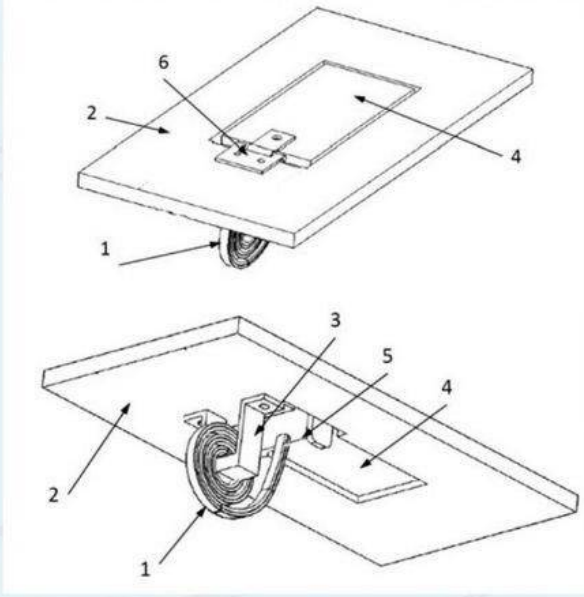
Short presentation

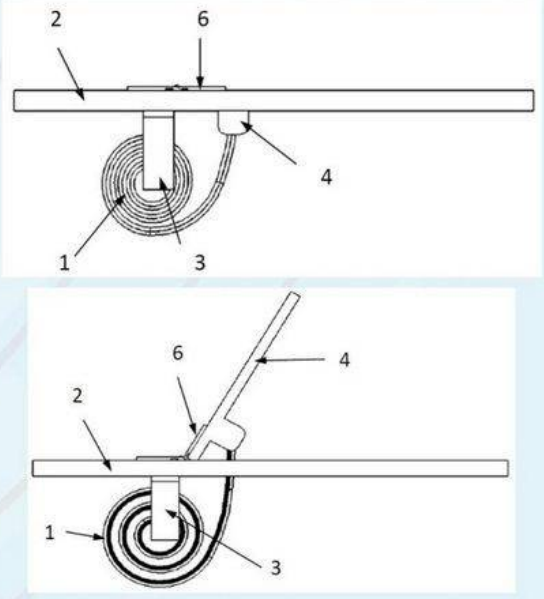
The functional performance of a battery equipped with an electric or hybrid vehicle is directly influenced by the ambient temperature in which they operate. At present, it is considered that for the functioning of a battery built on Lithium-ion technology (the most used at present) under optimal conditions, the temperature range of the internal environment in which the electrochemical cells are located must be between -15°C and +60°C. The invention relates to a passive ventilation device of a battery that equips an electric vehicle, by automatically maintaining the temperature (within predetermined limits) inside the battery housing of an electric vehicle.

Applicability

Different energy sources, batteries, electric of hybrid vehicles, thermal management systems and/or devices

Images





1-bimetallic spring; 2-battery case; 3-mechanic system; 4-mobile plate; 5-fixing system; 6-hinge.

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Title

DECONTAMINATION PROCESS BY WASHING OF HEAVY METAL POLLUTED SOILS USING POTASSIUM SALTS OF HUMIC ACIDS AND CHITOSAN AS WASHING AGENTS

Inventor/s - Contact

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Patent/ Application number

PATENT APPLICATION OSIM: A 00557/ 11.09.2019

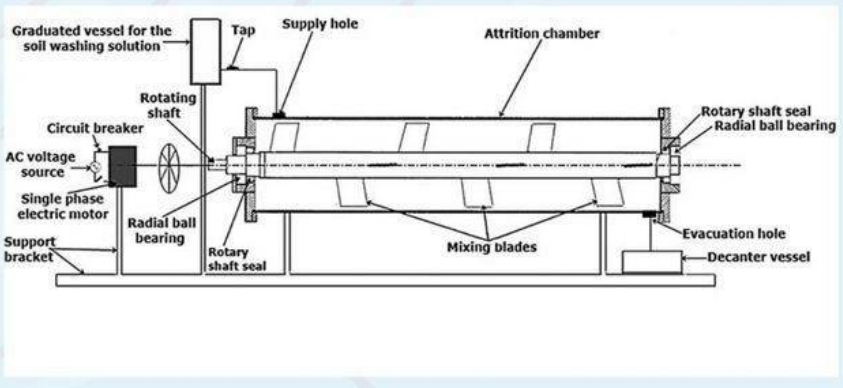
Short presentation

The process uses a suitable mixing and shredding installation where the contaminated soil together with the washing solution containing potassium salts of humic acids and chitosan is introduced into the attrition chamber, inclined at 1 with respect to the horizontal plane. The stirring of the mixture in the attrition chamber is performed with 12 mixing blades arranged on a rotating shaft and inclined at 3 with respect to the rotating shaft. The rotating shaft is driven by an electric motor. This decontamination process by washing of heavy metal polluted soils ensures a high contact of the soil particles with the washing solution, which leads to high efficiency. It also eliminates the need for soil sorting on small particle size prior to decontamination and is also an ecological process due to the nature of the washing agents used. By using this process in the case of treating, in a single step and under optimal conditions, an amount of 400 g of sandy soil contaminated with heavy metals with an initial concentration of 633.05 $mgkg^{-1}$ of lead, 424.81 $mgkg^{-1}$ of copper, 201.76 $mgkg^{-1}$ of zinc, 45.38 $mgkg^{-1}$ of chromium and 13.68 $mgkg^{-1}$ of nickel using a washing agent containing 5% soluble potassium salts of humic acids (pH=9.60), in a soil:solution ratio of 1:5 (g:mL) and a stirring time of 360 minutes at 700 rpm, the decontamination efficiency reaches 99.06% and 37.65% in the case of lead and copper, respectively. In the case of treating, in a single step and under optimal conditions, an amount of 250 g of the same sandy soil using a washing agent containing 2% chitosan (pH=7.88), the decontamination efficiency reaches 91.02% and 49.79% in the case of lead and copper, respectively.

Applicability

Decontamination of soils polluted with heavy metals - an innovative soil washing process for decontamination of soils polluted with heavy metals using soluble potassium salts of humic acids and chitosan have been developed. The soil washing installation developed for this process can also be adapted to treat polluted soil with organic pollutants and to use other washing agents. Ecological rehabilitation of heavy metal polluted sites – a larger capacity soil washing plant based on this patent can be used for the ecological rehabilitation of heavy metal polluted sites.

Images



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Title

EX-SITU BIOREMEDIATION PROCESS OF HYDROCARBON POLLUTED SOILS USING *PSEUDOMONAS* AND *BACILLUS* MICROORGANISMS

Inventor/s - Contact

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Patent/ Application number

PATENT APPLICATION OSIM: A 00683/19.09.2017

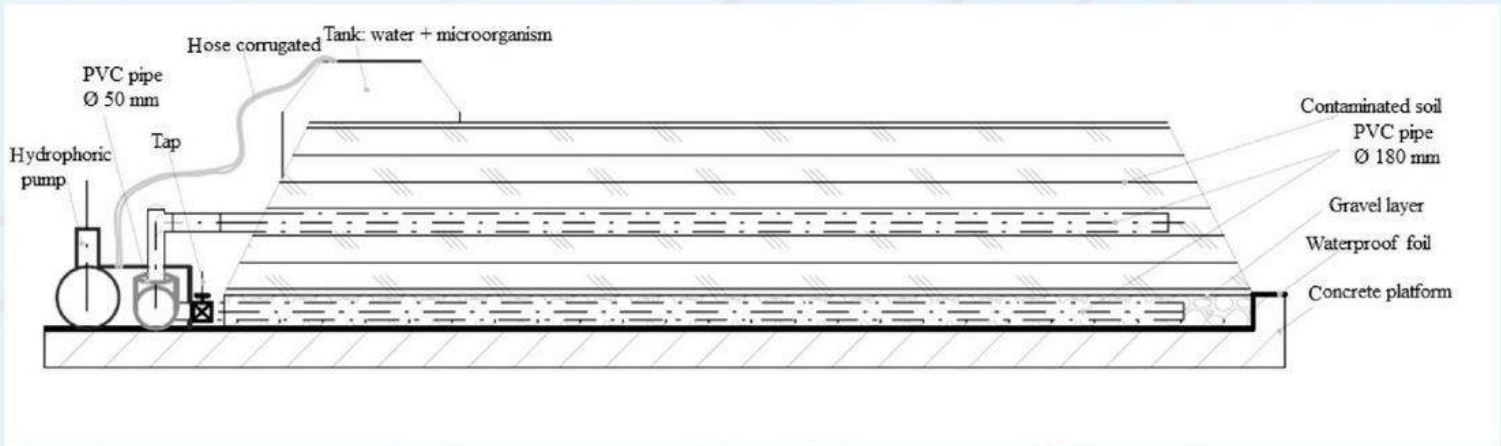
Short presentation

Soil polluted with petroleum hydrocarbons (with an initial concentration of 4280 mg kg^{-1}), after sorting and homogenization is mixed with nutritive substances (C/N/P 100:10:1) and microorganisms and placed in a pile (Lxlxh:3000x1400x500 mm). The pile of soil is placed on an impermeable surface consisting of a concrete platform over which plastic foil was added. At the bottom of the pile is placed a drainage layer made of gravel (4-7 mm diameter), inside which is introduced the pipe system through which aeration and wetting is carried out. The system for introducing water and the solution with nutrients and microorganisms $151x10^5$...$213x10^7$ CFU/g of soil (*Pseudomonas* and *Bacillus*) consists of a tank with a capacity of 100 L, a hydrophoric pump with a flow of 50 L/min, corrugated hoses and a blower. The discharge hose is connected to the distribution network that consists of an Ø 180 mm PVC pipe branched into five perforated Ø 50 mm PVC pipes, placed horizontally in the middle of the pile. Research carried out at pilot scale level for 12 weeks at the following parameters: 28-30% moisture, temperature of 24-26 °C, pH of 7.5-8, 5 days a week and 8 h a day aeration, with a flow of 50 m^3/min, have shown a decrease in the concentration of pollutant below 1000 mg kg^{-1}. Results obtained on the pilot scale model have shown a high depollution yield: 83%.

Applicability

Decontamination of soils polluted with hidrocarbons – there have been developed an innovative solution for ex-situ bioremediation of contaminated soils with hydrocarbons. This process can also be adapted to treat polluted soil with other pollutants such as heavy metals. Soil treatment based on this patent can be used for the ecological rehabilitation of hydrocarbons polluted sites: areas with oil exploitation, areas related to fuel stations, accidental pollution. It is a process of reducing the impact on the environment, it has low costs and it is suitable for treating large quantities of soil.

Image



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Title

INNOVATIVE PARALEL ROBOT FOR LOWER LIMB REHABILITATION

Inventor/s - Contact

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Patent/ Application number

PATENT APPLICATION OSIM: A00391/27.06.2019

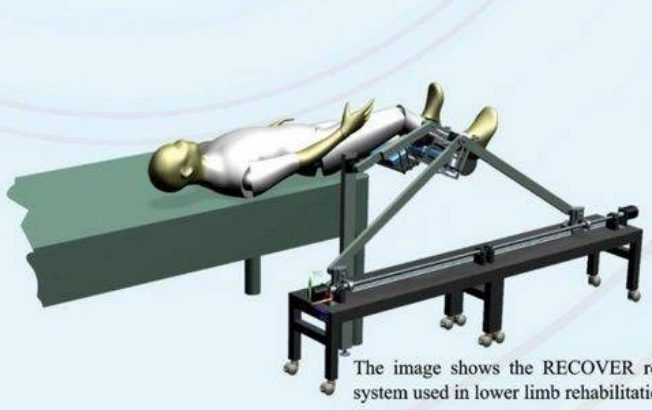
Short presentation

The present invention (RECOVER) is a parallel robotic system designed for the post stroke rehabilitation of the lower limb for bedridden patients. The robotic system consists of two parallel robotic modules which are connected to each other to achieve the rehabilitation of the main joints of the lower limb (the hip, the knee and the ankle). The first rehabilitation robotic module (the hip/knee module) is based on a 2 DOF planar mechanism and it is designed for hip and knee flexion and extension. The module incorporates a passive motion kinematic chain (with no active joints) on which the lower limb of the patient is mounted and guided by two input motion kinematic chains. The second rehabilitation robotic module (the ankle module) is based on a 2 DOF spatial mechanism which guides a mobile platform together with the patients' foot in spherical motion achieving the ankle flexion/extension and inversion/eversion motions. The lower limb main segments are entirely supported by the robotic system and can achieve various rehabilitation exercises in a reliable manner with very low risk of joint injury.

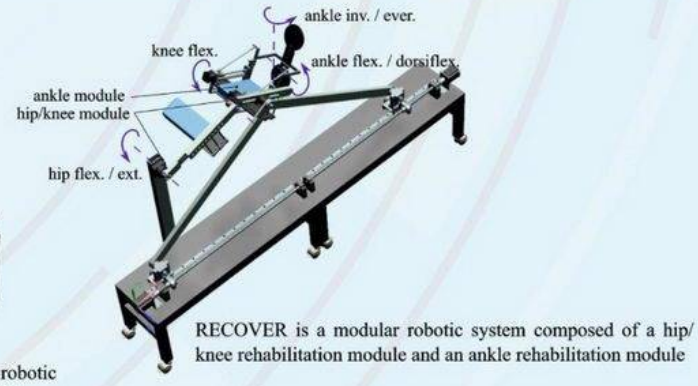
Applicability

Medical Robotics, Post Stroke Rehabilitation

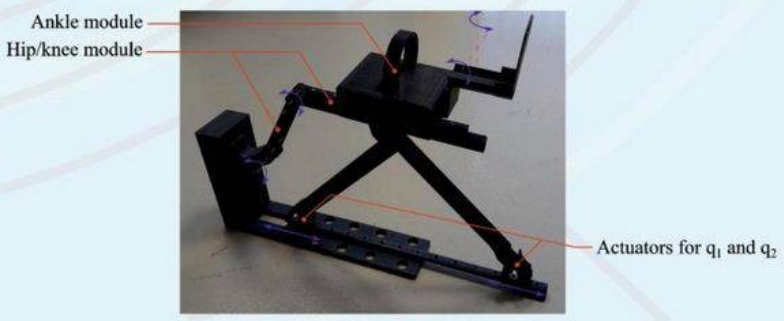
Images



The image shows the RECOVER robotic system used in lower limb rehabilitation



RECOVER is a modular robotic system composed of a hip/ knee rehabilitation module and an ankle rehabilitation module



RECOVER 3D scaled mockup

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Title

PARALLEL ROBOT FOR THE RECOVERY OF LOWER LIMB MOBILITY

Inventor/s - Contact

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Patent/ Application number

PATENT APPLICATION OSIM: A00752/15.11.2019

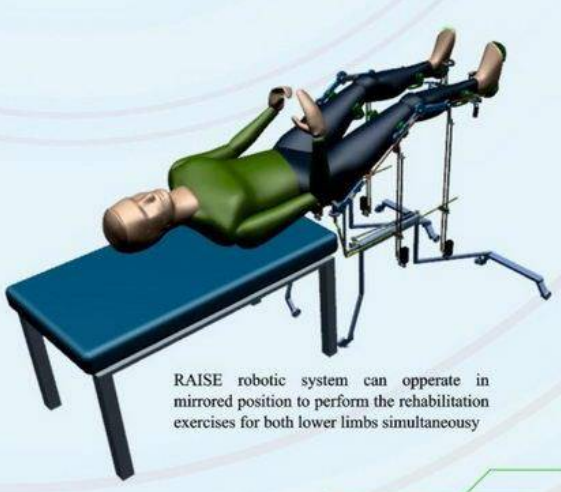
Short presentation

The present invention relates to a robotic system for the rehabilitation of the lower limb of post stroke patients, a system consisting of two robotic modules that are coupled to perform the medical rehabilitation process of the entire lower limb. The first module is designed for the rehabilitation of the hip and knee joints whereas the second module is designed for the rehabilitation of the ankle joint. The hip and knee module has 3 degrees of freedom for the recovery of the flexion / extension and abduction / adduction of the hip and the flexion / extension of the knee and the ankle module has 2 degrees of freedom for the recovery of dorsiflexion / flexion and inversion / eversion of the ankle. The specific application of the robotic system proposed in the present invention is the recovery of the mobility of the lower limb by moving the anatomical joints with the aid of the robotic system that supports and moves each segment of the lower limb in a controlled manner. The novelty brought by the robotic system proposed in this patent has a modular structure, with an improved rigidity compared to the existing ones (in particular the serial ones), allowing the mobilization of the joints of the lower limb in a controlled way which offers the therapeutic advantage of allowing a wider range of recovery exercises compared to existing systems.

Applicability

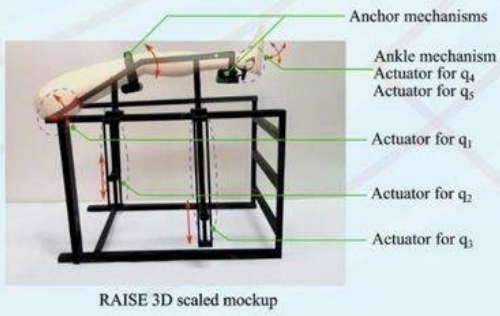
Robotics, Medical Robotics, Post-Stroke Rehabilitation, Paralel Robots

Images



RAISE robotic system can opperate in mirrored position to perform the rehabilitation exercises for both lower limbs simultaneousy

RAISE targets the main anatomic joints of the lower limb (hip, knee, ankle)



RAISE 3D scaled mockup

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Title

CIRCUIT AND METHOD FOR BALANCE OF PHASES IN A THREE-PHASE POWER SUPPLY SYSTEM

Inventor/s - Contact

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Asist. drd. ing. Elena-Mirela ȘTEŢCO, Alexandru-George BERCIU
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Patent/ Application number

PATENT APPLICATION OSIM: A/00124/03.06.2019

Short presentation

The invention relates to an automatic system capable of balancing the power consumption for the three – phases power network. The system consists of current sensors for each phase, a digital control unit, modules for switching consumers between phases, keyboard for the user interface, electronic display and optical warning indicators. The proposed invention achieves a redistribution of consumers during their operation by measuring the electric current from each phase. A switch unit is operated so that consumers are redistributed in a balanced way across the three phases, thus optimizing energy consumption and avoiding disturbances in the electricity supply network. The switches are designed in such a way that the switching time does not affect the entire operation.

Applicability

Energy

Images

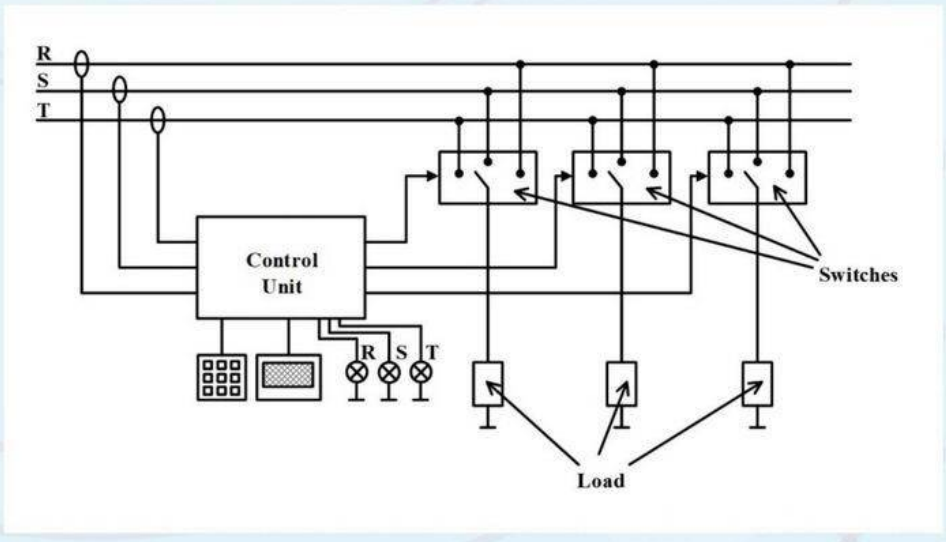

Fig.1. Block Diagram

Fig.2. Prototype

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Title

ACTIVE CELL BALANCING SYSTEM SYNCHRONIZED WITH THE CHARGING PROCESS

Inventor/s - Contact

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RUBA Mircea, mircea.ruba@emd.utcluj.ro

Patent/ Application number

PATENT APPLICATION OSIM: A/00390/12.08.2019

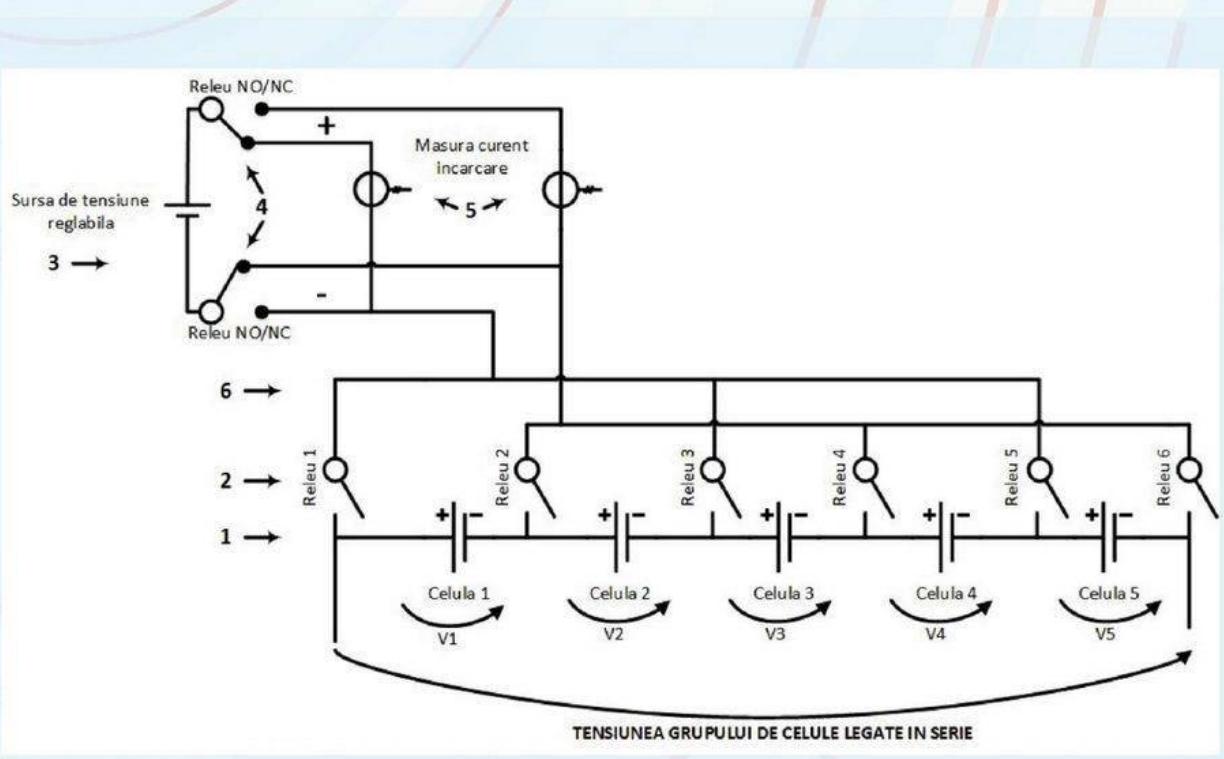
Short presentation

The patent refers to an active cell balancing system synchronized with the charging process, without losses, flexible and capable to charge a specific cell or a group of cells. The connections from the supplying source to each cell is realized through relays. Using these connections each cell can be charged separately. The balancing process is realized during the charging procedure by measuring the voltage of each cell in the pack and by controlling the relays accordingly.

Applicability

Electrical Engineering

Images



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Title

ROTARY-LINEAR MOTOR FOR THE INTEGRATED PROPULSION AND ASSISTED STEERING DRIVE OF ELECTRICAL VEHICLES

Inventor/s - Contact

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Patent/ Application number

PATENT APPLICATION OSIM: A/00446/24.09.2019

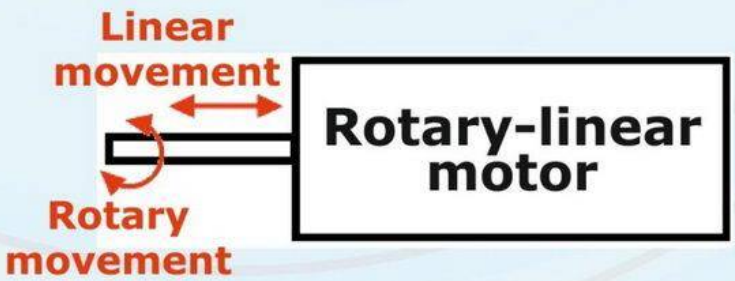
Short presentation

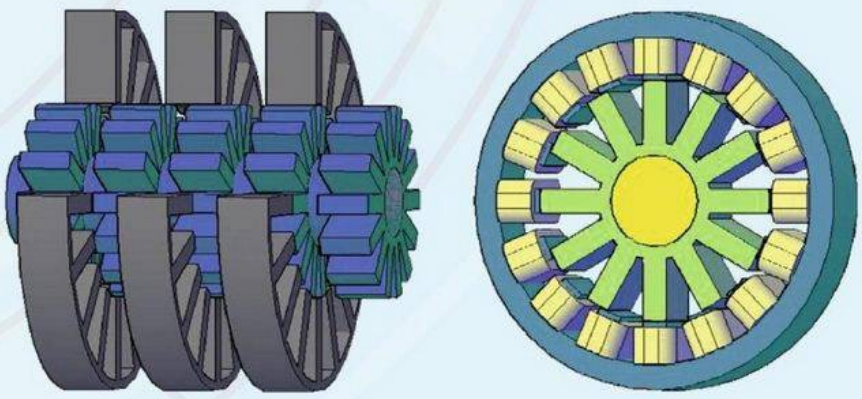
The invention relates to the use of a single rotary-linear switched reluctance motor for integrated driving of both the propulsion and assisted steering of electrical vehicles. The motor shaft can perform both a rotary motion, which can rotate the vehicle wheel at a variable speed, and a linear one, which cab actuate the electric steering system of the vehicle.
The application of the invention offers the advantages of simplification by reducing the number of electric motors required to drive the propulsion and steering system of electric vehicles with the direct and independent driving of the wheels, by reducing the volume and mass required for these two drive systems.

Applicability

Electrical vehicles

Images





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Title

THERMAL MANAGEMENT ACTIVE DEVICE FOR A BATTERY THAT EQUIPS AN ELECTRIC VEHICLE

Inventor/s - Contact

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Patent/ Application number

PATENT APPLICATION OSIM: A/00703/2019

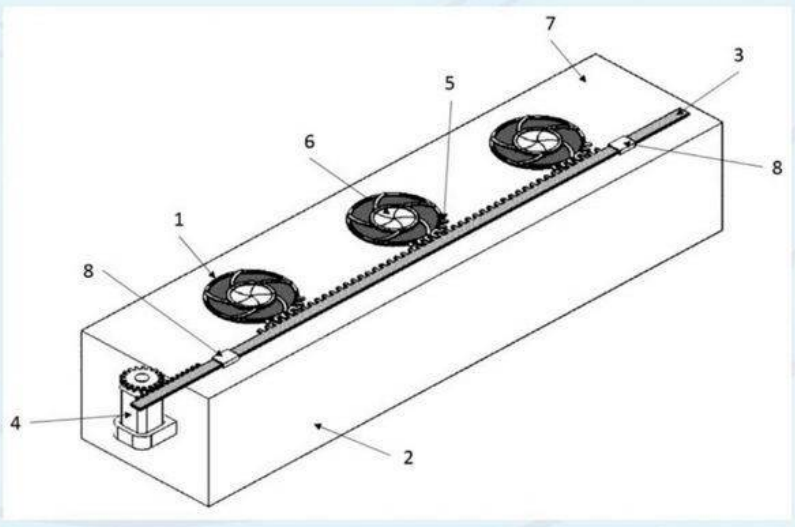
Short presentation

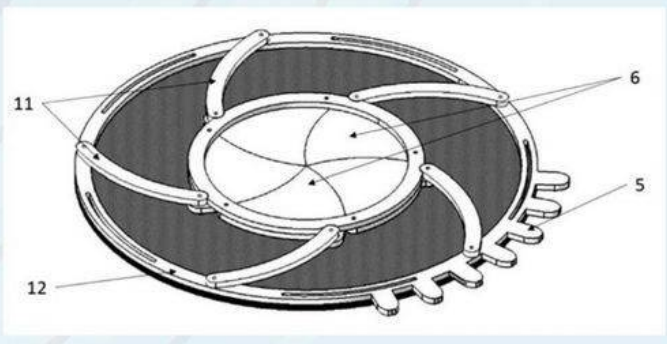
The problem solved by the invention by the active control device of the thermal management of a battery that equips an electric vehicle is maintaining a preset temperature (desired by the manufacturer depending on the dynamic performance of the electric vehicle) inside the battery housing, by natural ventilation with air at the ambient temperature of the electrochemical cells, by controlling some ventilation holes adjustable as air flow allowed. The active control device for the thermal management of a battery that is equipped with an electric vehicle is characterized by the fact that the principle of active operation is based on the sequential opening of some ventilation holes that allow the elimination of the heat inside the housing of a battery that equips an electric vehicle, in depending on the thermal charge of the battery.

Applicability

Different energy sources, batteries, electric of hybrid vehicles, thermal management systems and/or devices

Images





1-ventilation hole; 2-battery; 3-toothed rack; 4- electric motor step by step;
5- toothed sector; 6-slot; 7-housing; 8-guide;11-lever; 12- ring.

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Title

METHOD OF ELECTRODEPOSITION OF ZINC-NICKEL ALLOY ON STAINLESS STEEL SUBSTRATE

Inventor/s - Contact

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Patent/ Application number

PATENT APPLICATION OSIM: A/00673/23.10.2019

Short presentation

The invention relates to a method of zinc-nickel alloy electrodeposition on the stainless steel parts through several stages. Electrodeposition of zinc-nickel alloy on stainless steel is important in applications where stainless steel is in contact with a less noble metal. Electrodeposition of zinc-nickel alloy on stainless steel is used especially in the automotive industry. The method of electrodeposition of the zinc-nickel alloy on a stainless steel substrate according to the invention consists of: chemical degreasing (only if the parts are dirty, oily); washing in water; surface preparation in alkaline solution; washing in water and electrolytic zinc in alkaline Zn-Ni solution.

Applicability

Chemical industry, automotive industry, telecommunications industry, planes, boats and ships in harsh environmental corrosive conditions.

Images

(a)
Electrodeposition of the zinc-nickel alloy without using the method claimed on stainless steel substrate.

(b)
Electrodeposition of the zinc-nickel alloy by the claimed method, on stainless steel substrate

©
Stainless steel without electrodeposition

Images with parts obtained by electrodeposition of zinc-nickel alloy on stainless steel substrate

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Title

SPECIAL AND COMPATIBLE MORTARS USED IN REPAIRING MICROFISURES, FISURES AND CRACKS IN THE CASE OF HERITAGE BUILDINGS

Inventor/s - Contact

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Prof. Emerit Dr. Ing. ILDIKÓ BUCUR [ilbucurro@yahoo.com]

Patent/ Application number

PATENT PENDING

Short presentation

One of the main criteria for the restoration of heritage buildings may have are the aspect, composition and durability of the material used for the repairs. Rimetea Village, from the Alba county, was resurrected by the renovation of the 19th century houses made of stone masonry. Due to humidity, improper interventions with cement mortar, an uneven load or a structural element degradation, the masonry suffers and as a consequence mocrofisures, fisures and cracks appear; now we need a diagnose from specialists and the involvment of the owners. The laboratory experiment where we mixed ground Podeni calcar stone with different types of cement or hydraulic lime goal is to make compatible mortars suitable for the natural material masonry and increasing the resistance of the heritage building.

Applicability

In the field of constructions especially for the reparation of the masonry's microfisures, fisures and cracks in case of the heritage buildings

Images

The house before repairs

New materials with milled stone content for repairs, tested in the laboratory

The house after repairs

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Title

EXPLORATORY STUDY ON STEEL BAR DISSIPATING DEVICE

Inventor/s - Contact

Alin Mihali [1,*], Pedro Basto [2], Corneliu Cismașiu [3], Válter José da Guia Lúcio [3], Cosmin Gruia Chiorean [1]
[1] Technical University of Cluj-Napoca, Romania [2] CCPI, Military Academy (Portuguese Army), Lisbon, Portugal [3] CERIS and NOVA School of Science and Technology, Lisbon, Portugal
*Alin.Mihali@mecon.utcluj.ro

Patent/ Application number

PATENT PENDING

Short presentation

This research proposes, in the context of blast mitigation in structures, the use of an energy-dissipating mechanism. To assure the structural resilience, the large deformations needed to dissipate the massive energy will be driven towards this non-structural energy-dissipating bars disposed behind panels and fixed to the main structure. When subjected to a blast load the panels will deform and transfer the blast pressure through the energy-dissipating bars to the structure. These bars limit the peak loads transferred to the main structure. After an event, the panels and energy-dissipating bars can be replaced quickly allowing the building to regain its functionality in a short period of time.

Applicability

According to Global Terrorism Database™ bombing/explosion is by far the number one attack type preferred by the terrorists. This has led to a renewed interest in blast-resistant structures for civilian and military uses. Thus, this energy-dissipating mechanism is intended to be integrated in a complete solution that is expected to provide blast resistant potential.

Images

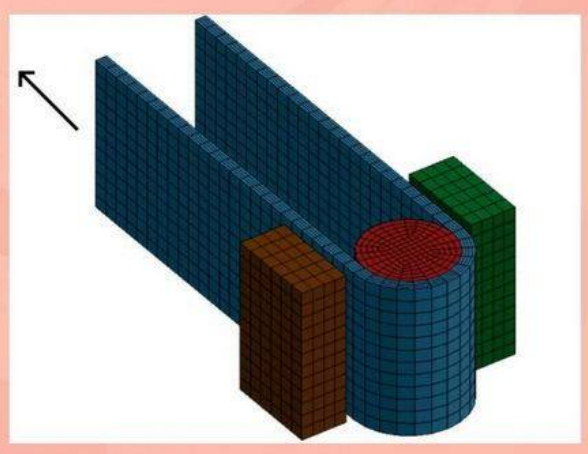

Figure 1. 3D view of the FE model

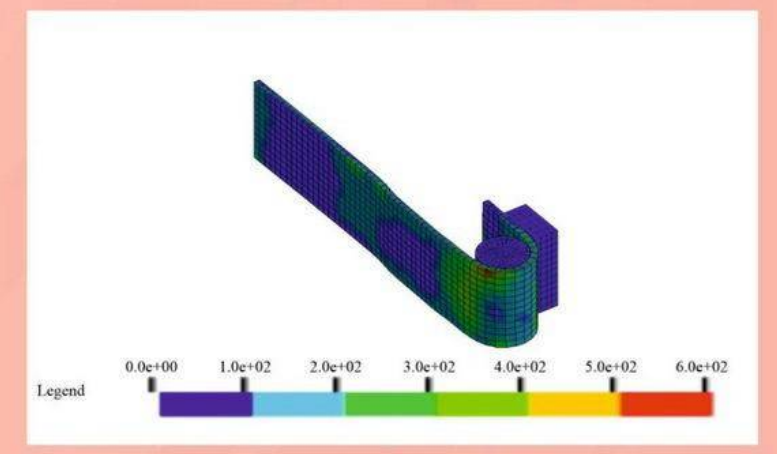

Figure 2. Von Mises stress at full elongation

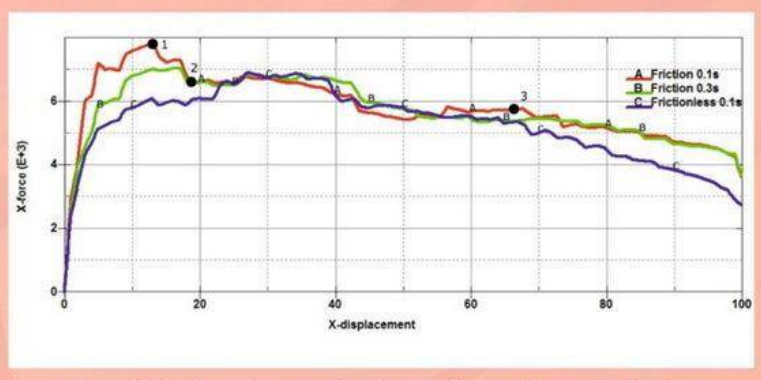

Figure 3. X-direction reaction force for models with friction (0.1 sec and 0.3 sec analysis time) and frictionless

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Title

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

Inventor/s - Contact

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Patent/ Application number

Patent Pending

Short presentation

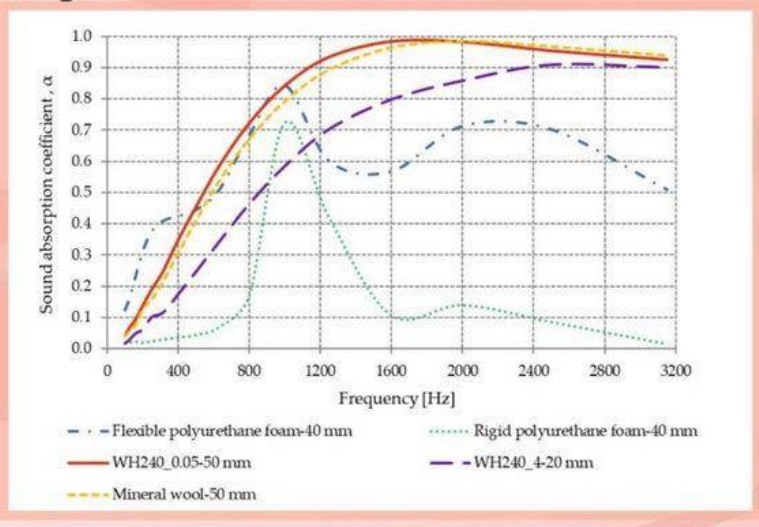
The aim of this study is to obtain new materials with sound absorbing properties using the sheep's wool as raw material. Seven new materials were obtained by hot pressing (60 ÷ 80 °C and 0.05 ÷ 6 MPa) of wool fibers and one by cold pressing. Results shown that by the simply hot pressing of the wool, 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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THE INFLUENCE OF BLAST FURNACE SLAG ON ABRASION RESISTANCE FOR ROAD CONCRETES

PhD St. Liliana Maria Nicula[1]/ Senior Scientific Researcher PhD. Eng. O. Corbu[*1,2,3]/ Prof. PhD. Eng. M. Iliescu[1]
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Introduction

Acest studiu are în vedere o analiză comparativă a rezistenței la abraziune și compresiune între amestecuri de betoane rutiere realizate cu materiale artificiale și betoane rutiere realizate cu materiale convenționale.

RESEARCH

S-a utilizat zgura de furnal, sub formă granulată și măcinată și sub formă de aggregate concasate în proporțiile stabilite în tabelul 1. Zgura de furnal provine din industria siderurgică de la compania ArcelorMittall din Galați. Experimentul s-a desfășurat pe 3 amestecuri de beton rutier cu zgură cuptor și pe 2 amestecuri de control cu materiale convenționale. Dozajele de ciment utilizate au fost de 360 kg/m³ pentru amestecul S 360c, S 54/20, S 54/40, S 54/60 și de 414 kg/m³ pentru amestecul S 414c.

Artificial materials of the mixtures	Compared with (GGBS) added	Compared with (GGBS) substitution
0 kg GGBS/ 0% ACB	S_{360}0/0- control	S_{414}0/0- control
54 kg GGBS/ 20% ACB	S 54/20	S 54/20
54 kg GGBS/ 40% ACB	S 54/40	S 54/40
54 kg GGBS/ 60% ACB	S 54/60	S 54/60

Table 1. Name of the mixtures ;
GGBS- ground granulated blast furnace slag under 63µm :ABS- crusched artificial aggregates from blast furnace slag, 0/4mm

Metode:

Rezistența la uzură s-a încercat pe discul abraziv a aparatului Böhme, marca Matest prezentat în figura 2, în accord cu standardul SR EN 1338:2004/AC:2006, Anexa H prin metoda pierderii în volum. Încercarea s-a efectuat pe epruvete cubice cu latura de (71 ±1,5) mm uscate la masă constantă la vârsta de 100 și 150 zile. Metoda presupune evaluarea pierderii de volum după 16 cicluri de testare, fiecare ciclu având 22 de rotații. Pe pista de încercare s-a împrăștiat 20 g material abraziv, epruveta s-a fixat în dispozitiv cu fața de încercat pusă pe pistă și s-a aplicat central o forță de (294±3) N. După fiecare ciclu s-a curățat discul, s-a înlocuit materialul abraziv și fața de contact a epruvetei s-a rotit progresiv la 90° (figura 1). Pierderea de volum s-a calculat ca raport între pierderea de masă și densitate, din media obținută pe 3 epruvete. Rezultatele s-au încadrat apoi în clase de rezistență la abraziune ca în Tabelul 2.

Table 2. The abrasion resistance classes.

Class	Marking	Conditions
1	F	No measured performance
3	H	≤18000 mm²/5000 mm²
4	I	≤20000 mm²/5000 mm²

Figure 1. Böhme device.

Rezistența la compresiune s-a determinat în acord cu SR EN 12390-3:2002 pe 3 cuburi de 150 mm pentru fiecare amestec la vârsta de 100 și 150 zile. Testul a fost efectuat cu presa digitală hidraulică de tipul Advantest 9, de 300tf din laboratorul universității tehnice.

Acknowledgements Thank you for the support of Technical University of Cluj-Napoca and EUROINVENT Iași , 12th 2020.

RESULTS

Rezultatele pierderilor de volum a epruvetelor testate la 100 și la 150 de zile și rezistențele la compresiune sunt prezentate în figura 2 și 3.

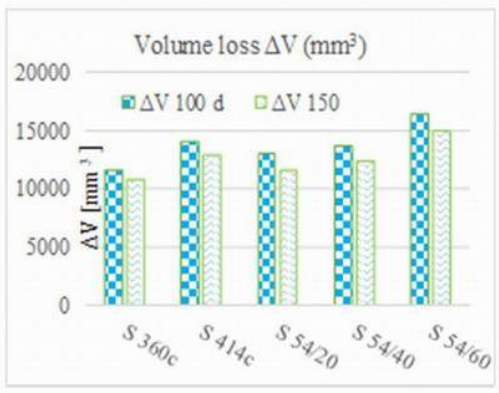


Figure 2. Volume loss through wear,

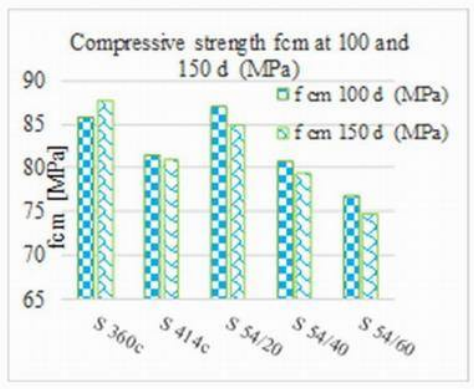


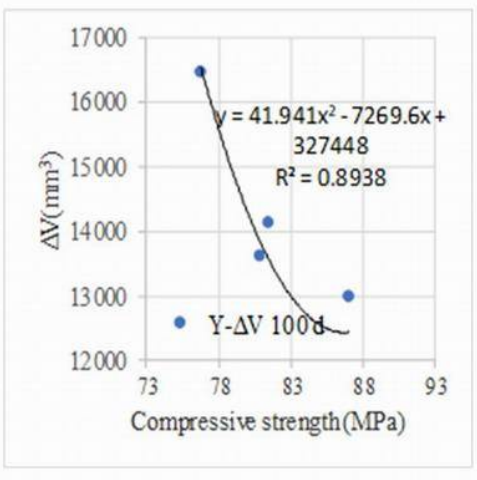
Figure 3. Compressive strength

În analiza efectuată pierderile de volum mai mici indică rezistențe la uzură mai mari, sau invers.

Proporțiile de materiale combinate în amestecurile cu zgură de furnal S 54/20 și S 54/40 au condus la pierderi de volum sub nivelul amestecului de referință S 414c realizat cu materiale convenționale, însă peste nivelul acestuia la amestecul S 54/60.

În comparație cu amestecul de referință S 360 pierderile de volum au fost apropiate la amestecul S 54/20 , dar mai mari la amestecurile cu 40% și 60% zgură de furnal.

Pentru amestecul S 54/20 s-au obtinut rezistențe la compresiune peste nivelul amestecului de referință S414c și apropiate cu cele obținute la S 360c. Însă odată cu creșterea nivelului de substituție de agregate din zgură de la 40% spre 60%. rezistențele la compresiune au fost în scădere.



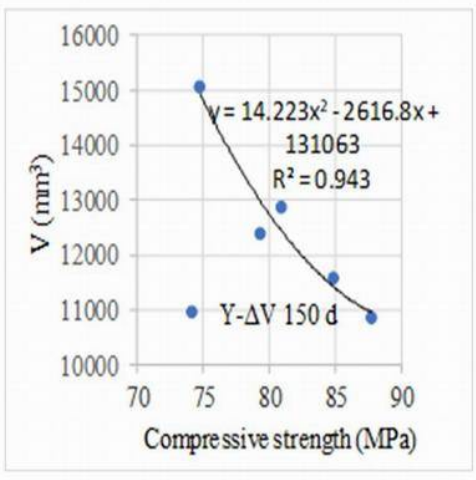


Figure 4. The relationship between compressive strength and volume loss a) at 100 days, b) at 150 days.

CONCLUSION

I. O concluzie generală desprinsă din acest studiu este că o creștere a rezistenței la compresiune conduce la creștere a rezistenței la uzură și implicit la scăderea pierderii de masă din încercarea la uzură.

II. Între cele două caracteristici studiate s-a dezvoltat o relatie matematică polinomială de gradul doi care arată o regresie a pierderi de volum din încercarea la uzură odată cu creșterea rezistenței la compresiune, ca în figura 4a) și 4b).

III. Amestecurile de beton realizate au înregistrat la toate vărstele pierderi de volum mai mici decât 18000 mm²/5000 mm² valori care au permis încadrarea la clasa de rezistență la abraziune 3 cu marca H, în accord cu clasificarea din Tabelul 2.

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METHODS FOR ASSESSING THE FREEZE-THAW RESISTANCE OF ROAD CONCRETE USED IN OUR COUNTRY AND AT EUROPEAN LEVEL

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Faculty of Civil Engineering, Technical University of Cluj-Napoca, Romania

Introduction

The paper addresses three methods of assessing the freeze-thaw resistance of road concretes prepared with conventional and artificial materials. The first method is frequently used in our country, and the second and the third method are used at European level.

RESEARCH

We used the blast furnace slag, as artificial material, granulated and grounded and as crushed aggregate coming from the steel industry from the company ArcelorMittall in Galați. The experiment was carried on three types of road concrete with oven blast furnace slag and on 2 control mixtures with conventional materials (figure 1).

Artificial materials of the mixtures	Series A- with (GGBS) added	Series B-with (GGBS) substitution
0 kg GGBS/ 0% ACB	S_{360}0/0- control	S_{414}0/0- control
54 kg GGBS/ 20% ACB	S 54/20	S 54/20
54 kg GGBS/ 40% ACB	S 54/40	S 54/40
54 kg GGBS/ 60% ACB	S 54/60	S 54/60

Figure 1. Name of the mixtures ;
GGBS- ground granulated blast furnace slag under 63µm :ABS- crusched artificial aggregates from blast furnace slag, 0/4mm

1st Method: Determining the freeze-thaw resistance using the destructive method, in compliance with the national standard SR-3518:2009. We used samples with 150 mm side undergoing 150 and 300 freeze-thaw repeated cycles. The admissibility condition was that the compressive resistance losses of the samples kept in the thermostat chamber should not decrease with more than 25% compared to the control samples kept in water.

2nd Method: Measuring the exfoliated mass on the concrete surface, in compliance with SR CEN/TS 12390-9:2009. We poured thaw solution (3% NaCl), a thickness of 3 mm on the surface of concrete stripes of 150x150x50 mm, tested at 7, 14, 28 and 56 freeze-thaw repeated cycles (see figure 2). The acceptance criteria were in compliance with the Swedish standard SS 13 72 44 (the Borås method).

Figure 2. Collecting the exfoliated material, weighting the mass after drying in the dryer, replacing the testing medium with a new one (3% sodium chlorine).

3rd Method: By percentage decrease of the relative dynamic modulus of elasticity (RDM) in compliance with CEN/TR 15177:2006. The method is based on measuring the propagation time of ultrasonic impulses (UPTT) between the opposite sides, on the length of the 150x150x50 mm sample. The propagation time (UPTT) was measured before and after 28, respectively 56 freeze-thaw cycles. The acceptance criterion was based on the equivalent performance of the mixtures containing blast furnace slag and the mixtures made with conventional materials.

Acknowledgements

Thank you for the support of Technical University of Cluj-Napoca and EUROINVENT Iași , 12th 2020.

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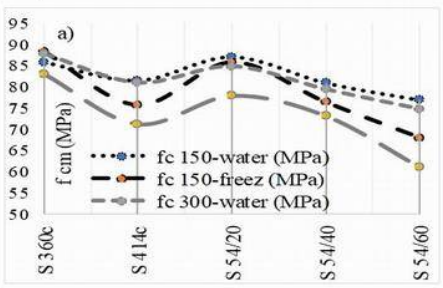
RESULTS

1st Method: Freeze-thaw results using the destructive method, (SR-3518:2009), fig.3a) and 3b).



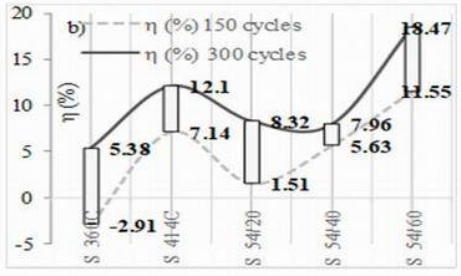
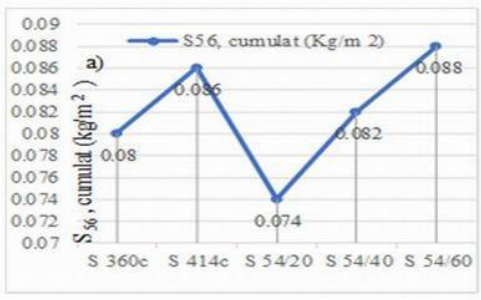


Figure 3. a) Compressive strengths and b) compressive strengths losses after 150 and 300 cycles, (MPa).

2nd Method: Freeze-thaw resistance by measuring the exfoliated mass of the sample surface, (SR CEN/TS 12390-9:2009), fig. 4a) and 4b).



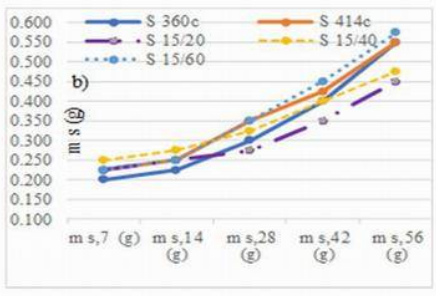
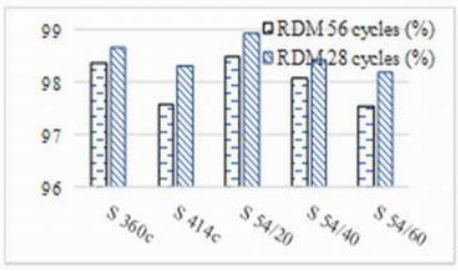
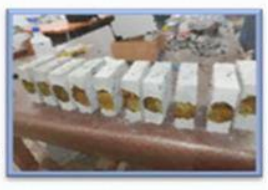


Figure 4. a) Cumulated exfoliated concrete quantity S56; b) Exfoliated mass at 7, 14, 28, 42 and 56 cycles

3rd Method: Freeze-thaw resistance by percentage decrease of the relative dynamic modulus RDM of elasticity, (CEN/TR 15177:2006), fig.5), fig.6a) and fig.6b)



a)



b)

Figure 5. RDM at 28 and 56 freeze-thaw cycles; Figure 6. a) and b) Images for measuring (UPTT).

CONCLUSION

I. The results show that replacing the cement with 54 kg (GGBS) and up to 40% natural aggregates (0/4 mm) with artificial aggregates with crushed blast furnace slag (ABS), the measured parameters are above the level of the control mixture S 414c. Which is why the material proportions combined in the mixtures S 54/20 and S 54/40 led to performances equivalent with the control mixture S 414c. Moreover, the mixture S 54/20 obtained results close to those of the control mixture S 360c, for which the values were the best in this experiment.
II. For the mixture with blast furnace slag S 54/60 we obtained results below those of the control mixtures, both in assessing the internal damages (method 1 and 3), and assessing the structure surface damages (method 2), caused by the increase of porosity in the structure of this mixture.
III. In all mixtures the compressive strengths losses determined with the 1st method are lower than the 25% limit, (figure 3a and 3b).
IV. The total exfoliated mass S_{56} was smaller than 0.1 kg/m^2 in all the mixtures we made, criterion that classified the concrete with very good exfoliation resistance (method 2).
V. The 2nd method is considered to be the most severe freeze-thaw resistance assessment method in road concrete. But, methods 1 and 3, which show the internal damages of the structures, are complementary, the first one shows the size of the damage, while the second shows the evolution in time.

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THE FEMORAL COMPONENT OF A MODULAR-ADAPTIVE HIP STENT, USING AN ELASTIC CENTRAL ROD THAT ENCLOSES SEVERAL METAL SPHERES AND CONSTRUCTION MODULES

Patent Number: A00104/26.02.2020
Patent Assignee: UNIV CRAIOVA

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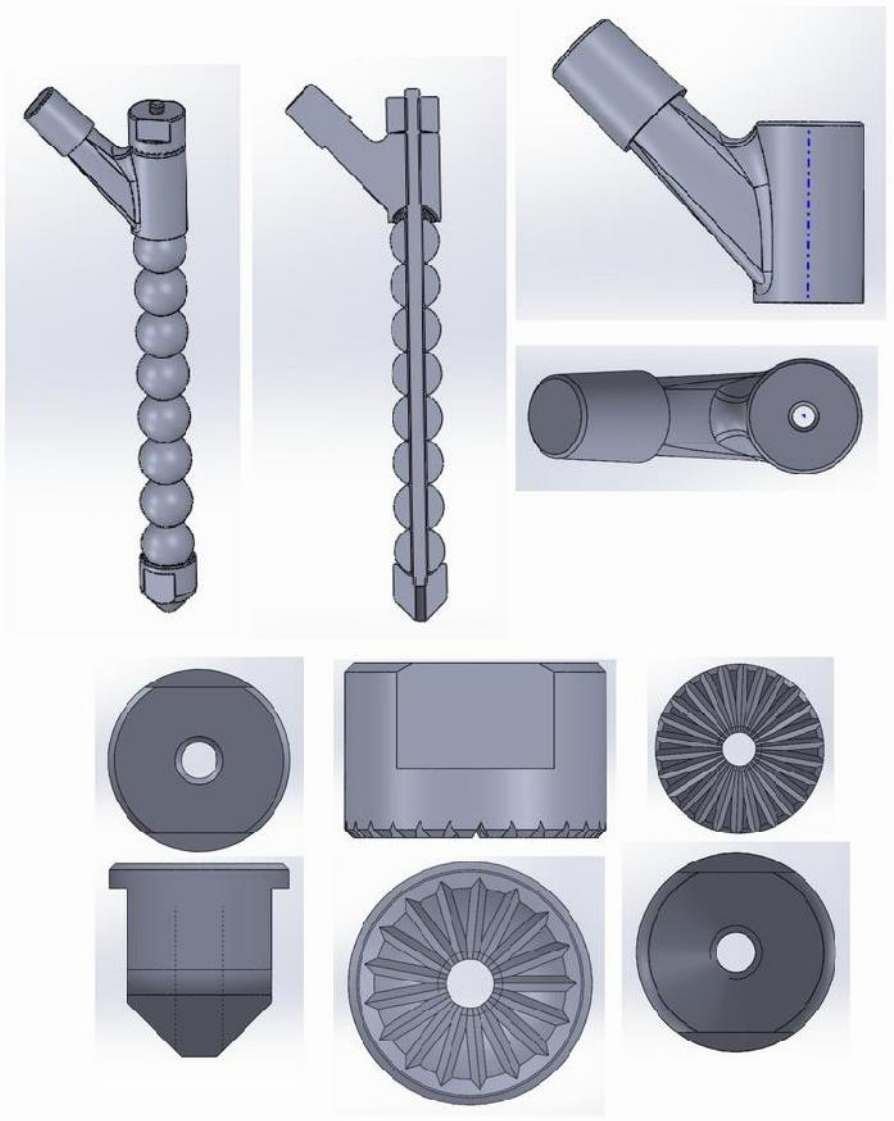
Description

The invention consists of a modular hip stent, which allows the adjustable selection and assembly of the component parts before insertion into the medullary canal of the femur, to allow the adjustment of the cervical-diaphyseal anteversion angle as needed, to allow a continuous fixation and partition of the endoprosthesis stent in the medullary canal, to allow a reduction of the tensions and deformations developed in the bone by taking part of them by the elasticity of the central rod and to offer possibilities of resolving the possible fractures of the femur at the tip of the prosthesis.



Applications

Orthopedics, Traumatology

Advantages

1. Is modular and adaptable to any type of femoral diaphysis;
2. Does not allow micro movements between the stem and the femoral bone;
3. Stability is ensured by continuous compression;
4. It avoids the appearance of degenerative - dystrophic injuries important at the level of the contact surface with the fracture focal point because the metallic spheres have a punctiform contact with the bone and not continuous as in the case of other prostheses;
5. Allows original solutions to resolve the femoral fractures at the tip of the femoral component of the stent;
6. Allows the extraction of the stem without loss of bone because the contact of the spheres with the bone is minimal.

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"Rugidom is a platform that connects producers of organic food with their consumers "

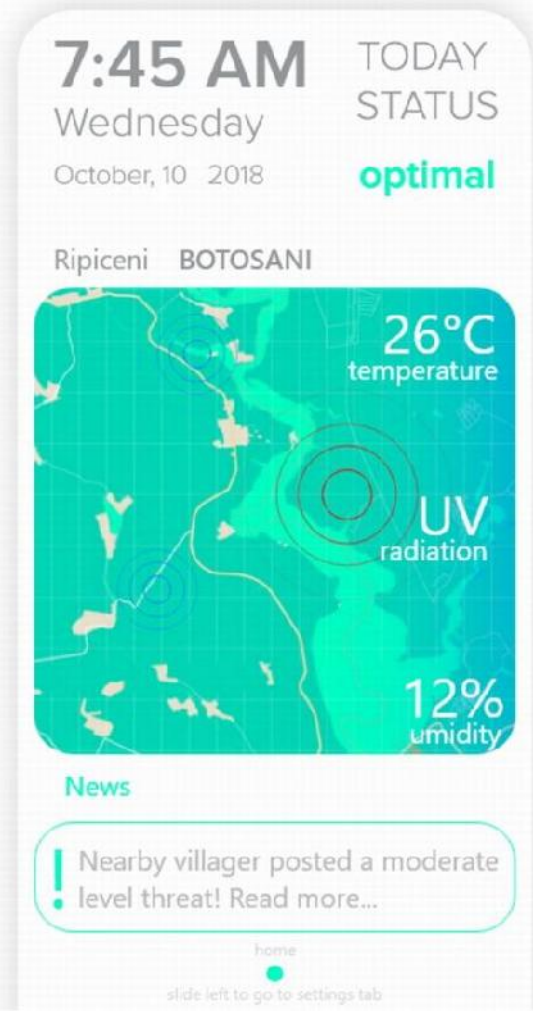
Andrei UNGUREANU[1], Florin Alexandru LUCA[2]
[1] *Phd student Alexandru Ioan Cuza University, Iasi, ROMANIA*
[2] *Gheorghe Asachi Technical University, Iasi, ROMANIA*

Following research has the scope of developing a prototype of a mobile application in the agro market field. The primary technology proposed will be blockchain crosslinked with mobile applications functionalities. Organic products have a spectacular growth in demand in Europe and thus in Romania as well. Even if the food market is not dominated by organic food, its social implications are to be considered for further research.

The questionnaire design was pre-tested and redesigned through personal interviews using email and online platforms during the two months. Chosen samples consisted of young farmers aged 18 to 40 and a large variety of consumers located in the Iasi metropolitan area. The results showed that both Rugidom application model aims to identify the farmers market products with the actual producers geographically and in a time-efficient manner. The scope is solving the ambiguity communication between the bio market and its consumers. The pandemic crisis experienced worldwide with COVID-19 emphasizes such importance, its priority being discussed on a large scale.

The first phase of Rugidom model is increasing public understanding and providing the mechanism and support needed for such technology. The model presented in the prototype has the mission consequently to connect, partner, and increase its benefits to improving the quality of life for Romanian citizens

The higher level of usage of the mobile application is more likely to trigger a favourable evaluation from both farmers and consumers; the interaction between future stakeholders could also be positively amplified.



Connecting the local farmers with their direct consumers helps both economic and social growth. Times require extensive technology to be used. Therefore, this study emphasises the use of blockchain technology for the benefit of human society.

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NATIONAL INSTITUTE OF INVENTICS, IASI, ROMANIA

ELECTRICAL SOCKET WITH MECHANIZED PULL OF THE PLUG

Cerere brevet (Patent application): 5248/18/06/2019

Inventatori (Inventors): Seghedin Neculai-Eugen, Chitariu Dragoș-Florin, Bocăneț Ana-Maria, Munteanu Adriana, Luca Alexandra, Cracan Arcadie, Andrusca Liviu, Suditu Gabriel, Dragoi Ina, Vatavu Cristina, Avram Elena

Rezumat

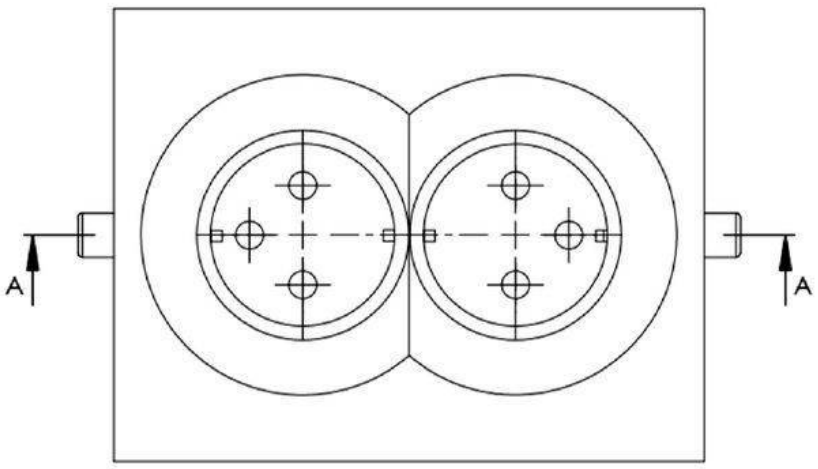
Invenţia se referă la o priză pentru alimentarea cu energie electrică prevăzută cu un mecanism pentru extragerea ştecărului.

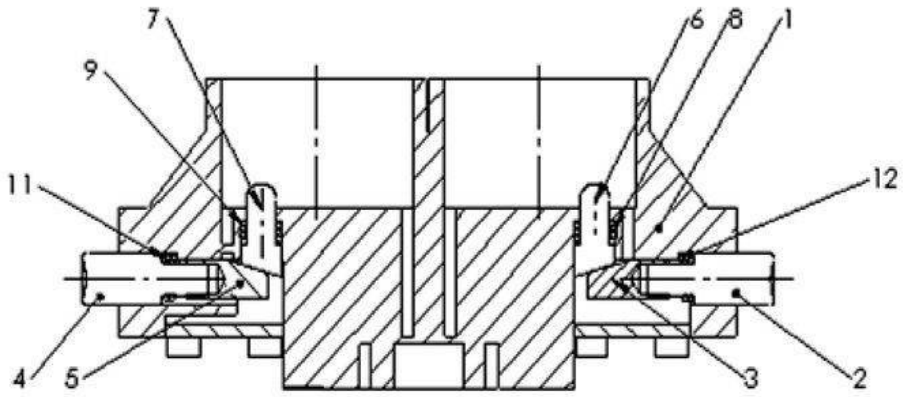
Problema tehnică pe care o rezolvă invenţia este realizarea unei prize care să permită extragerea mecanizată a ştecărului protejându-se legătura dintre priză şi locaşul acesteia.

Priza, conform invenţiei, este compusă dintr-un corp în care sunt amplasate două butoane diametral opuse care acţionează nişte pene care deplasează nişte plunjere ce acţionează asupra unui ştecăr în vederea extragerii acestuia, întreg mecanismul fiind retras în priză în stare liberă sub acţiunea unor arcuri.
Invenţia poate fi exploatată industrial la realizarea unor prize cu extragere automată a ştecărului fiind destinate alimentării unor aparate de uz casnic.

Priza, conform invenţiei, prezintă următoarele avantaje:
•Are un randament ridicat;
•Construcţie compactă;
•Prezintă un număr redus de elemente în mişcare;
•Prezintă un grad ridica de securitate a muncii;
•Soluţia propusă poate prezenta avantajul protecţiei copiilor prin reglarea unor elemente elastice care necesită aplicarea unor forţe mari în vederea extragerii ştecărului.

Priza, conform invenţiei, este compusă dintr-un corp 1 în care sunt introduse nişte butoane 2 şi 3 amplasate diametral opus. Butoanele 2 şi 3 acţionează asupra unor pene 4 ş 5 care deplasează nişte plunjere 6 şi 7 care, prin deplasarea axială produc extragerea unui ştecăr 10. Plunjerele 6 şi 7 sunt retrase în corpul prizei sub acţiunea unor arcuri elicoidale 8 şi 9. Butoanele 2 şi 3 sunt tensionate sub acţiunea unor arcuri 11 şi 12.





SECTION A-A

Abstract

The socket according to the invention is composed of a body in which two diametrically opposed buttons are arranged which act as feathers which move some plungers acting on a plug for extraction thereof, the whole mechanism being withdrawn in the free outlet under the action of springs .

The technical problem solved by the invention is to provide a socket for mechanically removing the plug by protecting the connection between the socket and the socket.

All the elements of the extraction mechanism are held in tension under the action of springs.

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NATIONAL INSTITUTE OF INVENTICS, IASI, ROMANIA

MECHANICAL PULL-OUT ELECTRICAL PLUG

Cerere brevet (Patent application): 5247/18/06/2019

Inventatori (Inventors): Seghedin Neculai-Eugen, Chitariu Dragoș-Florin, Bocăneț Ana-Maria, Munteanu Adriana, Fodor Dimitrie-Cristian, Rusu Oana, Chicet Daniela, Florea Raluca-Maria, Hudisteanu Sebastian Valeriu, Burlacu Andrei, Diac Maximilian, Parvan Costinela

Rezumat

Invenţia se referă la un ştecher pentru alimentarea cu energie electrică.

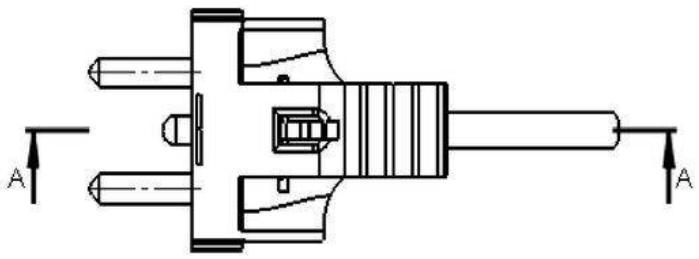
Problema tehnică pe care o rezolvă invenţia este realizarea unui ştecher care să poate fi extras cu o singură mână în mod mecanizat în vederea protejării legăturii dintre priză şi locaşul acesteia.

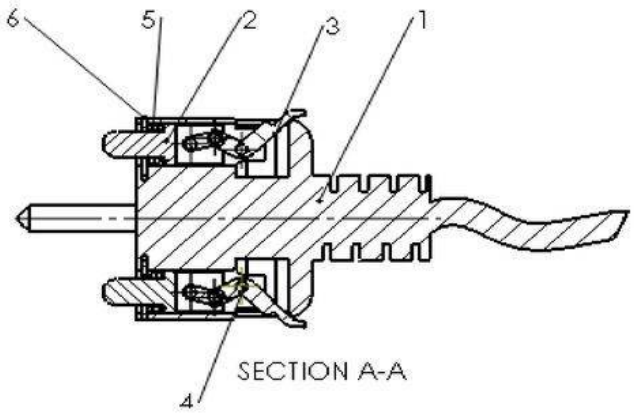
Ştecherul, conform invenţiei, este format dintr-un corp în care sunt prevăzute două plunjere care se deplasează axial sub acţiunea unor bare articulate care se rotesc datorită unor pârghii care sunt acţionate manual, deplasarea plunjerelor conducând la extragerea ştecărului, plunjerele intrând în contact cu corpul prizei.

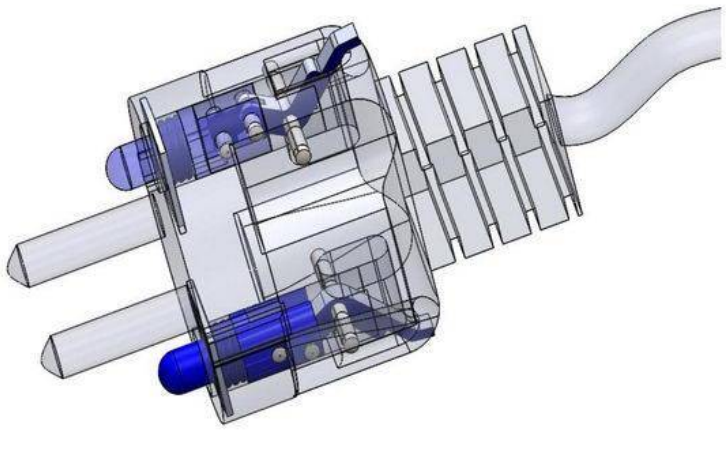
Invenţia poate fi exploatată industrial la construcţia ştecherelor pentru alimentarea cu energie electrică a aparatelor de uz casnic în vederea protejării legăturii dintre priză şi locaşul acesteia.

Ştecherul, conform invenţiei, prezintă următoarele avantaje:
•Permite extragerea ştecărului în condiţii de siguranţă cu o singură mână;
•Asigura protecţia legăturii dintre priză şi locaşul acesteia.

Ştecherul este realizat dintr-un corp 1 în care sunt introduse nişte plunjere 2 (două bucăţi) care se deplasează axial sub acţiunea unor bare articulate care sunt acţionate prin intermediul unor pârghii 3. Pârghiile 3 se rotesc în jurul unor articulaţii 4. Plunjerele 2 sunt menţinute într-o poziţie retrasă complet în corpul 1 al ştecărului sub acţiunea unor arcuri elicoidale 5. Arcurile elicoidale 5 sunt tensionate cu ajutorul unor inele de reţinere 6.







Abstract

The electrical plug according to the invention is formed by a body in which two plungers that move axially under the action of articulated rods which rotate due to levers which are hand actuated, the movement of the plungers is leading to the pull of the plug, the plungers coming into contact with the body of the socket.

The technical problem solved by the invention is to provide a plug that can be extracted with one hand in a mechanized manner to protect the connection between the socket and its housing.

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12th European Exhibition of Creativity and Innovation
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„Gheorghe Asachi" Technical University of Iaşi
Faculty of Machines Manufacturing and Industrial Management

NATIONAL INSTITUTE OF INVENTICS, IASI, ROMANIA

4 JAWS RECONFIGURABLE GRIPPER

Cerere brevet (Patent application): 5274/25.02.2020

Inventatori (Inventors): Păduraru Emilian, Chitariu Dragoș-Florin, Chifan Florin

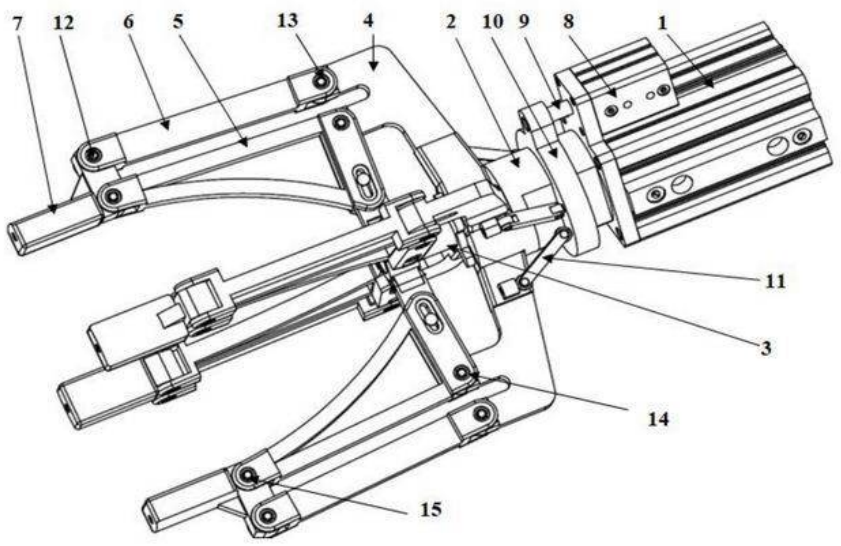
Rezumat

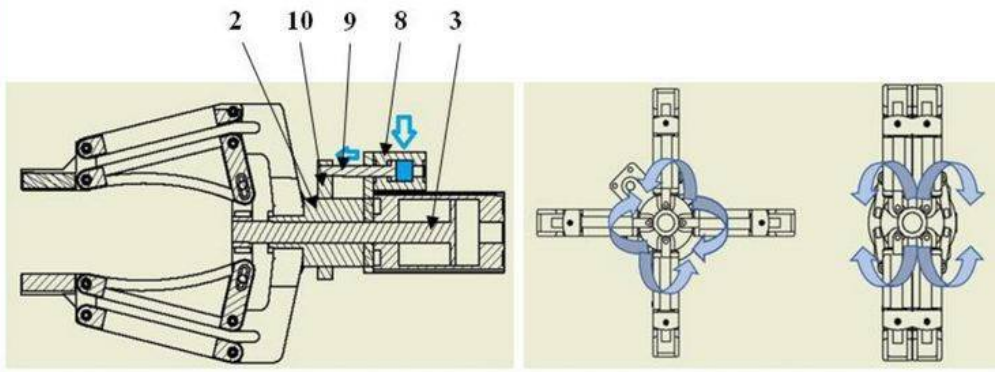
Invenția se referă la un mecanism de prehensiune reconfigurabil cu 4 fălci ce deservește un braț robotic industrial pentru operațiuni complexe de prindere, manipulare și transfer de obiecte.

Problema tehnică pe care o rezolvă invenția este realizare unui mecanism de prehensiune reconfigurabil care să manipularea unor obiectelor cu tipo-dimensiuni diferite fără a fi necesară schimbarea mecanismului de prehensiune pentru îndeplinirea altor sarcini. Soluția propusă are o construcție compactă care permite montarea lui pe diferite tipuri de brațe robotice industriale, cu posibilitatea deservirii mai multor operațiuni de centrare-strângere și manipulare a obiectelor.

Mecanismul de prehensiune reconfigurabil cu 4 fălci, conform invenției, este alcătuit dintr-un cilindru pneumatic cu dublă acțiune principal (1) prins de corpul mecanismului (2) care prin intermediul unei tije (3) transmite mișcarea liniară la fălci (4). Fălcile sunt articulate prin intermediul a patru bare interioare (5) și a 4 bare exterioare (6). Pe cilindrul pneumatic cu dublă acțiune, principal (1) se află montat un cilindru pneumatic cu dublă acțiune, secundar (8). O tijă de acționare (9) transmite mișcare de la cilindrul pneumatic cu dublă acțiune, secundar (8) la o piesă de legătura (10). Piesa de legătura (10) acționează niște bare (11) care rabatează 2 fălci. Barele interioare și exterioare sunt legate la fălcile propriu-zise (7) și asigură deplasarea paralelă a fălcilor propriu-zise respectiv centrarea-strângerea prin bolțuri (12), (13), (14), (15).

Mecanismul de prehensiune modular, conform invenției, prezintă următoarele avantaje: posibilitatea de prindere și manipularea a unei game variate a pieselor cu forme și dimensiuni diferite; posibilitatea de auto-centrare; posibilitatea de prinde piese lungi (de tip bară); închiderea paralelă a bacurilor asigură o prindere fermă.





Abstract

The invention relates to a 4-jaw reconfigurable prehension mechanism (gripper) that serves an industrial robotic arm for complex operations of grasping, manipulating and transferring objects, without having to change the prehension mechanism to perform other tasks.

The mechanism consists of two main subassemblies: a subassembly that acts as a prehensor and a subassembly that allows reconfiguration / folding of the jaws thus transforming the four-jaw prehension mechanism, into a two-jaw prehension mechanism, in both constructive forms allowing a parallel liniar displacement of jaws.

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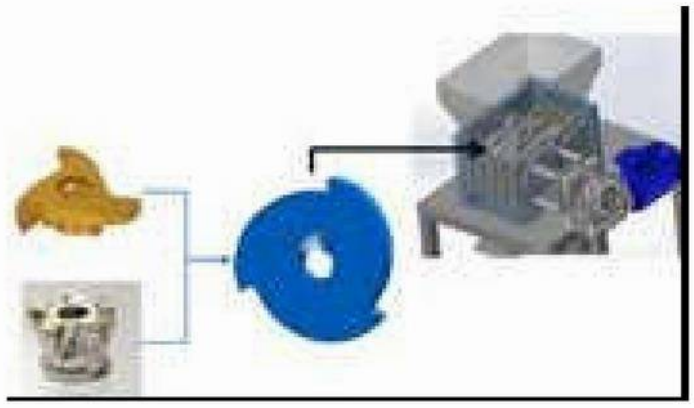
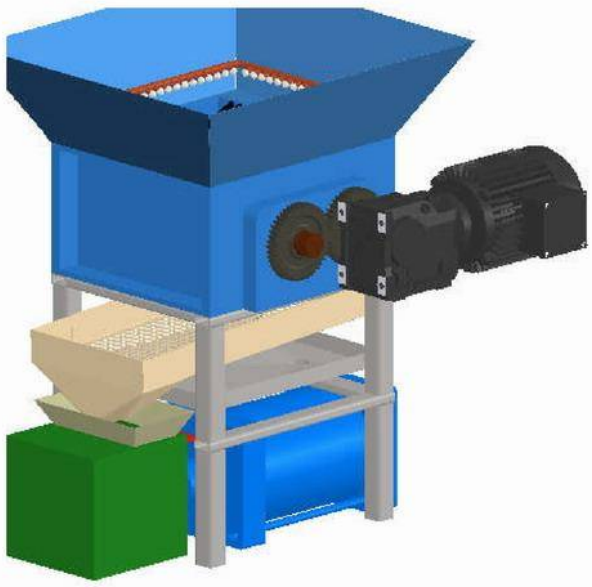
Energy efficient equipment for metallic chip fragmentation and compression

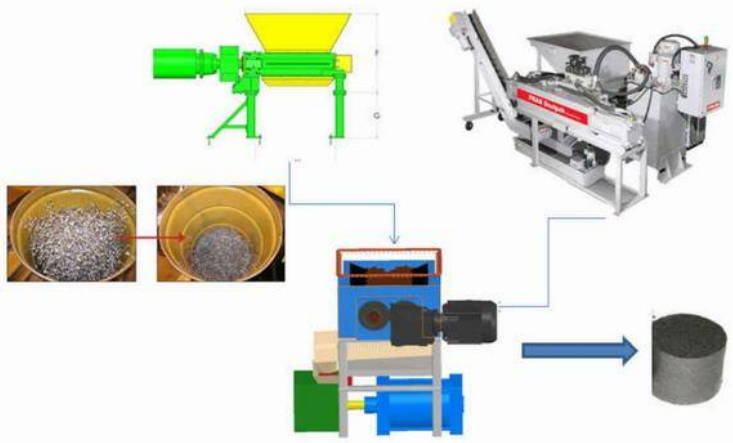
Proiect de cercetare (Research project): Contractul nr. 9PFE/2018 – team 10

Membri echipa de proiect (Research project team): Chitariu Dragoș-Florin, Păduraru Emilian, Chifan Florin

Obiectivul principal al proiectului este de a dezvolta un nou echipament hibrid pentru fragmentare / mărunțire - compresie / brichetare pentru așchii metalice rezultate în urma prelucrării în domeniul construcției de mașini.
Soluția propusă pentru echipamentele hibride noi pentru mărunțire / brichetare încorporează într-o structură singulară unitatea de fragmentare mecanică și compresie – unitatea hidraulică. Scopul principal este proiectarea unei familii modulare de echipamente hibride care au două funcții principale - 1 fragmentarea și compresia așchiilor metalice și 2 recuperarea lichidului de răcire-ungerea toxic folosit la prelucrarea CNC prin așchiere.
Soluția propusă are o construcție compactă care permite amplasarea în proximitatea mașinilor-unelte, cu posibilitatea deservirii simultane a mai multor mașini și realizează procesarea imediată a așchiilor, fără a fi necesare operații de manevrare suplimentare a așchiilor.
Echipamentul, propus, este alcătuit din două subansamble principale: un subansamblu pentru sfărmare și un subansamblu pentru compactarea așchiilor. În ambele subansamble sunt prevăzute elemente cu rol de separarea-colectarea lichidului de răcire ungere. Echipamentul utilizează resurse uzuale, existente la postul de lucru (energie electrică, aer comprimat).







Abstract

The main objective of the project is to develop a new hybrid equipment for fragmentation/ shredding - compression / briquetting for metal chips resulting from machining in machinery construction field.
The proposed solution new hybrid equipment for shredding / briquetting incorporates in a singular structure the shredder - mechanical fragmentation and compression - hydraulic components. The main goal is the design a modular family of hybrid equipment that have two main functions - 1 the fragmentation and compression of metal chips and 2 recover the toxic cooling oil used in CNC machining by briquetting.

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FORMULATION OF PHYTOCOSMETIC NANOEMULSION FOR TOPICAL THERAPY OF ACNE VULGARIS

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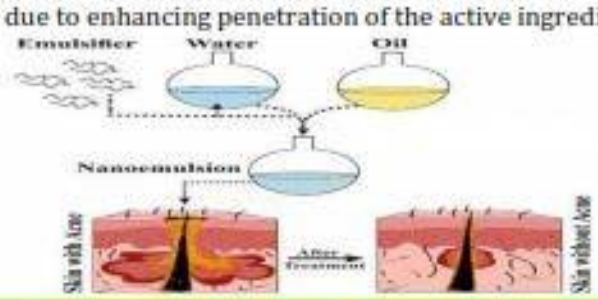
1 "Gheorghe Asachi" Technical University of Iasi, Faculty of Chemical Engineering and Environmental Protection "Cristofor Simionescu", Iași, România
2 Emergency County Hospital Piatra Neamț, Piatra Neamț, România

The objective of the current investigation was to design a nanoemulsion based on phytocompounds from *Salix nigra* (willow) bark extract and *Propolis glycolic* extract suitable for topical application in acne vulgaris treatment. The nanoemulsion formulated is "O/W" emulsion/ waterbased, which have *Hamamelis virginiana* hydrosol as a continuous phase and a synergistic combination of noncomedogenic oils as a dispersed phase. The phase oil is a combination of wet oils like: *Nigella sativa, Azadirachta indica, Cannabis sativa, Avena Sativa* and *Calophyllum inophyllum*. As a surfactant was used a non ethoxylated emulsifier based on vegetable-derived propanediol.

SYNTHESIS OF OINTMENT

Nanoemulsions as nano-sized emulsions represent an advanced mode of drug delivery which have potential in topical anti-acne therapy. They improve the delivery of active pharmaceutical ingredients and offer better options in topical acne treatment due to enhancing penetration of the active ingredients



HOW DO ACTIVE INGREDIENTS OF OINTMENT WORK?

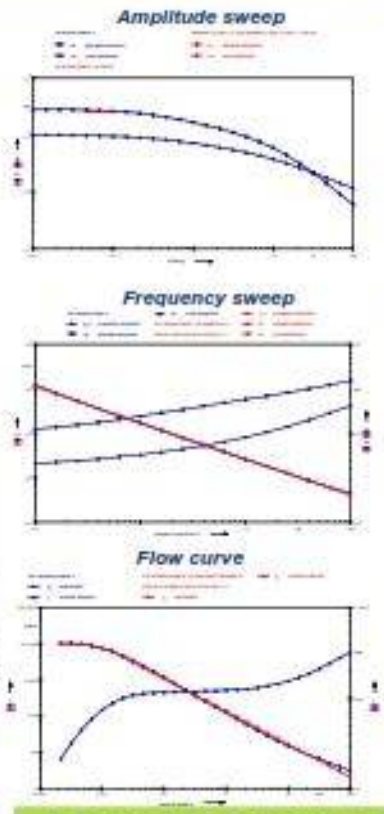
❖ **CONTINUOUS PHASE – 70 %**
***Hamamelis virginiana* hydrosol** - botanical anti-inflammatory effect, skin-soothing properties, astringent activity due to the high tannin content

❖ **DISPERSED PHASE: noncomedogenic oils – 14%**
Nigella sativa, Azadirachta indica, Cannabis sativa, Avena Sativa, Calophyllum inophyllum - deliver fatty acids and nutrients to the skin affected by acne which tend to have a deficiency of the fatty acid, linoleic acid

❖ **SURFACTANT/ EMULSIFIER – 7%**
Non ethoxylated emulsifier based on vegetable-derived propanediol
Lipomulse® Eco L - able to form liquid crystals which help enhance the stability of formulations, as well as improve moisturization of the skin. It is non-ionic in nature and compatible with anionic and cationic actives and excipients

❖ **ACTIVE INGREDIENTS**
***Salix nigra* (willow) bark extract – 8 %**
contains phytocompound like **Salicyline** wich is a natural derivate of salicilyc acid with non iriting effect. It works by acting as a keratolytic agent, softening the outer layer of the skin and causing the skin cells to shed more readily. It also helps unclog skin pores, but does not affect the oiliness of skin, nor the bacteria which causes acne.
***Propolis glycolic* extract- 1 %**
antioxidant effect due to the flavonoids, antibacterial, antiviral and antifungal effect due to the galangin, caffeic and ferulic acids

THERMO-RHEOLOGICAL STUDIES



- Knowledge of the rheological and mechanical properties of different cosmetic systems is important in the design of flow processes, for quality control, in predicting storage and stability behavior, and in understanding and designing their texture
- Cosmetic system have been studied using rotational and oscillatory rheological tests.
- Rheological parameters controlling processing, storage stability and application of these products have been determined.
- The studied system exhibited solid-like behavior, with different consistencies and degrees of structural stability. A good correlation between rheological parameters and sensory perception conferred to the cosmetics was found.
- Thus, it was found that the rheological properties, closely correlated with the sensory perception and the quality of the final product, depend mainly on the quality and the chemical composition of the cosmetic product.

ANTIMICROBIAL ACTIVITY EVALUATION

Evaluation of the antimicrobial activity of active ingredients *Salix nigra* (willow) bark extract and *Propolis glycolic* extract contained in nanoemulsion against *Propionibacterium acnes* was tested by disc diffusion method.

- Disc diffusion method is based on property of active ingredients to diffuse on the surface of a solid medium (inoculated with a specific germ). If nanoemulsion have an antimicrobial effect on the germ, an inhibition of bacterial growth on the surface of Petri dishes appears.

CONCLUSIONS

- ✓ **The formulated phytocosmetic nanoemulsion was found to be stable, with a homogenous texture and without signs of phase separation.**
- ✓ **The nanoemulsion exhibited suitable rheological characteristics.**
- ✓ **The results of antimicrobial activity evaluation showed that the active ingredients *Salix nigra* (willow) bark extract and *Propolis glycolic* extract from nanoemulsion determined inhibition zones of the test microorganisms (*Propionibacterium acnes*) growth.**
- ✓ **These results have provided evidence for the potential use of this phytocosmetic nanoemulsion for topical therapy of acne vulgaris.**

Aghaei Y, Ilkani M, Jahanian N, Shahnavaz Z, M Nafchi S, Sobhanipour M, K Kiguel (2015) *Medicinal Plants for the Treatment of Acne Vulgaris: A Review of Recent Evidences*, Jundishapur J Microbiol, 8(11): e25589

EUROINVENT – European Exhibition of Creativity and Innovation, Iasi, Romania, May 2020

Green Synthesis of Gold Nanoparticles Using Marine Red Algae Biomass for Technological Applications

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[2] „Gheorghe Asachi" Technical University of Iaşi, "Cristofor Simionescu" Faculty of Chemical Engineering and Environmental Protection, Organic, Biochemical Food Engineering Department

[3] "Al. I. Cuza" University of Iaşi, Faculty of Geography and Geology, Department of Geology, Iaşi, Romania

[4] Romanian Academy, Filial of Iaşi, Branch of Geography, Iaşi, Romania

Summary:

In recent years, nanoparticles have become particularly important for technological applications, but their preparation is often costly and laborious. The research aims to provide a cheap and green preparation of gold nanoparticles (Au NPs) using as reducing agent marine red algae biomass. The method is based on the simple mixing of a solution of gold(III) ions with marine red algae biomass (*Callithamnion corymbosum sp.)* in acid media (pH = 2.0), at room temperature (22 ± 1 °C). Atfer 6 hours of contact time, sferic gold nanoparticles are formed and their size is between 20 and 80 nm. The UV-VIS spectrum of the obtained gold nanoparticles showed a broad band in the region 543-547 nm, which corresponds to their surface plasmon resonance. The shape of the UV-VIS spectra does not change even after 15 days, which indicates that the obtained gold nanoparticles are stable at least during this period. FTIR, SEM and EDX methods have been used for the detailed characterization of gold nanoparticles, in order to confirm their size and dispersity. In addition, the kinetic studies allow us to design the mechanism for obtaining gold nanoparticles. Besides the short preparation time, high stability in aqueous solutions and simplicity, this method does not require gold solutions of high purity, wastewater from industrial activities can be also used. All these advantages are in agreement with the principles of green chemistry.

1. Au NPs preparation

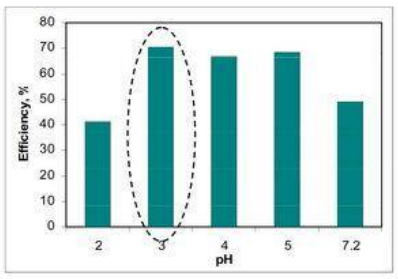
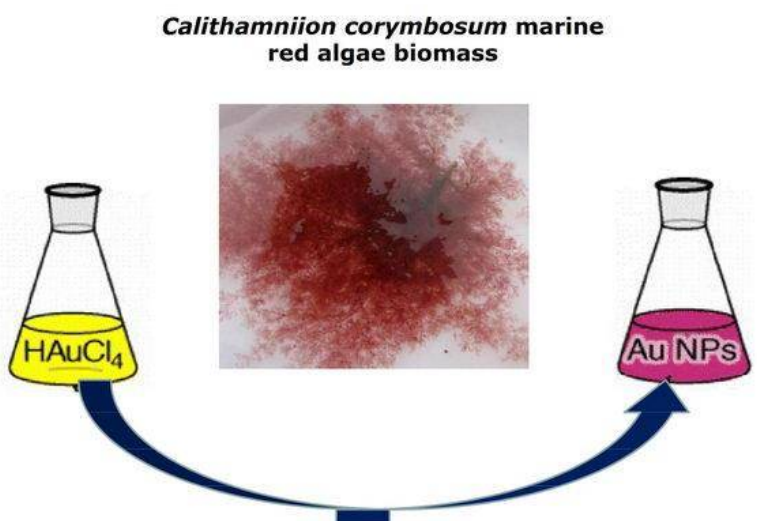
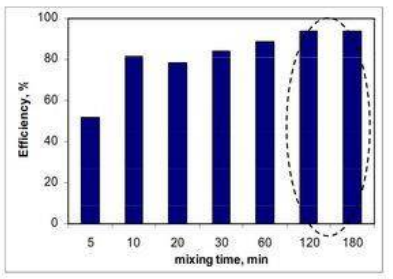


Fig. 1. Effect of pH and mixing ratio on the efficiency of obtaining Au NPs





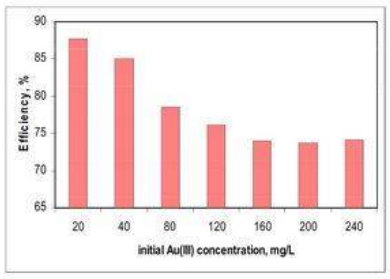
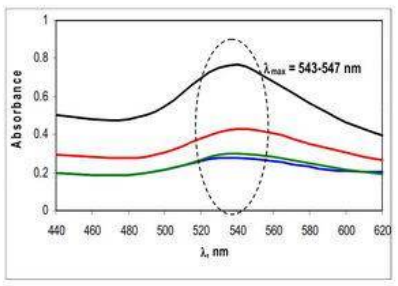


Fig. 2. Effect of contact time and concentration on the efficiency of obtaining Au NPs

2. Au NPs characterization



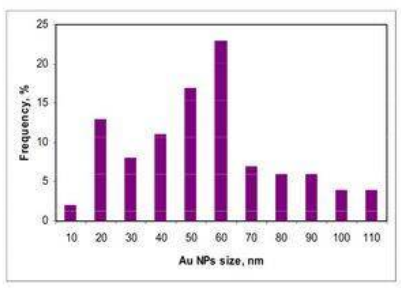
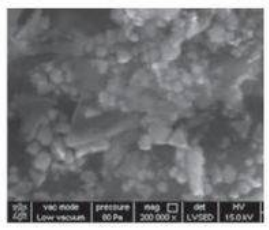


Fig. 3. VIS spectra and size distribution of obtained Au NPs



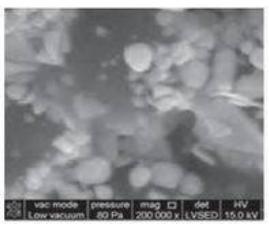


Fig. 4. SEM images of obtained Au NPs

Fig. 5. Economical importance of Au NPs
(https://www.gminsights.com/industry-analysis/gold-nanoparticles-market)

Titanium based alloy

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[3] *Universitatea Tehnică a Moldovei,* Bulevardul Ștefan cel Mare și Sfînt 168, Chișinău 2004, Republica Moldova
** E-mail: peviz2002@yahoo.com*

Abstract:
Ti-based alloys are widely used in medical applications, in the last decade. When implant devices are implanted to reconstruct disordered bone, prevent bone resorption and enhance good bone remodeling, the Young's modulus of implants should be close to that of the bone. To satisfy this requirement, many kinds of titanium alloys composed with different biocompatible elements (Zr, Ta, Mo, Si, Nb etc.) interact well with adjacent bone tissues, promoting an adequate osseointegration.

Patent Application no: MD 1981/2019

Invention:
The invention refers to the metallurgy of the alloys, namely to a titanium alloy. The titanium alloy, according to the invention, contains molybdenum and silicon. The components are taken in the following report,% mas:

silicon	0.25 ... 1.00
molybdenum	16.00 ... 20.00
titanium	the rest.

Ti-Mo-Si
NEW ALLOYS

The samples were produced by argon arc-melting.

The choice of material for the achievement of biomaterial depends on several factors

- biocompatibility
- type of interaction with the host
- implantation time
- modulus of elasticity
- wear resistance
- cytotoxic behavior

✓ **low elastic modulus**

✓ **increased resistance to corrosion**

✓ **good biocompatibility**

Conclusion:
From the experimental results it can be seen that the introduction of silicon into the binary Ti-Mo alloy of silicon increases the biocompatibility of the alloy, decreases the modulus of elasticity and improves the corrosion resistance.

Selected References:

[1] M. Niinomi, Mechanical properties of biomedical titanium alloys, ed. Mater. Sci. Eng., A 243, 1998, p. 231-236.
[2] C.N. Elias, J.H.C Lima, R. Valiev, M.A., Meyers, Biomedical applications of titanium and its alloys, ed. Biological Materials Science, 2008, p. 46 - 49.
[3] I. Antoniac, Handbook of Bioceramics and Biocomposites, 2016.

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.**

BIOCOMPATIBLE ALLOY AND METHOD OF PRODUCING THE SAME

"Gheorghe Asachi" Technical University from Iasi, Romania

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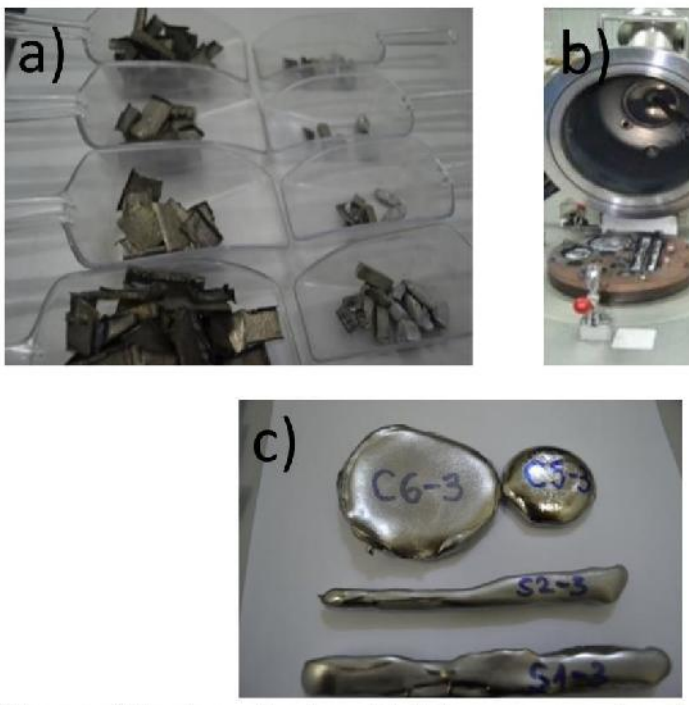
Patent Application no: No. PI2019006569/ 10.11.2019 on The Registrar of Patents Registration Office Kuala Lumpur, Malaysia

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:

A method of producing a biocompatible alloy comprising the steps of blending a composition of substantially impurity-free elements comprising titanium, molybdenum, zirconium and tantalum, and subjecting the blend to repeated melting and solidification in an electric arc furnace and in an oxygen-depleted environment for 6-10 cycles to form the alloy.



Stages of titanium alloying obtaining process: a) weighing of raw materials and gravimetric dosing; b) loading of the raw material; c) titanium semi-products obtained after solidification

- Biocompatible elements
- Support a damaged biological structure
- Mechanical properties closer to the human bone

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.)

Selected References:

[1] Baltatu M.S.,Tugui C.A., Perju M.C., Benchea M., Spataru M.C., Sandu A.V., Vizureanu P., Biocompatible Titanium Alloys used in Medical Applications, Revista de Chimie, vol. 70, nr. 4, 2019, pp. 1302-1306.
[2] Niinomi M., Titanium Alloys, Encyclopedia of Biomedical Engineering, 2019, pp. 213-224.
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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.

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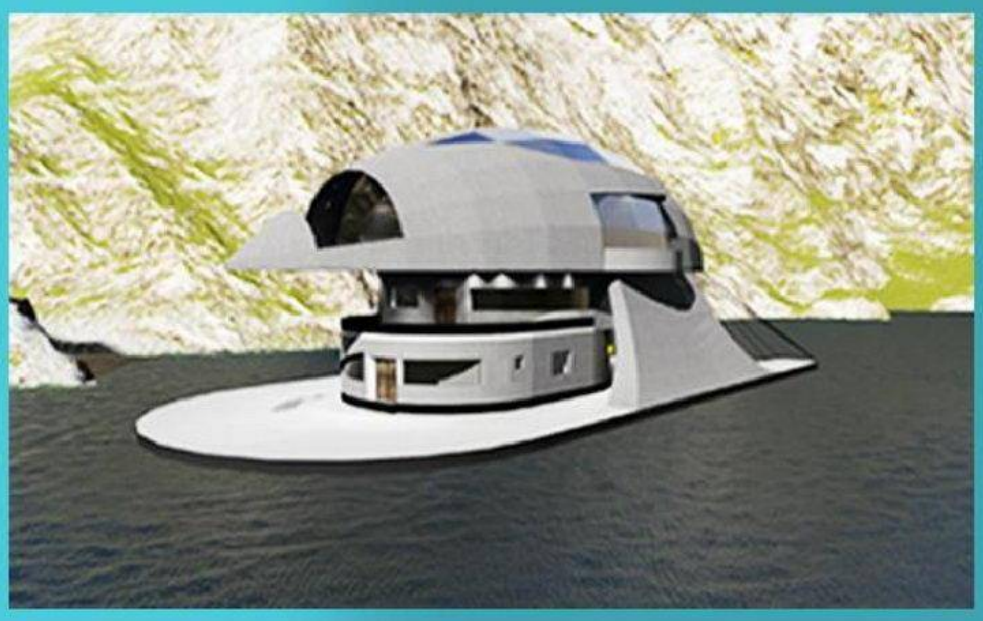
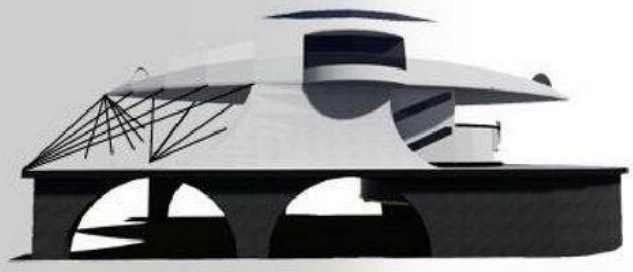


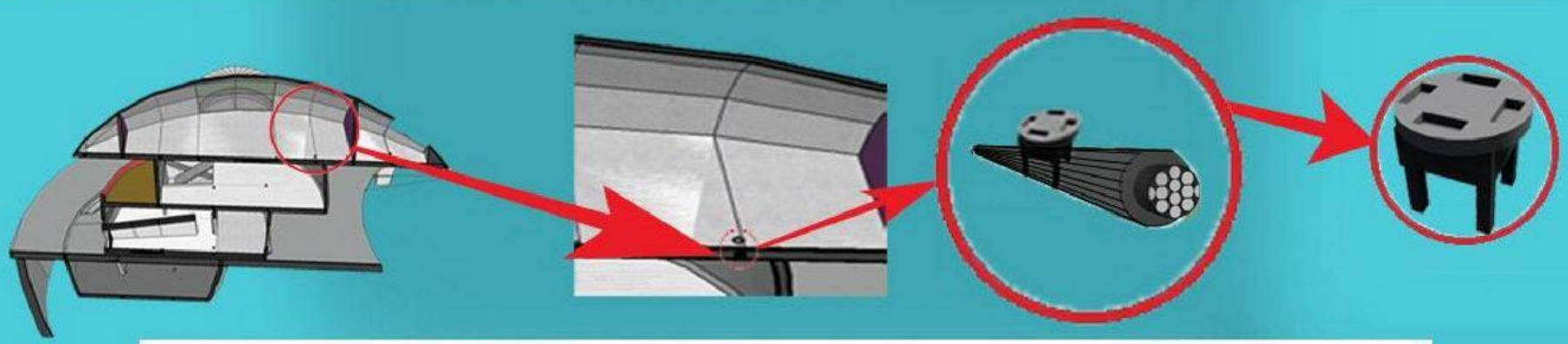
BAT HOUSE CONCEPT

Building space is more and more limited. A solution is placing houses in more unconventional areas, like on water.
The architectural concept called Bat-house (name given by the reflection of the house on water) implies a building situated on water with a ground floor, an eccentrically placed level, and a wild life observation deck under water.
The building has a caisson foundation, shaped into four arches, fixed in the bedrock at the bottom of the see or lake. The structure consists in an oval shaped concrete core, and a parabolic roof which is supporting itself on two slim concrete pillars and by using metallic cables, similar to suspended bridges. The metallic cables are inserted in pipes placed in the concrete floor between ground floor and the storey. To create the eccentrically placed level, the cantilever principle is applied.
The innovative system of this building consists in pipes that are placed in the concrete floor and through which metallic cables of 14 cm diameter pass. The idea is to pre-stress the concrete floor, while the metallic cables are subjected to tension. Where the cables go out from the concrete floor, gripping rectangular elements are placed in order to induce the desired stresses.



How it works ?

Below you can see the element in detail.
The 4 holes on the surface of the head allow the use of a device to turn the element and create tension in the cables and closing the formwork. Thus the concrete is compressed.



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

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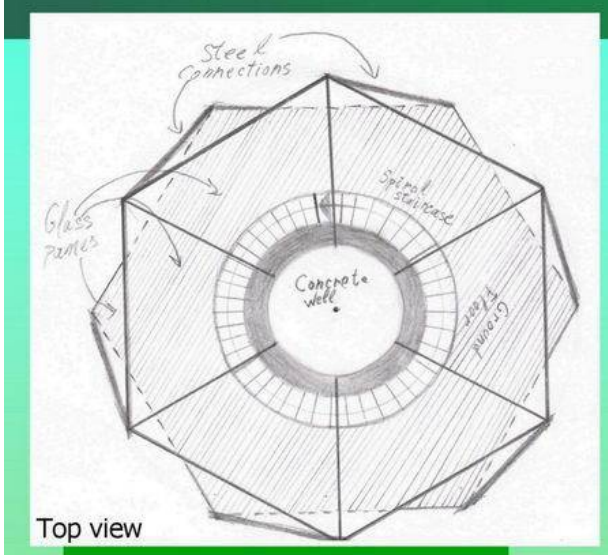
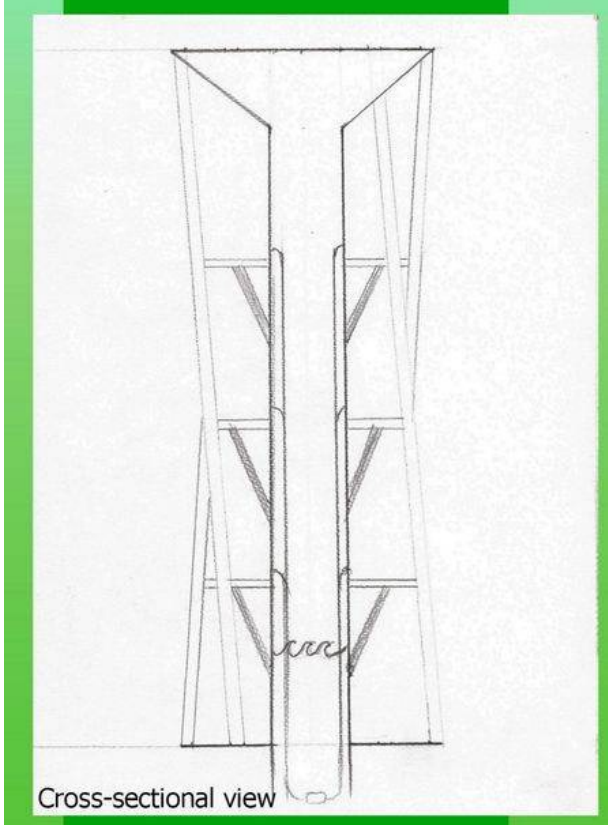
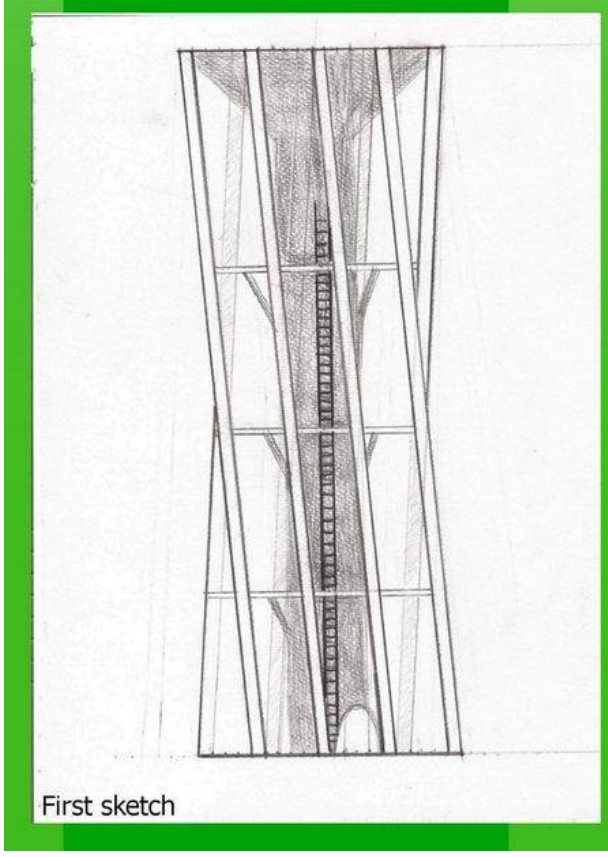
Hyperbolic suspended gardens

Authors:Neculai Oana, Bodescu Liliana



Top view


Cross-sectional view


First sketch

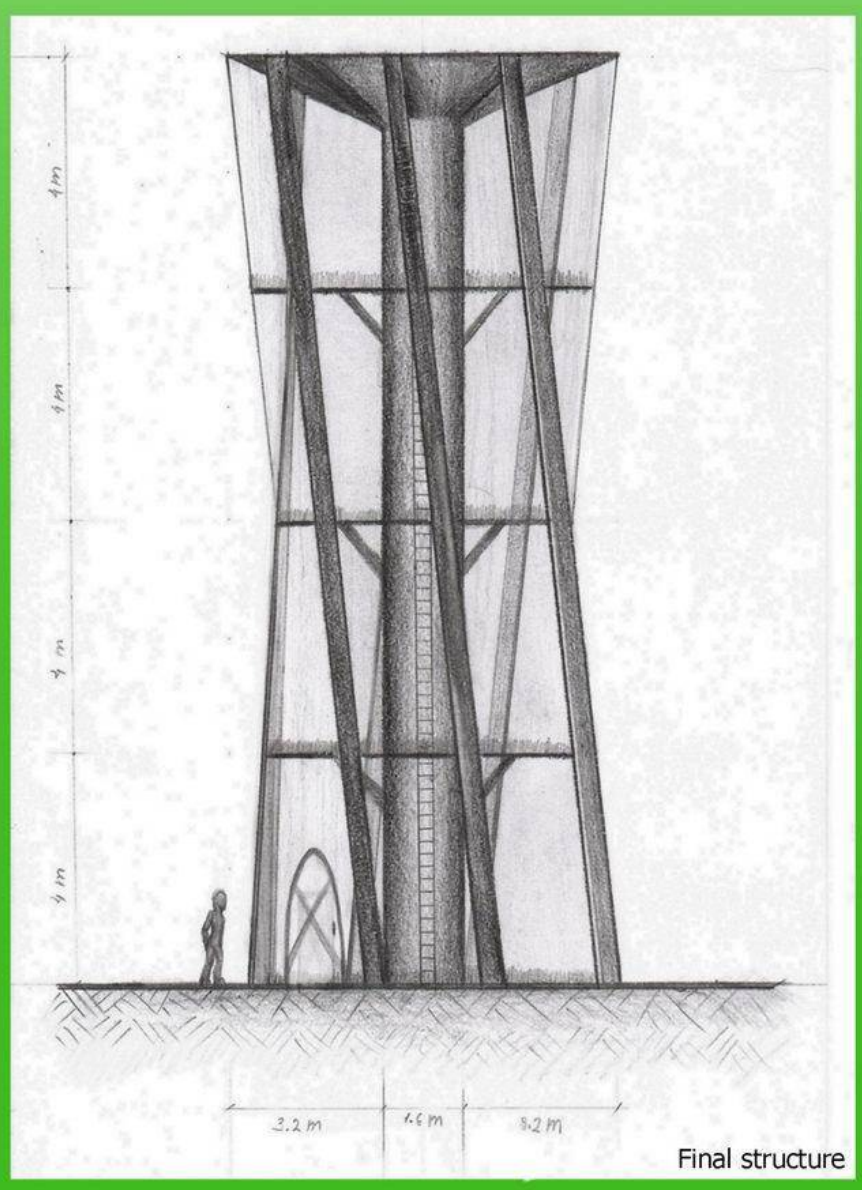
In order to create more space for agriculture purposes, one idea is to look up.

The proposed hyperboloid structureis composed of multiple glass panes, interconnected with stainless steel rods or casings which connect to three concrete floors, supported by a cylindrical concrete core. The rigid core had a hollow middle which goes down to the groundwater layer, where a pump brings water to all of the floors, therefore reducing the costs of irrigations.

At the top, the glass structure is slanted inwards so that rain and snow to slide into the well, thus collecting it for irrigation purposes.

The shape was chosen in order to have a stronger structural integrity. The platforms which compose the elevated floors are suspended as cantilevers fixed on the concrete core, and the concrete wall presents holes placed 90 cm over the level of the platform, where the hoses for the pumped water are placed. Access to the higher floors of the greenhouse is made by either a simple iron stepladder with a pulley system that eases the transport of fertilizers and gardening tools, or a spiral staircase around the concrete core.

Another advantage for this system is allowing growing different types of plants as the soil type,water quantity, humidity level and temperature conditions can be modulated for each level and sector.



Final structure

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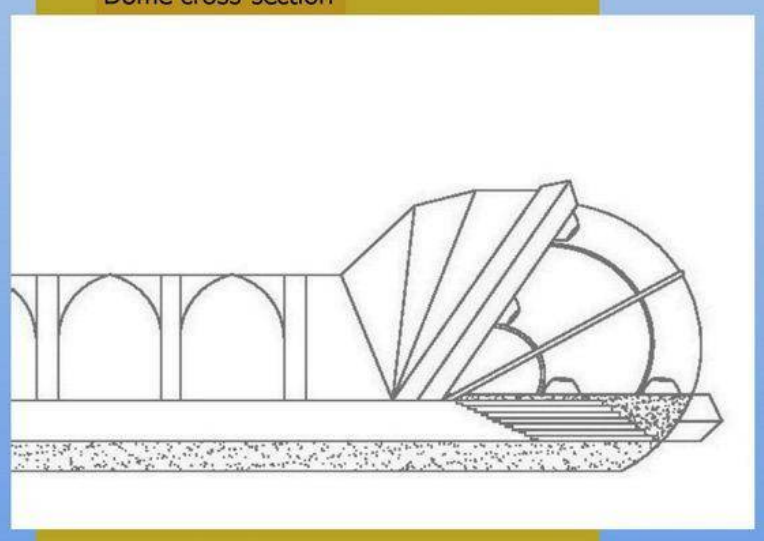
Under the sea opera

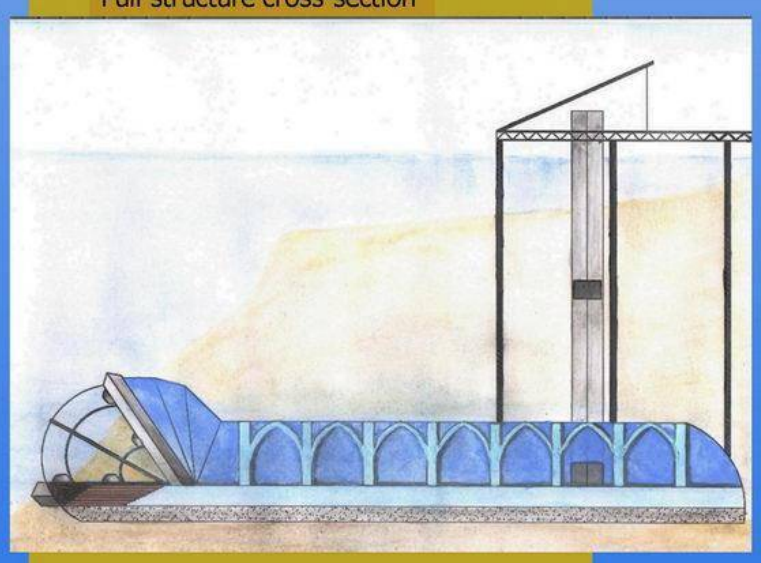
Authors: Neculai Oana, Bodescu Liliana

General look of the structure through the sand.
First sketch

Dome cross-section



Full structure cross-section

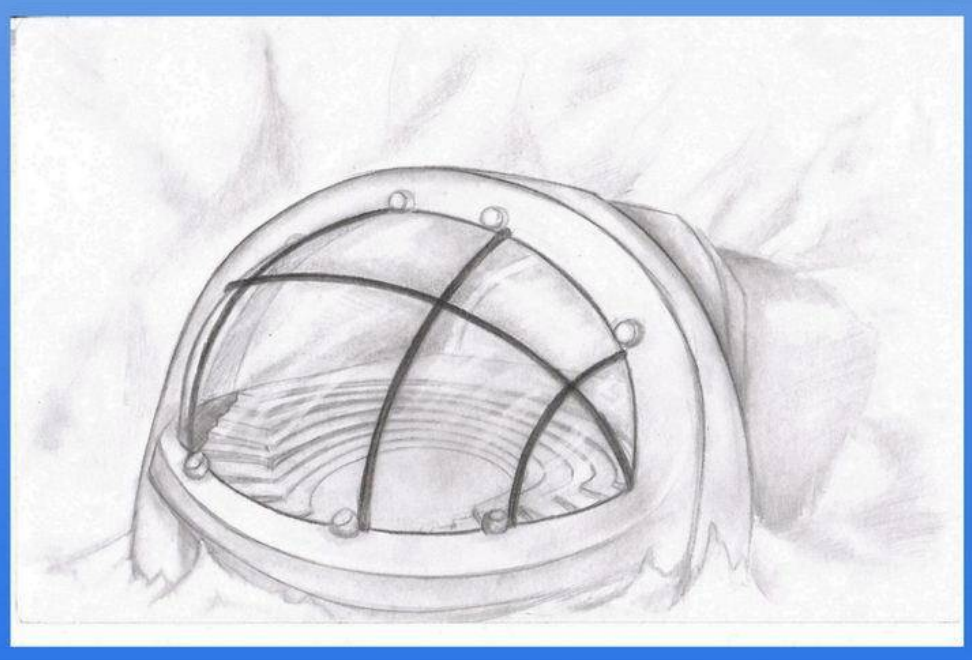


Being able to admire wild underwater life swim through the sea as you are attending either a **conference**, a **play** or a **concert**, was the main driving idea of this project. As space seems to be a pressing issue, and inspired by the salt mines concept, the idea of an underground structure emerged, composed of an arcade beneath the sea floor, emerging through the underwater steep slope as a large dome, a quarter of which being composed of **high strength glass**. The arcade can host a **museum**, an **art exhibit** or even a **play area for children**, while the dome would hold a large concert hall.

On the outside of the glass there are large spotlights that illuminate the surrounding water. Inside the dome, the floor descends with wide steps in the style of an ancient Greek theater, curving around the sides of the dome. The steps are wide enough to allow either chairs or people can simply sit directly on them.

The entrance and exit of the building are through a hydraulic elevator which emerges either in a **gift shop** or a **cafe** located at the end of a large **platform above the sea,** supported by **columns** that go all the way down to the bedrock layer, into the slab foundation.

The roof at the access point is **inclined,** covered with solar panels to provide electrical energy for the **surface structure,** while tidal energy generators fuel the **underground structure.**



Design and Development of Robotic Rehabilitation Device for Medical Therapy

Corciovă Călin, Fuior Robert, Luca Cătălina, Gheorghiţă Andrei

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

INTRODUCTION

Rehabilitation is an important key to recovery for patients with neurological related injury and repeated practice of a particular movement appears to be crucial for motor recovery in hemiparesis patients. The use of robotic devices for the rehabilitation has shown promising results for patients to improve their motor functions. The promising fact of robotics therapy is meaningful and motivating for patient which is a key driver towards recovery. According to the World Health Organization, by 2050, the number of persons over 65 years old will increase by 73% in the industrialized countries and by 207% worldwide. Reductions in healthcare reimbursement place constant demands on rehabilitation specialists to reduce the cost of care and improve productivity.

A. System Architecture

The project aims to develop a robotic rehabilitation system of the upper limb to facilitate flexion and extension of the fingers with an aim for faster recovery by motivating through the use of bio-feedback signals together with progress logging facility to store and assess the patient performance. The complete control system comprised of electronic hardware interface and graphical user interface for user interaction and actuating the robotic hand. Electronic hardware interface consists a microcontroller, a flex sensors module and a USB based Data Acquisition (DAQ) device interfaced to a computer. DAQ device is USB 6009, from National who is configured to send control signal to the microcontroller for activation of the motor based on the mode selection. Signal from each flex sensors is processed to decide the trigger signal level required to activate one of each servomotor for movement each finger to perform therapy. Signals are connected to the DAQ device interfaced to the LabVIEW based GUI developed for control of the entire system.

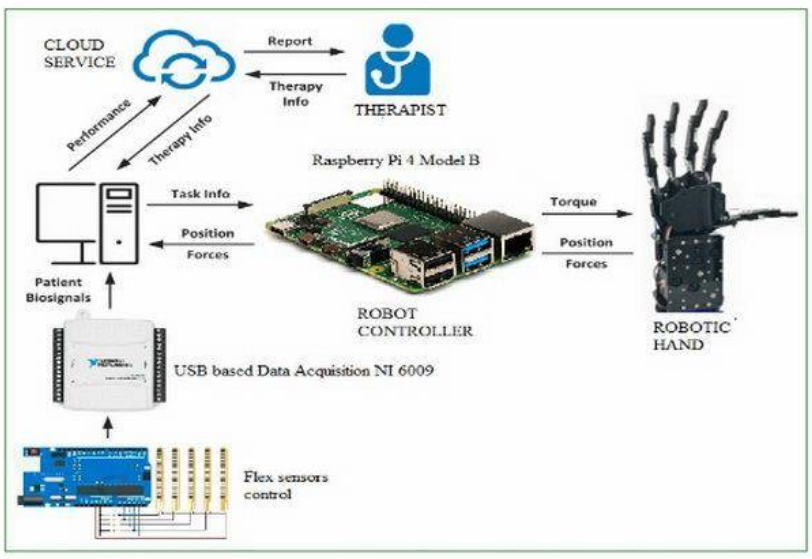


Figure 1. Architecture design of the system

Clinical evidence of device efficacy and safety are required for a medical device to achieve clinical acceptance from hospital and successful practical implementation of the device.

B. Electronic Hardware and Software Interface Design

The central element of the system is represented by Raspberry Pi 4 Model B who is the latest product in the popular Raspberry Pi range of computers.

It offers ground-breaking increases in processor speed, multimedia performance, memory, and connectivity. This product's key features include a high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, hardware video decode at up to 4Kp60, up to 4GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth 5.0, Gigabit Ethernet, USB 3.0, and PoE capability (via a separate PoE HAT add-on).

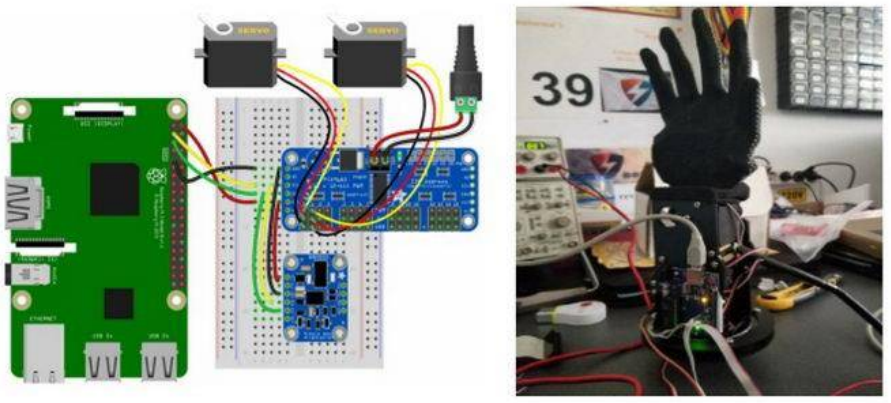


Figure 2. Control servos with Circuit Python and Raspberry Pi: wiring diagram in fritzing simulator and practical assembly

Microcontroller employed here is to control the motor triggered through the DAQ device by the GUI running on a Windows-based computer. Microcontroller will call an appropriate function routine to run the motor for hand therapy (each finger) based on the selection of a hardware control switch provided for the therapist to select.

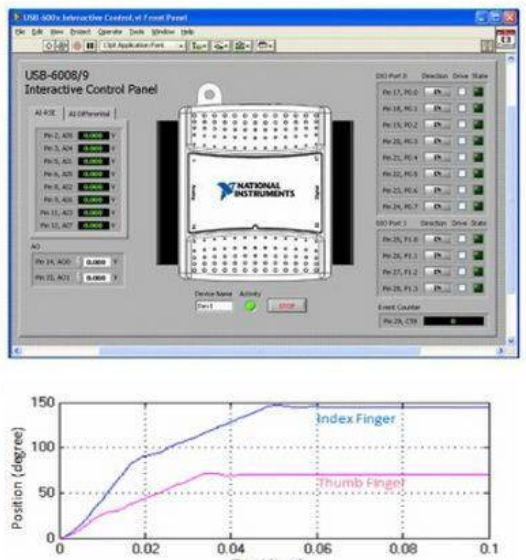


Figure 3. Command panel of the NI 6009.Thumb-Index finger touch motion

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.

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Intelligent device for monitoring the physiological parameters of isolated persons at home

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

INTRODUCTION

Maintaining a high level of health in a population is one of the global challenges for humanity, especially in these days, because the SARS-CoV19 pandemic has forced the rethinking of medical techniques and procedures. In this sense, the care and the remote monitoring of the physiological parameters, for a real diagnosis, requires considerable attention and at present it is in continuous development involving high hardware and software techniques. Through the developed system, a series of physiological parameters are measured, such as temperature at two points, oxygen saturation, pulse, dehydration degree of the patient using the specified sensors attached. All of these sensors will transmit data to the ATmega328P microcontroller on a Seeeduino Cloud development platform. The purchased data can be stored on an SD card and downloaded later for analysis, but it can also be sent to an analysis center or in a cloud continuously via the Internet using 802.11ac wireless technology on two bands or GSM mode. Following the values received, a daily and hourly report can be made automatically with the patient's evolution during the monitoring days.

A. SYSTEM ARCHITECTURE

The interconnection between different components is explained using the system architecture. The architectural diagram is shown in Figure 1. Patients connect the sensors to their body, and the other end of the sensors is connected to the Arduino Uno development platform. The data acquired by the sensors are stored in the SD module and then processed by the microcontroller and subsequently transmitted to the platform associated on the laptop.

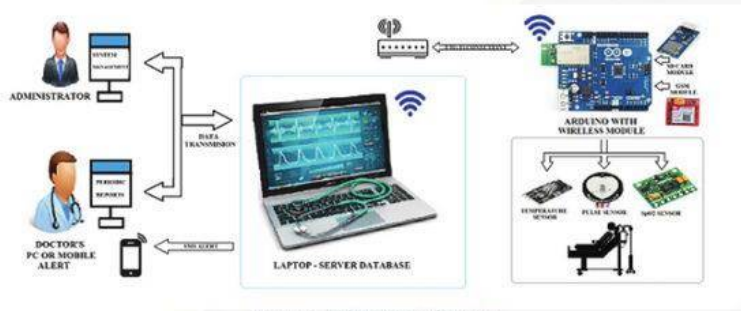

Figure 1. Arhitecture diagram

The values of the data taken from the sensors are displayed on the laptop and, at the same time, if the values exceed the normal range, the alarm is triggered. The stored values are sent to the server using GSM. All values are stored on both the server and the SD, and the values are displayed via the acquisition platform. The doctor together with the authentication data can authenticate you and see the patient data. Doctors can see all previous records of a patient and suggest medications and prescription changes. Patients are also given a unique user ID and password to view their

B. DESIGN METOHODOLOGY

1. MAX30100 SpO2:

The MAX30100 SpO2, a plug-and-play sensor, is designed to work with a development board equipped with at least one analogue pin. The receiving signal from the sensor will connect to port SCL and SDA of the Arduino development platform.

Figure 2. SpO2 - Max30100

2. Heart Rate Sensor:

The principle behind the working of the Heartbeat Sensor is Photoplethysmograph. According to this principle, the changes in the volume of blood in an organ is measured by the changes in the intensity of the light passing through that organ.

Figure 3. Pulse sensor

3. Temperature Sensor :

The sensor is a small, inexpensive and handy temperature sensor. Use a capacitive moisture 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.

Figure 4. Temperature sensor

4. Arduino UNO:

The microcontroller on the Arduino UNO-R3 WiFi design plate has a 5V operating voltage, but with a voltage stabilizer it can power up to 12V. The core of the device is the Arduino UNO development board that uses an ATmega328P microcontroller fast enough to be able to acquire signals from sensor's.

Figure 5. Arduino UNO R3

5. SIM800L GSM & SD module:

The SIM800L GSM module communicates with the Arduino development platform via the serial UART interface. It has the role of having a continuous internet connection, but also sending an emergency message to the emergency service.

Figure 6. GSM module

Calibration can be done with each patient at the beginning of recovery. It will be saved on the computer but also on the SD card connected to the device to have a complete history with all the recordings.

Figure 7. SD module

C. CONCLUSION AND FUTURE SCOPE

Preliminary results have shown that the device is capable of taking the signals from the attached modules so that we eventually have a complete set of data for the functional evaluation of the patient.

This system plays an important role in monitoring patients diagnosed with COVID-19 and assisting healthcare professionals. The transparency of this system also helps patients to trust it and be safe. When the upper and lower limit values are reached, it will alarm the medical staff through an SMS message but also on the platform on the laptop. The goal of developing monitoring systems is to reduce health care costs by reducing visits to the doctor.

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COMMUNICATION SYSTEM FOR PEOPLE WITH SPEAKING DISABILITIES

MITOCARIU ADINA-ECATERINA, SIMION MĂDĂLINA-PETRONELA, FUIOR ROBERT, ATODIRESEI IRINA

Introduction

Hearing plays an important role in the life and mental activity of a person, and is especially appreciated for his contribution to the development of verbal language.

Automatic sign language translation systems have undergone various changes with the advancement of the technology, and there are numerous research projects aimed at this type of device, designed to facilitate communication between people with hearing impairments and normal ones.

Methods

The main objective of this device is to raise the social barriers between normal people, and those with hearing and speech impairments.

The device presented in this paper is designed based on the block diagram, detailed below, having in its composition a glove to which are attached 5 flex sensors, an accelerometer, a microcontroller, a microSD card and one LCD .

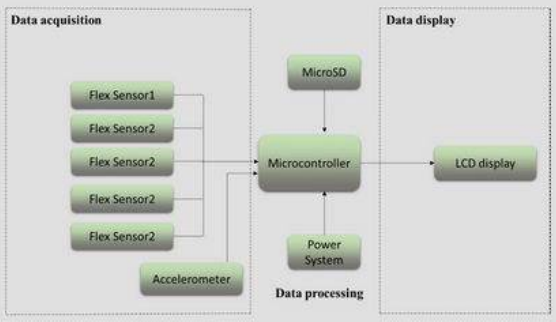

Fig.1. *The block diagram of the system*

All these components help to translate the sign language into a written text, which depending on the signs that the user performs, and after that will be displayed on the LCD screen.

Results

With the help of flex sensors (**Fig.2**), which are part of the data acquisition system, the physical phenomenon is converted into numerical values that can be interpreted as an electrical signal.

Using the MPU6050 accelerometer (**Fig.3**), which contains a silicone chip, on which are mounted the sensor and the sensitive structure, all accelerations applied to the glove were measured.

. With the help of the Arduino Mega 2560 microcontroller (Fig.4), which has 54 digital input/output pins, the data acquisition and processing part was performed.

The display of the message executed following the sign language, is done through a two-line, 16-character LCD (**Fig.5**).

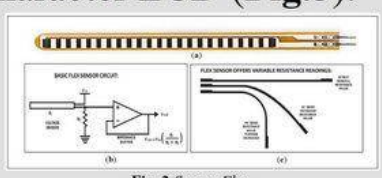

Fig. 2 *Sensor Flex*

Fig. 3 *Accelerometre*

Fig.4 *Arduino Mega 2560*

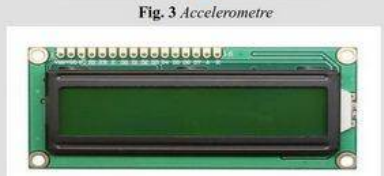

Fig.5 *LCD*

Conclusions

As a result, the system fulfills the purpose for which it was designed, facilitating communication between people with disabilities and the normal ones.

In the future, the system can be improved by adding a camcorder, that accurately captures the signs performed by the user, and also, by adding an audio system that can render words translated from sign language in real time.

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Novelty in the non-surgical treatment of pressure ulcers using combined biostimulation low-level laser therapy and TENS electrostimulation

Ilie Onu, Anca-Irina Galaction

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Pressure ulcers are localized lesions of the skin and / or underlying tissue, and usually occur over a bony prominence and are caused by pressure, friction or shear forces. They remain a major cause of morbidity and mortality. The healing process of pressure ulcers is slow on standard treatment and the main objective is to accelerate healing, reduce pain and infections. Non-surgical treatment is performed in stage I and II, the healing rate being 70%-90% and consist in wound cleaning solutions, mechanical and enzymatic debridement, transparent adhesive dressings and antibiotics. In stage III and IV, the lesions may require surgery.

Low-level laser therapy (LLLT) and TENS are considered adjuvant treatment of physiotherapy techniques. TENS electrostimulation intervene in the inflammatory, proliferative, epithelialization and remodeling phase, increasing blood and cell flow, oxygenates tissues, reduces edema, increases epidermal growth factors. LLLT stimulates the cellular functions, increase the mitochondrial ATP production, activate the lymphocytes and mast cells, and accelerates proliferation of fibroblasts.

The novelty is the conception of an optimal physiotherapeutic protocol using the combination LLLT - TENS during the standard treatment, reducing the local pain and accelerating the healing process in stages I, II and III

A physiotherapy treatment design was created so that the standard treatment technique was supplemented with TENS and LLLT in order to manage pressure ulcers that could not be stopped from the negative evolution. LLLT parameters was: Ga-As probe in infrared with 904 nm, at 25 mW, with frequency 1000 Hz. The application lasted on average between 12-20 minutes, irradiating from the outside to the inside of the lesion without the probe having contact with the instrument. The TENS currents were applied on two channels around the lesion with autoadhesive electrodes arranged in a cross, with pulse trains having variable frequencies, for 20 minutes per session. The pulse trains were applied following the parameters: phase 1 - 10 minutes with 120 Hz and 50 μs, phase 2 - 6 min 2Hz and 200 μs and phase 3 - 4 min 110Hz 50 μs.

Fig. 1 before and after 3 weeks of treatment - 9 sessions

Fig. 2 before and after 2 weeks of treatment - 6 sessions

Fig. 3 before and after 2 weeks of treatment - 6 sessions

Results and advantages:

- **LLLT and TENS** treatment session lasts only 20 minutes and is performed after standard treatment
- chronic pain management without drugs
- reduction of local inflammation
- good management on large lesions, when standard therapy cannot stop the evolution
- in the initial stages the healing time is reduced by half
- the procedure is non toxic and safe for the patient
- low costs and it's versatile

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UNCONVENTIONAL METHOD DESIGNED TO IMPROVE ERGOSTEROL PROCESS

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

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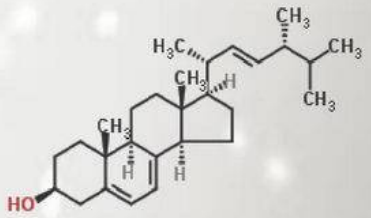
[2]"Gheorghe Asachi" Technical University of Iasi, "Cristofor Simionescu" Faculty of Chemical Engineering and Environmental Protection, Dept. of Organic, Biochemical and Food Engineering, D. Mangeron 73, 700050 Iasi, Romania; e-mail: **dancasca@ch.tuiasi.ro**

Ergosterol (ergosta-5,7,22-trien-3β-ol), also known as provitamin D_2, is the precursor of vitamin D_2 (ergocalciferol), because it is converted under UV radiation to this vitamin. The natural sources of ergosterol are mainly the yeasts (*Saccharomyces sp.*, *Candida sp.*), but it can be also found in fungus (*Claviceps sp.*) or plants (orchids).



In the **yeasts cells**, ergosterol is accumulated in membranes, especially in free form in the plasma-membrane, but also as esters with fatty acids in membrane lipids.

The aim of this study was to analyze comparatively the influence of aeration efficiency on ergosterol production by *S. cerevisiae* in batch and fed-batch fermentations, by considering different levels of mixing intensity, aeration rate, and n-dodecane concentration.

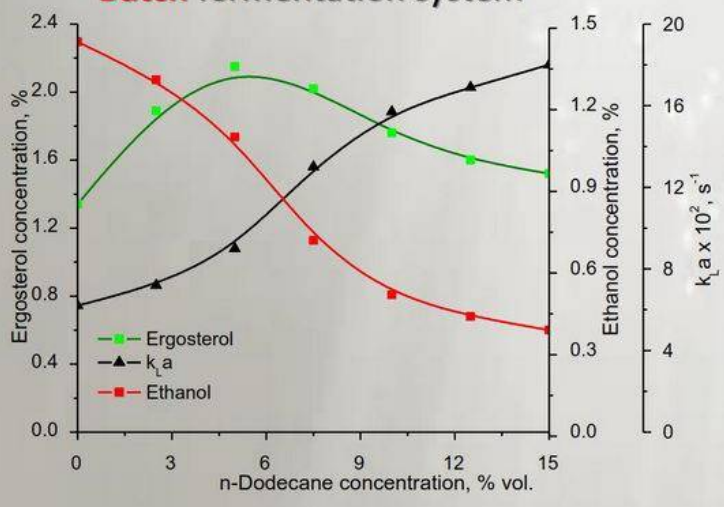
The experiments were carried out in 2 L laboratory stirred bioreactor (Fermac, Electrolab), provided with computer-controlled and recorded parameters. The bioreactor mixing system consists of one turbine impeller and three baffles.

The fermentation was carried out comparatively in **batch** and **fed-batch** systems. In both fermentation systems, the temperature was 30°C. The pH-value was maintained at 5.4, being automatically adjusted by addition of 25% ammonia solution.

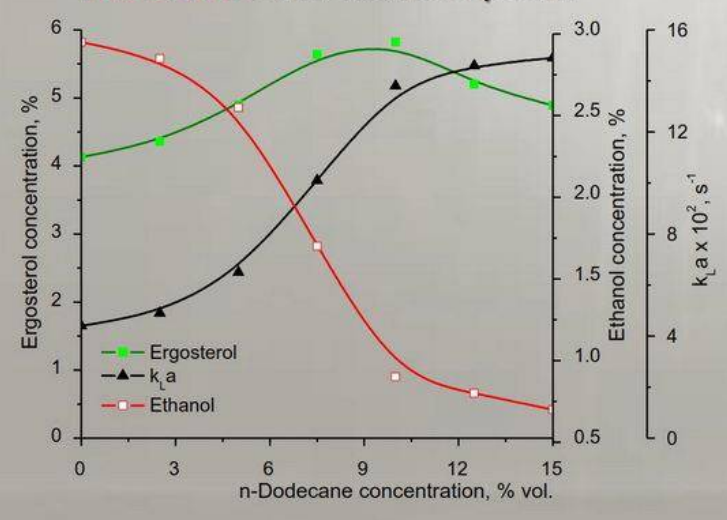
n-Dodecane was used as oxygen-vector with volumetric concentration varied between 0 and 15%.

Results

Batch fermentation system



Fed-batch fermentation system



The hydrocarbon concentration exhibits a significant influence on ergosterol production mainly by accelerating the oxygen transfer rate. Therefore, for the fermentation moment corresponding to the maximum ergosterol content (9 h), first figure for batch indicated that the oxygen mass transfer coefficient, k_La, is amplified for about 3 times by increasing the volumetric concentration of n-dodecane from 0 to 15%. Moreover, the increase of dissolved oxygen concentration by adding n-dodecane leads to the diminution for 3.5 times of the produced alcohol amount.

For the batch process, the maximum ergosterol amount was reached for 5% vol. n-dodecane, while for the fed-batch process for 10% vol. hydrocarbon.

In the fed-batch process, in presence of hydrocarbon, the ergosterol concentration increased with over 50%, and the ergosterol yield factor with almost 70%.

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SYSTEM FOR GAIT ANALYSIS USING KINECT

Simion Mădălina-Petronela, Fuior Robert,
Mitocariu Adina-Ecaterina, Atodiresei Irina

INTRODUCTION

Rehabilitation equipment leads to faster recovery or improvement of certain deficiencies in patients, resulting in an increase in the quality of their lives or their social reintegration. The main objective of our study is to evaluate the movement of the lower limb using force sensors and video camera, kinect.

Our study tries to develop a gait analysis system using kinect and a foot pressure monitoring device using force sensors. It can be used by patients suffering from certain dysfunctions as well as to prevent their appearance. In this way, the doctor or physiotherapist can easily help prevent long-term damage to the affected part and even accelerate the recovery period.

METHODS

The patient has to walk or to do some exercises following the doctor's instructions and his movements are monitored by kinect and displayed through a 3D visualization platform, Blender.

Fig.1. Kinect

In the same time, he has attached the force sensors to the soles that will analyze the plantar pressure using Processing 2. The pressure sensors are mounted on an insole. Their position was chosen taking in consideration the areas of anatomical importance when walking. Our sketch reads the numerical values from the sensors and displays a preset color.

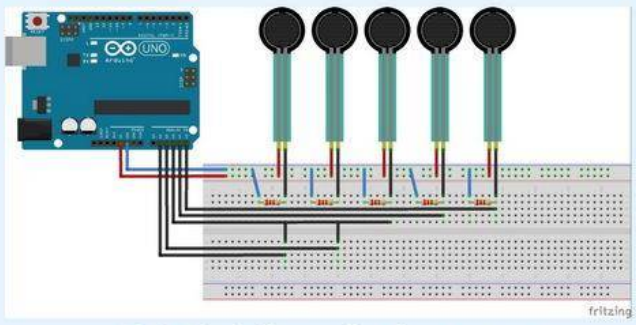


Fig.2. Block diagram for plantar pressure

This system combines imformations of leg biomechanics and how subject's foot makes contact with the ground during normal walking.

RESULTS

To calibrate the system, the subject being tested is asked to stay in orthostatic position in front of the kinect wearing the insoles with the sensors.

For each step, the system collect the data from all the sensors. A normal step would consider the following cycle: the initial contact with the ground is made with the heel, followed by the sole's middle and ending on the top of the foot.

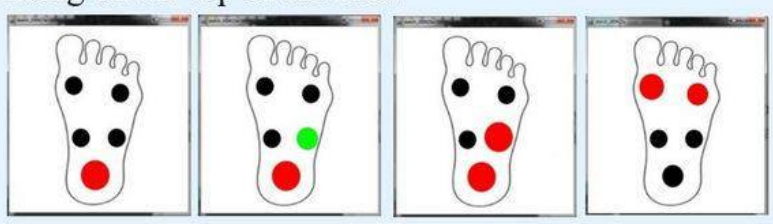


Fig.3. Display of the data

Depending on the amount of pressure applied on each sensor, we made a simplified color map to show the changes of each sensor during test. Black stands is for the absence of pressure, the growth in pressure is shown with colors from blue to green then yellow and red. Every movement from the pacient can see in real time in the program, Blender, and can be analyzed by the doctor.

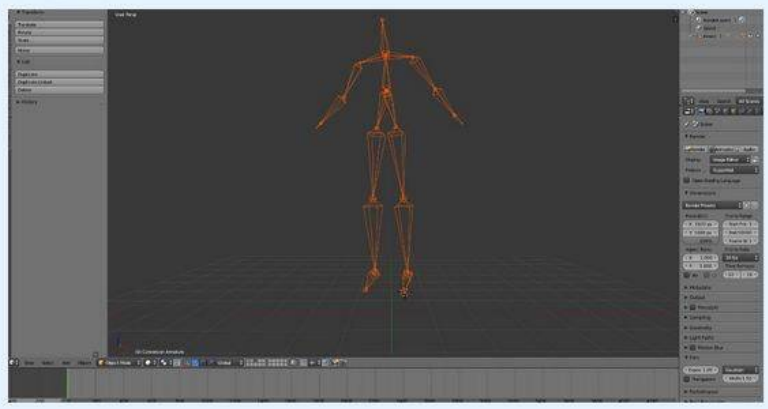


Fig.4. 3D view

CONCLUSION

As a result of the exercises, the system has demonstrated it is useful and the results obtained in testing proposed the device at the laboratory level that can be applied in the current practice of recovering patients with locomotor dysfunctions in the lower limb. The develop system met our purposed target.

12th European Exhibition of Creativity and Innovation EUROINVENT
Iasi, Romania, 21-23 MAY 2020

GRIGORE T. POPA UNIVERSITY OF MEDICINE AND PHARMACY IASI

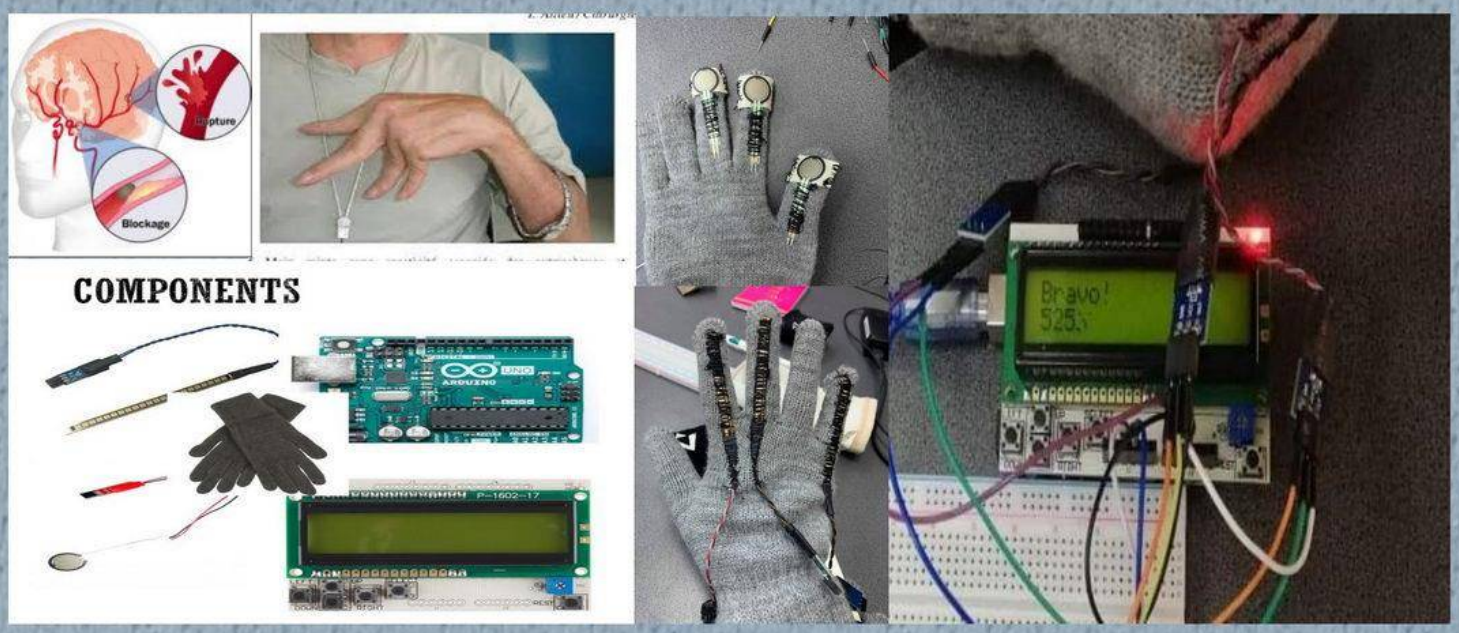
PERSONALIZED GLOVER FOR RECOVERY PATIENTS POST-STROKE

Cătălina LUCA, Nechifor Ana-Maria, Lovin Bianca, Palel Gabriel

"Grigore T. Popa" University of Medicine and Pharmacy of Iasi, Faculty of Medical Bioengineering, Department of Biomedical Sciences, catalina.luca@umfiasi.ro

- The Stroke is the leading cause of adult disabilities and the third leading cause of death worldwide. Hemiplegia is the frequent stroke deficit whereby the survivor loses control of the skills required for daily activities. Planning a rehabilitation treatment to regain the skills that the patient has lost is necessary to quantify the movements of the hand that he is able to perform.
- The system proposed by us is in the form of a glove with sensors capable of transposing movements captured in hand gestures, as a basis for the control and rehabilitation function. The proposed system is capable of detecting flexion, movement of the fingers and grasping force, which combined with the manual therapy applied in the rehabilitation of the upper limb increase the chances of rapid recovery of hemiplegic patients.

INNOVATION: The proposed medical device is the first of its kind that can be used in the rehabilitation of the superior hemiplegic limb. With the help of this system it is possible to combine in rehabilitation the manual therapy with the mirror technique, which leads to a faster recovery of the patient.



- A hemiplegic patient's recovery plan includes recovery and compensation processes.
- Functional restoration of protection inhibition zones is a physiological measure that sometimes acquires a pathological character, lasting a long time and making impossible the restoration of functions.
- Medical measures must be taken at this level, to disinhibit the nerve elements and their stimulation and this can be achieved by applying curative gymnastics, massage, physiotherapy procedures.
- If all these elements are coupled with a device specially designed for rehabilitation, it will be to the benefit of the patient and the healing time will be shorter.

ADVANTAGES:

- This device can be used by any type of pacient in hand rehabilitation programs.
- The designed device can be easily used by the patient at home, with favorable results.
- It is possible to combine in rehabilitation the manual therapy with the mirror technique, which leads to a faster recovery of the patient.

12th EUROPEAN EXHIBITION OF CREATIVITY AND INNOVATION, 21-23 May 2020 Iasi - Romania

GRIGORE T. POPA UNIVERSITY OF MEDICINE AND PHARMACY IASI

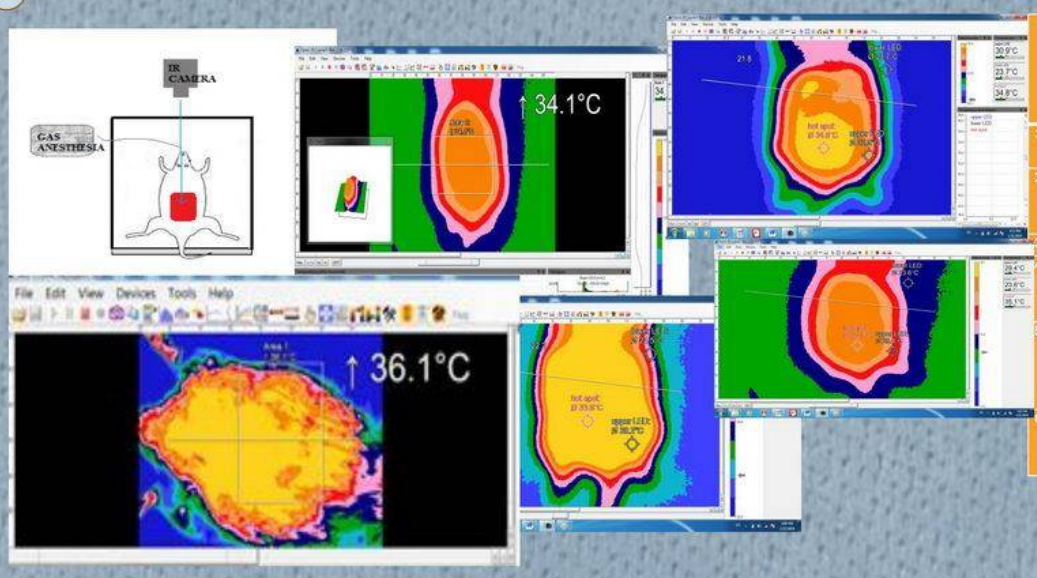
INFRARED THERMOGRAPHY USE FOR POSTOPERATIVE MONITORING OF RAT SKIN FLAPS COMPERING EFFECTS OF VASOACTIVE DRUGS

Cătălina LUCA, Ioannis GARDIKIOTIS, Ioana-Cezara CABA, Ionela-Lăcrămioara ȘERBAN, Bogdan CABA

"Grigore T. Popa" University of Medicine and Pharmacy of Iasi

The evaluation of the viability of a flap, especially in the case of clinical studies in which various substances are applied, that may or may not improve microcirculation is of certain importance. The purpose of this experimental study was to show that infrared thermography can be used as a non-invasive method to assess the flap survival and perfusion and to compare the use of various vasoactive drugs in improving the survival of skin flaps, on rats.

INNOVATION: This study is the first one to investigate IR thermography for postoperative monitoring of rat skin flaps comparing the use of vasoactive drugs. Therefore, IR thermography offers a real-time imaging solution for the control of microvasculature in surgery.



Batch	The duck of necrosis	Substance used	Temperature Max average	MEAN	Standard Deviation	Coefficient of variation
1. Control group - July	49.64%	No substance	35.1 °C	26.12	4.54	0.173 %
2. CAP	14.47%	Cold atmospheric plasma	34.1 °C	24.60	4.10	0.166 %
3. L-NAME	18.56%	L-NAME	33.6 °C	24.28	4.01	0.163 %
4. PRP	23.85%	Platelet rich Plasma	34.5 °C	24.98	4.16	0.166 %
5. PRP+L-NAME	17.76%	Platelet rich plasma and L-NAME	35.4 °C	25.16	4.28	0.170 %
6. CAP reverification	16%	Cold atmospheric plasma	35.9 °C	29.65	3.73	0.125 %

The experimental study was performed at the Advanced Research and Development Centre for Experimental Medicine (CEMEX) of the Grigore T. Popa University for Medicine and Pharmacy from Iasi. We used 40 male adults Wistar rats, which were hosted in special cages, with constant temperature and a day/night cycle from 7 a.m. to 7 p.m. In our study, infrared thermograms were collected using an OPTRIS PI160 IR medical camera with a measurable temperature range of -20 ° C to 900 ° C, Spectrum 7.5-13 µm, Recording Rate of the 120Hz image and an optical resolution: 160 x 120 pixels.

Improved image enhancement techniques have been used to help visualize and analyze images easily. It has been chosen to use the imaging techniques in the thermography to process the image so that the resulting image contains more useful information than the original image. In our case, the improvement technique was performed as a post-processing step. Smooth Spatial Filters (LPF) was also used to reduce noise. With their help, we succeeded in selecting low-frequency components and reduced or in some cases eliminating high frequencies.

From a thermographic point of view, the best perfused batch without ischemic problems at the flap was the L-NAME group. With an average maximum temperature of 33.6 ° C, there were no high temperature variations at the flap level, with no visible spots boiled with a distribution uniform. It also correlated with the rate of low necrosis.

IR thermography offers a real-time imaging solution for the control of microvasculature in surgery. The static thermography is a promising objective method for postoperative monitoring of free-flap reconstructions and for detecting perfusion issues before macroscopic changes in the tissue surface are obvious.

12th EUROPEAN EXHIBITION OF CREATIVITY AND INNOVATION, 21-23 May 2020 Iasi - Romania

UNIVERSITATEA DE MEDICINĂ ȘI FARMACIE GRIGORE T. POPA IAȘI

Devices associated with occupational therapy used in the recovery of prehension of the handicapped hand/ disabled hand

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[1]University of Medicine and Pharmacy „Grigore T. Popa", Street University, no 16, Iași, România
rotariu29@yahoo.com

Introduction

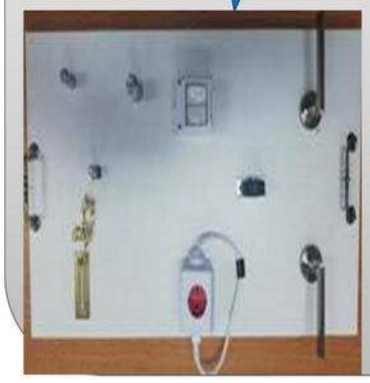
➢ ADLs are activities common to all people, which they perform on a regular basis to lead an independent life.
➢ An essential role in the achievement of ADLs has prehension – motor skill which helps the hand to grasps objects with the fingers.
➢ Occupational therapy, the branch of medical recovery, has as main objective the re-education of the prehension.
➢ 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, plasticine modeling and clay proved to be effective in this sense.

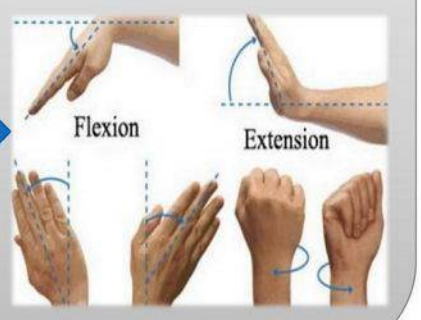
Materials and method

➢ In this direction we designed and realized in the occupational therapy laboratory, from the Faculty of Medical Bioengineering - three devices - ergonomic wall plates, meant to offer a variety of techniques and exercises, a flexible working environment with illustrations and explanations that allows/helps the recovery of pre-tension. The tiles are made of wood, provided with various aids that simulate daily household activities when they are used.
➢The elements are fixed to three panels: button system, staples system, horizontal laces, cross laces, quick release loop, adjustable strap, zipper, snail screw with adjustable strength, window handle, door handle, rotary latch, sliding latch, electric sliding lock, power plug with an adapter, wall spiral, lego.
➢ The sizes of the plates are different and depend on the number of devices attached.

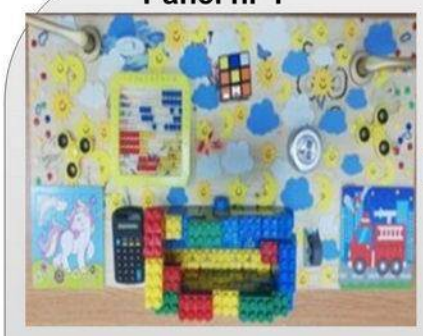
Devices and movements

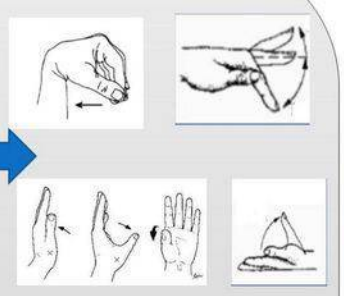
Panel nr 3





Panel nr 1





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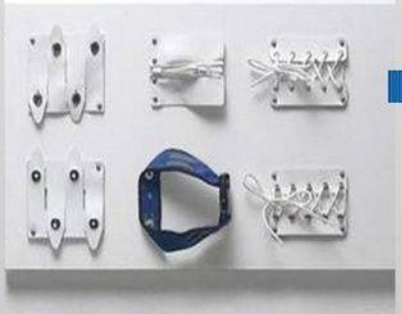
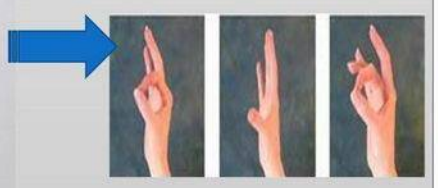
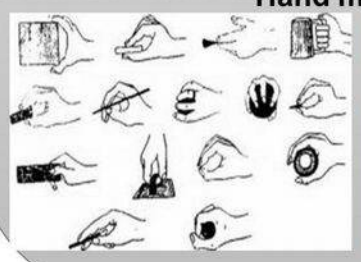




Hand movements



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

➢ By using the devices attached to the plates during the kinetics sessions, the patients are using known motor skills and they manage to recover much faster the pre-extension including the ADLs becoming independent, independent persons capable of professional reintegration.

Silicone scleral buckle extrusion in the context of phthisis bulbi

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1."*Grigore T. Popa" University of Medicine and Pharmacy Iasi, Romania*
2. "Sf. Spiridon" Emergency Hospital Iasi, Romania
3.Oftaprof Clinic Iasi, Romania

A 70-year patient presents in our service accusing intermittent pain and discomfort of the right eye with the onset approximately two years ago.

Personal medical history reveals: in the right eye she had a rhegmatogenous retinal detachment operated 10 years ago.

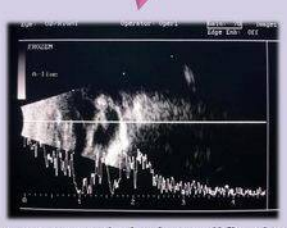
Right eye

Best corrected visual acuity right eye- no light perception

Biomicroscopic examination: mucopurulent discharge, conjunctival congestion.

In the inner angle we observed a brittle, translucid, foreign body eroding the conjunctiva.

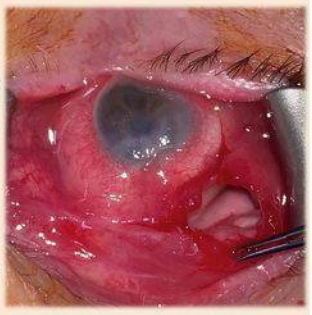
The eye is atrophic (phthisis bulbi)



B mode echography right atrophic eye, a band wrapped around the eye

Left eye no pathologic modifications.

We decided to operate, extract the silicone band that was wrapped on 360◦ around the eye and reconstruct the integrity of the conjunctiva.



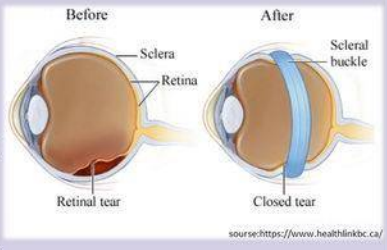
The fragments from the silicone band were extracted and evaluated microbiologically with no evidence of gram-positive and gram-negative bacteria.

The patient received preoperative and postoperative treatment oral with ceftriaxone and local with instillations of moxifloxacin, tobramycin and dexamethasone.

The evolution was favorable in the 6 months follow up period.

Discusion

- ✓ **Scleral buckling is an ophthalmological surgical procedure used for treating rhegmatogenous retinal detachment.**



- ✓ **In the case presented above the buckling procedure was done with a silicone band attached to the sclera with sutures.**
- ✓ **Scleral buckling bands are made out of a number of biocompatible materials among them the most frequently used is silicone.**
- ✓ **Synthetic polimer of siloxan, resulting from a combination of silicon, oxigen, carbon and hidrogen atoms.**
- ✓ **It is heat-resistant with an elastic consistency, chemically inert and with a long term in vivo stability.**
- ✓ **It generates a minimal local inflammatory response.**
- ✓ **Band extrusion in the settings of an atrophic eye is a rare complication. To our knowledge similar cases were presented by:**
  - ✓ **Galbinur et all. described a similar case (1)**
  - ✓ **Nguyen et all. have a 20 yeras experince in the subject and have operated over 4400 scleral buckling cases and have identified only 4 similar cases (2)**
- ✓ **We address the possibility of a correlation between the extrusion of the band and the atrophic eye: while the diameter of the eye is reduced, the arc of circle formed by the band wrapped around the eye maintains its diameter, this results in a disproportion and leads to the erosion of the conjunctiva by the band.**

In conclusion, patients with scleral buckling on an phthisis bulbi eye need a long term follow-up in order to be able to observe a potential extrusion of the silicone scleral buckle band and treated it promptly

1. Galbinur T., Chowers I. Scleral buckle extrusion associated with phthisis, Case Rep Ophthalmol Med, 2011;2011:942946.
2. Nguyen QD, Lashkari K, Hirose T, Pruett RC, McMEEL JW, Schepens CL. Erosion and intrusion of silicone rubber scleral buckle: presentation an management. Retina. 2001;21(3):214–220.

Impacted canine transplatation an alternative option to orthodontic anchorage

Lungu Bogdan Vasile[1], Dodi Andreea[1], Ciureanu Ioan Adrian[2], Alexa Anisia-Iuliana[3,4]

1.Evosmile Dental Clinic Iasi, Romania 2."Grigore T. Popa" University of Medicine and Pharmacy Iasi, Romania 3."Sf. Spiridon" Emergency Hospital Iasi, Romania

Dental transplantation is a surgical procedure in which an extracted tooth is replanted in a new alveolus in the same patient.

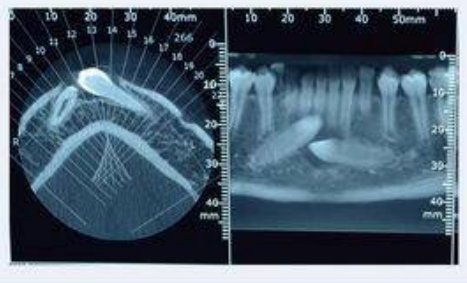
A CASE REPORT

A 12-year-old patient presents mandibular and maxillary dento-alveolar incongruence and persistence of the temporary canines on the lower arch.

Radiological examinations Cone Beam Computer Tomography shows:

•the definitive inferior canines located horizontal intraosseously on the mandibular midline with the dental crowns in relation to the apical part of the roots of the lower central incisors.

•temporary lower canines have physiological resorbtion.



Therapeutical approach

•Preparatory orthodontic treatment for transplant surgery has been initiated.

•Extraction of the impacted canines and temporary left canine and preparation of a neoalveolus

•endodontic treatment of the permanent left canine, apical sealing with **Aggregate Mineral Trioxide** and transplantation of the tooth were performed.

•In the remaining bone defect we performed bone augmentation.

•The tooth transplanted is immobilized orthodontically.

The postoperative evolution is favorable for a follow-up period of 2 years.

Discutions:

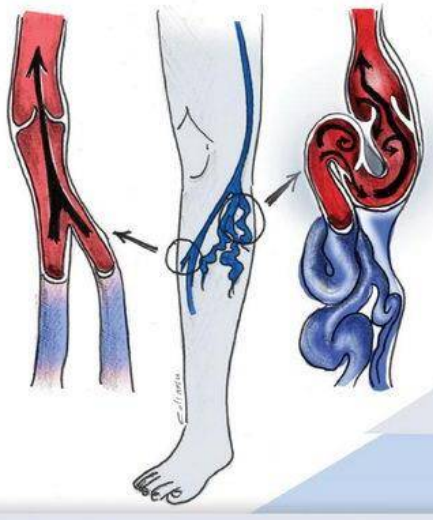
In the scientific literature, some orthodontic treatments by anchoring the impacted teeth and alignment on the arch have been reported, but not by dental transplantation as was done in our case. The choice to transplant only the lower left canine was taken because we could create in this case a safe neoalveola in the autologous bone at distance from the resulting cavity after the canine odontectomy. For the contralateral canine, if an attempt was made to create a neoalveola, there would have been direct contact with the large cavity resulting from postodontectomy. This justifies the therapeutic attitude of preserving the temporary canine on the right side.

The particularity of the case is given by the topography of the dental inclusions, less common at the mandibular level, but also by the therapeutic approach.

Conclusion:

The presented case shows a new perspective on the therapeutical approach of the impacted inferior canines that are not suitable for orthodontic anchoring due to the risk of compromising the lower frontal incisors.

evoSmile
Dental Clinic



VENOUS INSUFFIENCY ULCER.

C. H. I. V. A. & NEGATIVE PRESSURE TREATMENT

dr. Gabriela COZMANCIUC[1], Oana OLARIU[1], Florentina SEVERIN[2], Anisia Iuliana Alexa[2], Ioan Adrian CIUREANU[3]
1 Inimed 360° - Cardiovascular Medicine
2. Grigore T. Popa University of Medicine & Pharmacy, Iasi, România

Introduction

C.H.I.V.A.
- a surgical treatment that has been developed by dr. Claude Franceschi in France.
- the philosophy of C.H.I.V.A. treatment is based on a minimally invasive technique and restores the hemodynamics.
- there are no surgical contraindications either related to age or associated pathologies

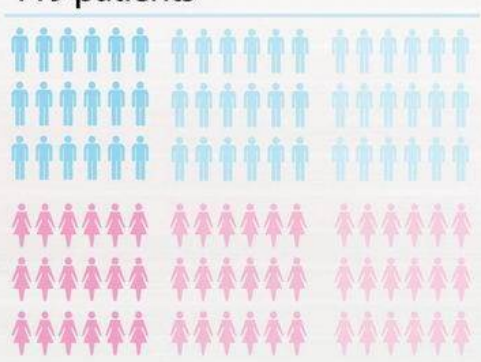
Objective

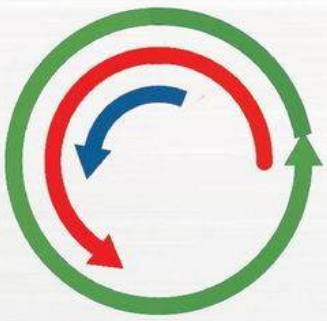
→ to evaluate the results of the treatment of venous isuffiency ulcer

Methods

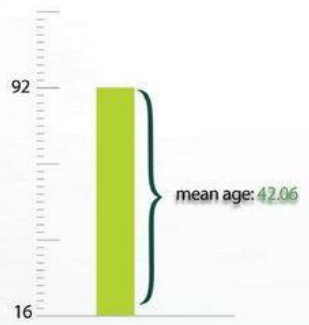
- a study in 119 patients treated between January 2018 and January 2020
- preoperative the patients were marked during Doppler ultrasound examination.
- interventions were performed with sedation and local anesthesia.
- after 1, 3, 6 and 12 months we perform clinical examination and also ultrasound Doppler evaluation

Results

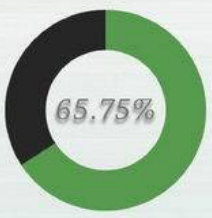




100%
119 patients
61,34 %
73 women
38,65%
46 men

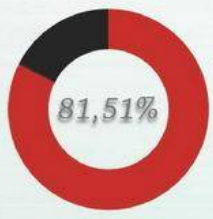


bilateral



unilateral

complications & deaths



negative pressure treatment

ulcer healing after 14 days

Conclusions

- After 14 days we have significant ulcer healing and after 4-6 weeks of the intervention the diameter of affected veins was normalized.
- With this treatment the veneous function is considerably improved and aesthetic results obtained are excellent.
- CHIVA technique is an ideal treatment of recurrent ulcers.

Bibliography
1. Claude FRANCESCHI 1, Massimo CAPPELLI 2, Stefano ERMINI 3, Sergio GIANESINI 4, Erika MENDOZA 5, Fausto PASSARIELLO 6, Paolo ZAMBONI 4 CHIVA: hemodynamic concept, strategy and results International Angiology 2016 February;35(1):8-30
2. Claude FRANCESCHI, Paolo ZAMBONI, Principles of Venous Hemodynamics, 2009, ISBN: 978-1-60692-485-3

COMPUTER TOMOGRAPHY AS A POSITIVE PROGNOSTIC FACTOR IN COMPLEX CERVICAL TRAUMA

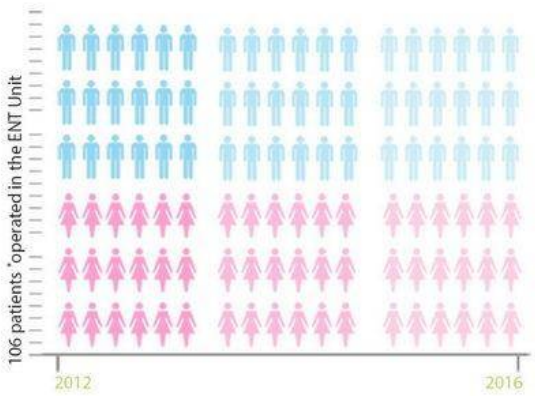
SEVERIN Florentina, ALEXA Anisia-Iuliana, COBZEANU Dan Mihail

GRIGORE T. POPA UNIVERSITY OF MEDICINE AND PHARMACY IASI

introduction performing preoperative computer tomography, is an approach, who is related to the affected cervical area and to the lesion described in order to avoid formal and unnecessary surgical exploration

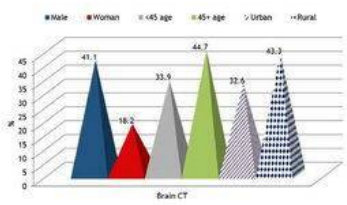
objective determining the profile of paraclinical explorations used in the diagnosis of complex aerodigestive cervical traumas;

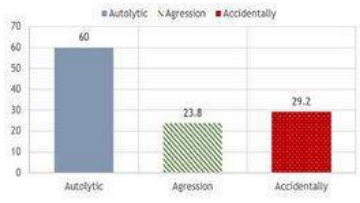
methods

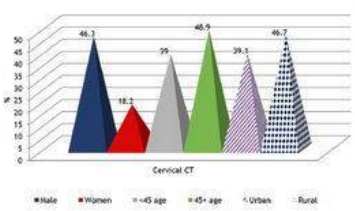


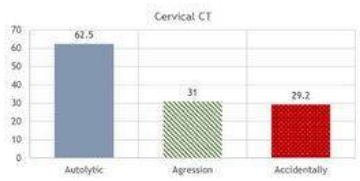
with: complex cervical trauma pathology
- car accidents,
- domestic accidents,
- aggression,
- ballistic trauma,
- autolytic attempts,
- hanging or strangulation

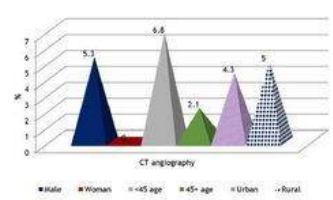
results

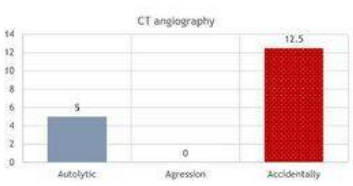


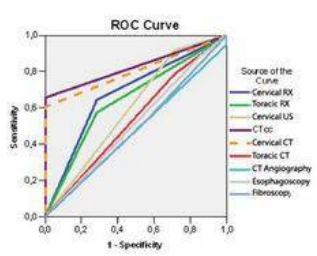


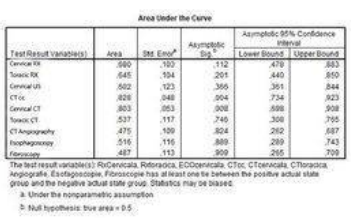












Area Under the Curve

Test Result Variable(s)	Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Cervical RX	,680	,102	,112	,479	,883
Toracic RX	,645	,104	,201	,440	,850
Cervical US	,602	,123	,366	,361	,844
CTcc	,828	,048	,004	,734	,923
Cervical CT	,803	,053	,008	,698	,908
Toracic CT	,537	,117	,746	,308	,765
CT Angiography	,475	,109	,824	,262	,687
Esophagoscopy	,516	,116	,889	,289	,743
Fibroscopy	,487	,113	,909	,265	,708

The test result variable(s): RxCervicala, RxToracica, ECOcervicala, CTcc, CTcervicala, CToracica, Angiografie, Esofagoscopie, Fibroscopie has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

conclusions

CT and angiographic examination reveals a sensitivity and diagnostic specificity of approximately 100%

CT examination with or without direct laryngoscopy is sufficient to diagnose laryngeal or laryngotracheal lesions.

The use of imaging paraclinical explorations in the diagnosis of complex cervical traumatic lesions is a positive prognostic factor in the evolution of this pathology.

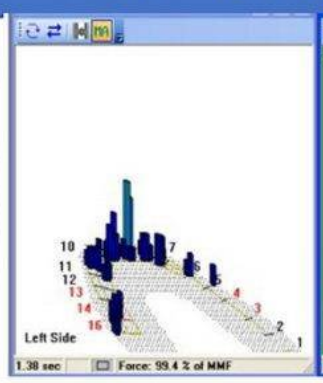
ROLE OF T-SCAN IN THE ASSESSMENT OF PATIENTS WITH OROFACIAL DYSORDERS

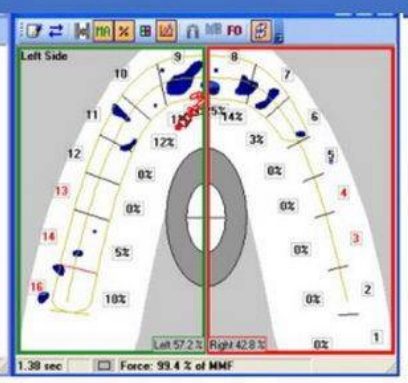
Dragoş Frăţilă, Dragos Virvescu, Claudiu Topoliceanu
U.M.F. "Grigore T.Popa" Iaşi, Faculty of Dental Medicine

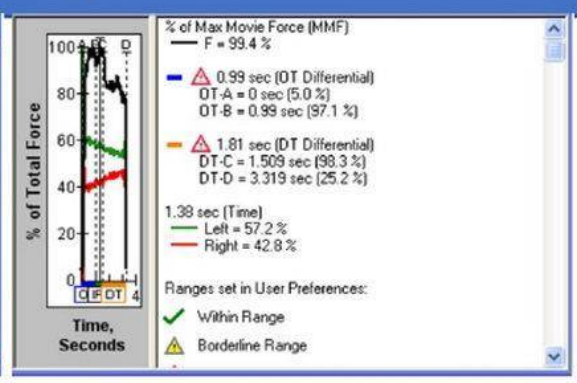
AIM OF STUDY was to demonstrate the possibilities to use the device T-SCAN III (TekScan, USA) in the evaluation of the force, timing and distribution of the occlusal forces in a group of patients with orofacial dysfunctions.

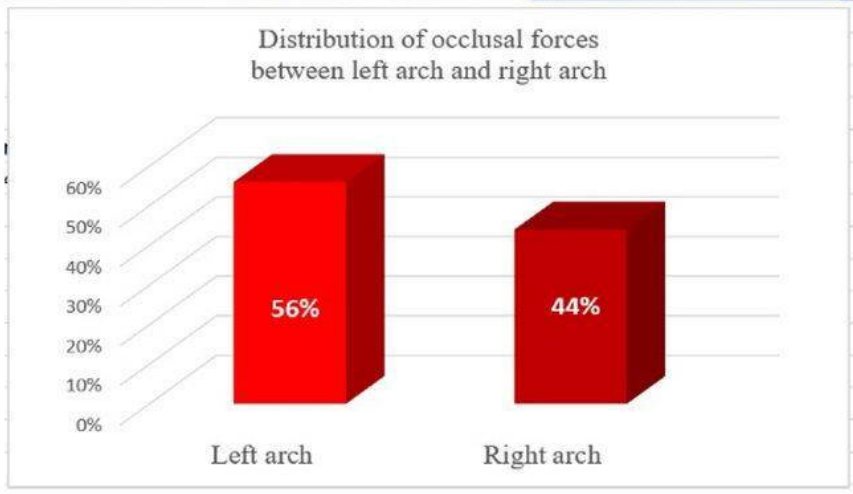
MATERIAL AND METHODS. Study group included 20 patients with orofacial dysfunctions (muscular/ATM pain or discomfort, laterodeviations) due to partially edentations or iatrogenic fixed partial dentures, selected from patients of Dental Educational Clinical Base "Mihail Kogãlniceanu", Faculty of Dental Medicine, U.M.F."Grigore T.Popa" Iassy. Patients were programmed for prosthetic treatment with fixed partial prosthesis or removable partial denture. T-SCAN was used to record on graphs the distribution of occlusal forces on molars, bicusps and anterior teeth. The system T-SCAN allowed the calculation of occlusal forces intensity and their distribution on all dental groups. The results were statistically analysed.

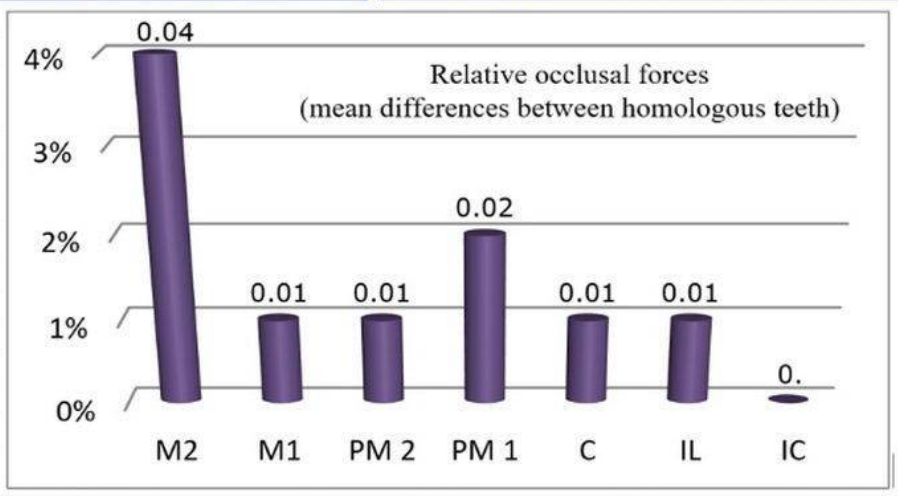
RESULTS. T-SCAN graphs obtained from a partially edentulous patient, age 48 (fig.1.a-c) and the results obtained from the study group (fig.2.a-b) are exposed in figures below.











CONCLUSIONS. T-SCAN use for patients with orofacial disfunctions proves the existence of different intensity of relative occlusal forces between homologous teeth, significantly statistic only for bicusps dental group. T-SCAN use allows detection of premature occlusal premature contacts and interferences to patients with orofacial disfunctions.

Faculty of Medical Bioengineering | Romanian Red Cross | Romanian Inventors Forum

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MECHATRONIC DEVICE FOR BREATHING FLOW SIMULATION WITH FIRST AID APPLICATIONS

UMF IASI
"Grigore T. Popa" University of Medicine and Pharmacy
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INTRODUCTION AND OBJECTIVES

Currently, more than 135 million deaths annually due to cardiovascular causes are registered worldwide and the trend is growing. Most cardiac arrest occurs in the presence of witnesses. The optimal performance in the cardiopulmonary resuscitation (CPR) of a victim in cardiac arrest is directly related to the preparation of the rescuer and the correct execution of the specific maneuvers, in the present medical emergency.

The basic life support (BLS) provides that the rescuer checks the presence of the victim's breathing and determines its frequency, in order to respect the resuscitation protocol (Figure 1).

Medical emergency simulation provides a learning opportunity for controlled clinical practice without putting real patients or others subjects at risk. Simulation of cardiopulmonary resuscitation maneuvers allows training to be targeted to the need of the future rescuer, not the patient, allowing multiple practice attempts in order to achieve necessary competence. Learners are given ''permission to fail'' and to learn from these exercises, something which is undesirable in medical clinical practice.

For this, we were able to design and implement a breath simulator in an innovative, interactive and easy-to-use form in the first aid training centers at an affordable price. The system functions can be preset or controlled from a console.

Fig. 1 – Evaluation and resolution of the ABC algorithm (airways, respiration, circulation)

MATERIALS AND METHODS

The simulator contains a microcontroller that controls an air supply source (negative pressure for inhalation, respectively positive pressure for exhalation). The respiratory medium is aspirated or evacuated to the outside through artificial superior airways of the manikin using a solenoid valve system (Fig. 2).

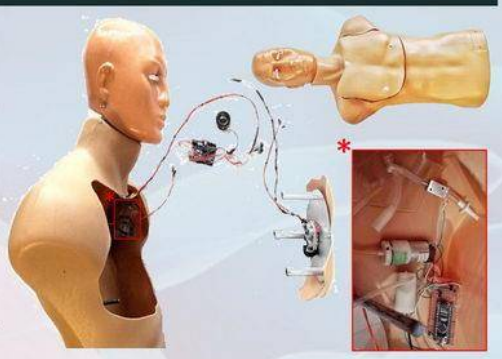

Fig. 2 –The anatomical model and the prototype of the simulator

According to first aid guides, the rescuer performs a brief and succinct analysis of the victim. This refers to the fact that if the victim is lying, the rescuer bends his head, so that the ear is near the nostrils of the manikin.

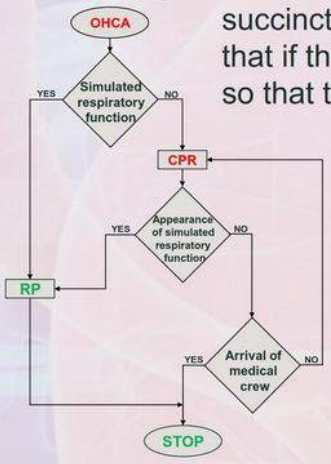

Fig. 3 – Logical scheme of the method

If the respiratory flow is present (the simulator operates on a certain respiratory frequency), the rescuer positions the dummy in the recovery position (RP). If the victim does not show vital respiratory signs (the simulator is not working), CPR is performed.

If during the CPR execution, the first aid instructor starts the simulator, the rescuer places the victim in RP, according to the logic diagram attached (Figure 3).

RESULTS

In order to verify the signal emitted by the breathing simulator that reaches the rescuer during the ABC algorithm, the sound intensity of the noise produced by the airflow crossing the artificial airways was recorded. The data was obtained using a decibel meter placed in the nostrils of the dummy.

Figure 4 shows three examples of signals that can be used in practicing CPR maneuvers. The frequency of breathing can be changed at any time by the first aid instructor, to test the rescuer and to put him in difficulty in the simulated emergency situation.

Fig. 5 – A volunteer practicing the first aid maneuvers on the prototype

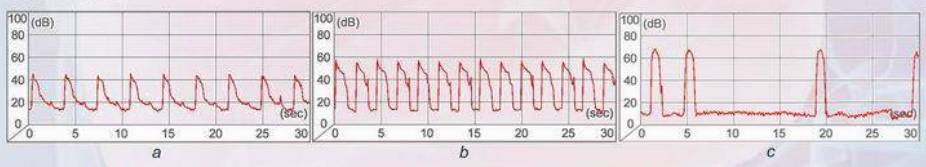

Fig. 4 – Sound intensity of simulated respiratory flow over time (a. normal frequency; b. tachypnea; c. gasping)

The manikin was successfully tested at the Romanian Red Cross (Iasi Branch – Figure 5) in the presence and under guidance of a physician in the field of emergency medicine.

CONCLUSIONS

The system comes to the aid of the rescuer who needs to be trained on how he can detect breathing: tracking chest movements, listening to respiratory sounds, and sensing air flow from peripheral airways.

With the help of this simulator, which is implemented in an anatomical model, the resuscitator learns to differentiate normal breathing (when the victim will be placed in the recovery position - RP) from superficial or irregular breathing (gasping - in which case CPR is continued).

We appreciate that the Technology Readiness Level is 5 (out of 7), as the prototype was validated by specialists in the field of emergency medicine (the system was tested within the Romanian Red Cross – Iași Branch).

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BIOCOMPATIBLE OIL IN WATER MICROEMULSIONS WITH HYALURONIC ACID AND SALICYLIC ACID AND METHOD FOR OBTAINING THEREOF

Patent Application No. A 176 / 01.04.2020 – OSIM

Cristina Elena DINU-PÎRVU, Lăcrămioara POPA, Mihaela Violeta GHICA, Valentina ANUȚA, Răzvan-Mihai PRISADA, Bruno Ștefan VELESCU, Marina-Theodora TALIANU

Class no. 4: Medicine - Health Care - Cosmetics

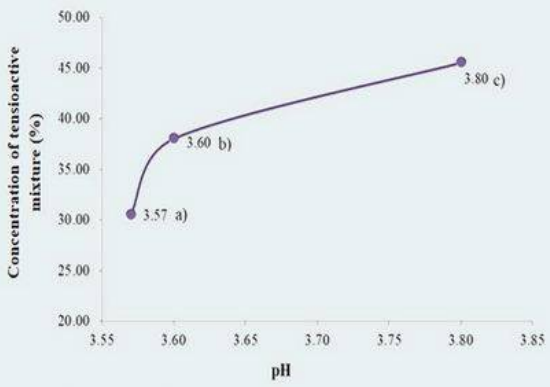
THE FIELD OF THE INVENTION

❑ The invention refers to **biocompatible** oil in water microemulsions with hyaluronic acid and salicylic acid, designed for topical application in **dermatologic therapy of acne** and a method for obtaining thereof.

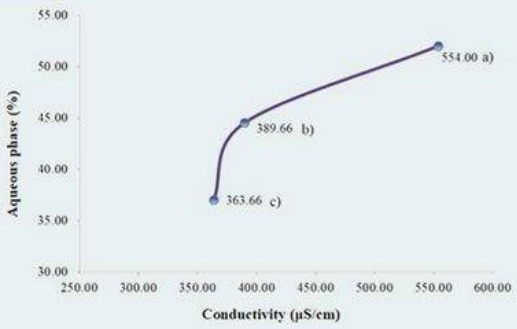
DESCRIPTION

❑ The method used to prepare oil in water microemulsions, according to the invention, consists in: lecithin 0.5% prepared as aqueous suspension is mixed with Tween 80 20...30% and propylene glycol 10...15% thus generating a complex surface tension modulator with solubilization function for salicylic acid 0.5%. The resulted mixture will be integrated in a solution formed with hyaluronic acid 1% and distilled water. The vegetable oil phase 1% composed of oat oil 0.5% and pomegranate oil 0.5% will be added drop by drop using oil titration method, under magnetic stirring. Finally, the obtained systems have a clear aspect, with fluid structure. After a deposition period at 4ºC the microemulsions were physico-chemically characterized by: pH, conductivity, refractive index and rheological behaviour.

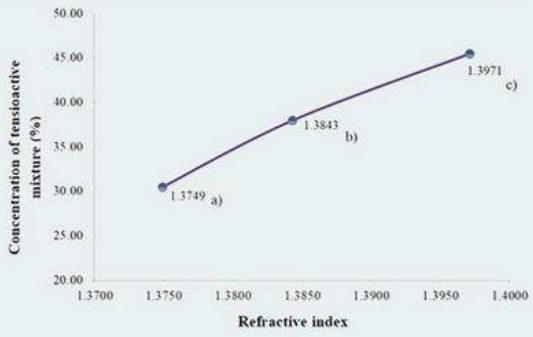
CHARACTERIZATION



pH values for the invented microemulsions, coded MEAS1, MEAS 2 and MEAS 3, as a function of the selected tensioactive mixture



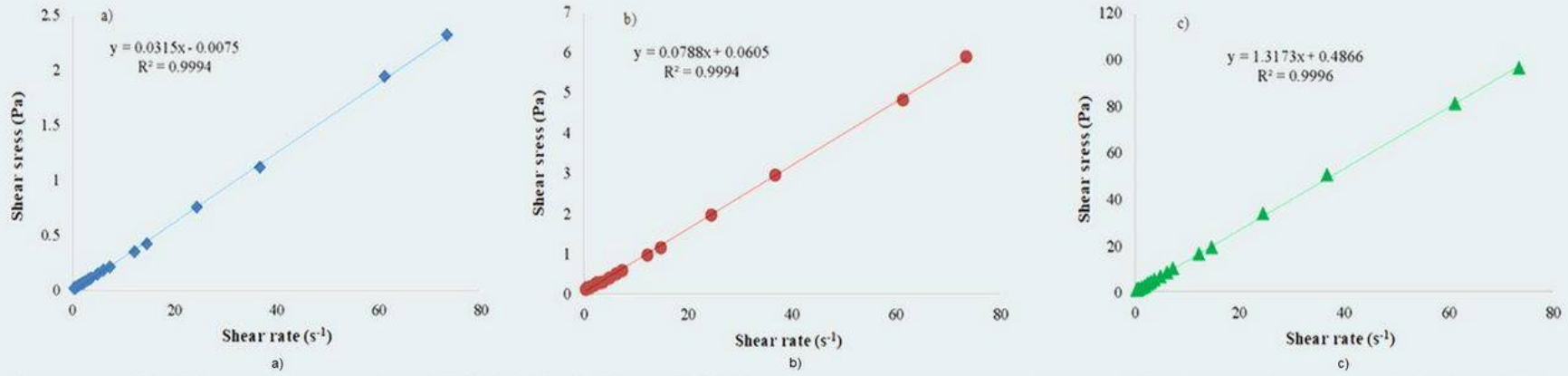
Conductivity values (µS/cm) for the invented microemulsions as a function of the aqueous phase content, defining the oil in water type of microemulsions



Values of refractive index expressed as a function of the tensioactive mixture content for the invented microemulsions, proving the isotropic character

Mathematical modeling of the rheological profiles for the invented microemulsions and the corresponding viscosity (cP)

Formulation	Straight line equation	Determination coefficient	Viscosity (cP)
MEAS 1	y = 0.0315 x – 0.0075	0.9994	31.5
MEAS 2	y = 0.0788 x + 0.0605	0.9994	78.8
MEAS 3	y = 1.3173 x + 0.4866	0.9996	1317.3



Rheological profiles for the invented microemulsions MEAS 1 (a), MEAS 2 (b) and MEAS 3 (c), expressed as shear stress versus shear rate, defining the linear character according to Newton's law

ADVANTAGES

The advantages residing from the application of the invention are the following:

❑ The topical use of biocompatible oil in water microemulsions which (i) may include an antiacne active, namely salicylic acid 0.5% by integrating a surface tension modulator system with a double function: solubilization capacity and diffusion promoter through stratum corneum;

❑ In the same manner, minimizing the adverse reactions of salicylic acid like erythema or dryness by integrating (ii) hyaluronic acid as a biopolymer with hydrating, protective and resurfacing properties;

❑ Hyaluronic acid acts as a viscosity promoter due to hydrogen bonds formed with water molecules, resulting thus a structural network which enhance the sensorial properties of the final products;

❑ The biocompatibility of surface tension mixture is defined by the (iii) association of Tween 80 as a non-ionic surfactant with lecithin as a natural zwitterionic surfactant in combination with propylene glycol as a cosurfactant in a minimal concentration, under 70 %.

❑ Based on the described composition, microemulsion systems with a high biocompatibility will result, using a simple and rapid manufacturing method without energy consumption.

ACKNOWLEDGEMENT

This work was financially supported by „Carol Davila" University of Medicine and Pharmacy through Contract no. 23PFE/17.10.2018 funded by the Ministry of Research and Innovation within PNCDI III, Program 1 – Development of the National RD system, Subprogram 1.2 – Institutional Performance – RDI excellence funding projects.

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Iasi, Romania, 21-23 May 2020

COLLAGENATED TEXTILE MESHES IMPREGNATED WITH MINOCYCLINE FOR SURGICAL USE AND PROCESS FOR THEIR PREPARATION

Patent Application No. 00755 – 27.09.2017 – OSIM

Class no. 4: Medicine - Health Care - Cosmetics

Ștefania MARIN[1], Mădălina Georgiana ALBU KAYA[1], Mihaela Violeta GHICA[2], Denisa Ioana UDEANU[2], Constantin Vlad Denis[3]

[1]Division Leather and Footwear Research Institute, National Research and Development Institute for Textile and Leather, Bucharest, Romania; [2]University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania; [3]"St. Pantelimon" Emergency Clinical Hospital, Bucharest, Romania

THE FIELD OF THE INVENTION

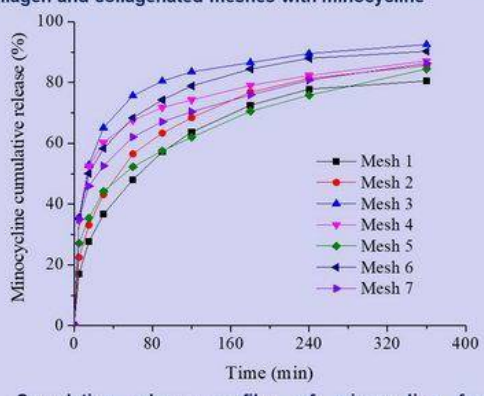
- The invention refers to a drug delivery system developed as collagenated textile mesh impregnated with minocycline, used in general surgery for the treatment of abdominal hernia or associated postoperative infections, and a process for its preparation

DESCRIPTION

- According to the patent application the meshes consists of a textile support impregnated with a gel obtained from a natural polymer – fibrillar collagen type I, minocycline – antibiotic with a broad spectrum and a cross-linking agent – glutaraldehyde. The process of obtaining drug delivery systems developed as collagenated textile meshes impregnated with minocycline, according to the invention, consists in: (i) firstly the fibrillar collagen gel type I, extracted from calf hide, having a content of 1.1... 2.3% dry collagen, is mixed with the 0.1 ....0.8% minocycline solution, homogenized, the pH is adjusted at 7.4 and distilled water is added until the final composition contains 1.1% dry collagen and 0.15% ... 0.9% cross-linking agent is added, mixed in the final composition as 0.2% ... 0.3% solution in distilled water; (ii) the synthetic meshes are immersed in the composition obtained as collagen-minocycline cross-linked gel then dried for 24 h, to form a film at their surface; repeated immersions are then realized to increase the collagen-minocycline layer thickness.

CHARACTERIZATION

Images obtained by optical microscopy for control mesh without collagen and collagenated meshes with minocycline



Cumulative release profiles of minocycline from collagenated textile meshes as a function of time

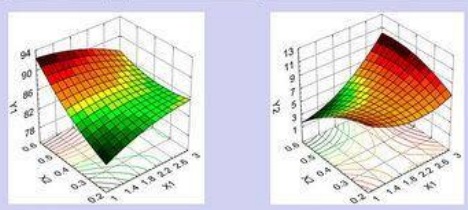
Correlation coefficients for minocycline release from collagen collagenated textile meshes determined by application of Higuchi and Power law models; kinetic parameters for Power law model

Mesh no.	Higuchi Model	Power Law model	Release exponent	Kinetic constant (1/min^n)
Mesh 1	0.9450	0.9854	0.33	0.121
Mesh 2	0.9220	0.9889	0.29	0.162
Mesh 3	0.7716	0.9758	0.19	0.327
Mesh 4	0.7798	0.9874	0.18	0.310
Mesh 5	0.9265	0.9995	0.27	0.174
Mesh 6	0.8195	0.9907	0.20	0.291
Mesh 7	0.8423	0.9988	0.21	0.264

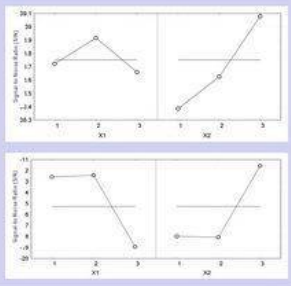
Process variables and experimental conditions in Mitchell-Bayne design

Independent variables	Coded symbol	Coded and uncoded variation levels		
		Low (1)	Middle (2)	High (3)
Number of layers	X_1	1	2	3
Minocycline (g%)	X_2	0.2	0.4	0.6

Dependent variables	Coded symbol	Constraints
Drug percent released, PR (%)	Y_1	Maximize
Weight loss, WL (%)	Y_3	Minimize



Plot of response surfaces for system responses as a function of experimental conditions

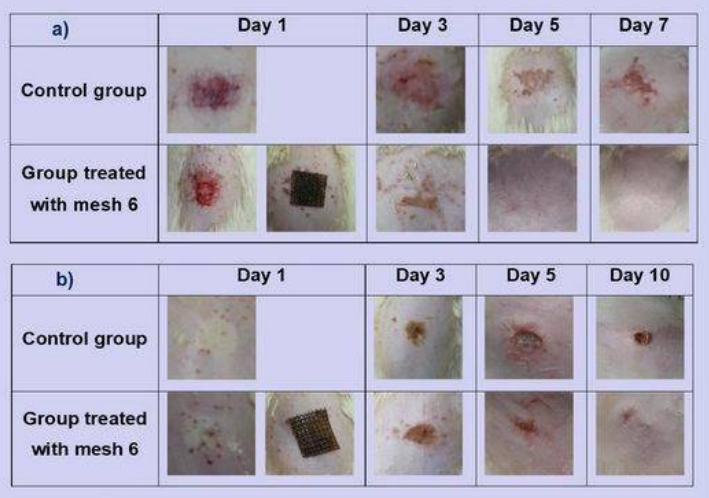


Control factors	Y_1 "larger is the better"	Y_1 effect size	Y_2 "smaller is the better"	Y_2 effect size
X_1	2	0.165	2	2.832
X_2	3	0.327	3	3.683
S/N pred. (dB)	39.243		-8.745	
S/N obs. (dB)	39.110		-6.444	

Taguchi analysis – Mesh 6 the most stable, robust and insensitive to the noise factors

Experimental Mitchell-Bayne design – coded and physical values of the independent variables; observed and predicted responses for collagenated meshes with minocycline

Mesh no.	Independent variables (coded level)		Responses			
	X_1	X_2	Y_1 – PR (%)		Y_2 – WL (%)	
			Obs.	Pred.	Obs.	Pred.
Mesh 1	1(1)	1(0.2)	80.53	80.70	8.16	7.48
Mesh 2	3(3)	1(0.2)	85.62	84.98	7.70	8.49
Mesh 3	1(1)	3(0.6)	92.52	92.27	2.22	1.19
Mesh 4	3(3)	3(0.6)	87.09	86.52	11.7	10,29
Mesh 5	3(3)	2(0.4)	84.43	85.56	7.69	9.17
Mesh 6	2(2)	3(0.6)	90.27	90.80	2.10	4.60
Mesh 7	2(2)	2(0.4)	86.32	85.92	8.33	6.64



Evolution of the experimentally induced: a) superficial, b) medium severity burns, to Wistar rats after the treatment with collagenated textile Mesh 6 impregnated with minocycline comparing to the untreated control group

ADVANTAGES

- The application of the invention has **the advantage** of ensuring a local and improved minocycline release to the affected tissues, maintaining an optimal and efficient concentration of antibiotic from a polymeric film obtained from collagen as natural biopolymer added on a surface of a synthetic textile mesh; thus the adverse secondary reactions, the first hepatic passage consequences, the risks and inconvenient of intravenous therapy are avoided, increasing the patients compliance.
- Moreover, the invention has a beneficial effect in the evolution and healing of two superficial lesions with medium severity experimentally induced to Wistar rats, the experimental animals presenting no local or systemic secondary reactions following the topical treatment, the meshes being easily tolerated and having beneficial effects in such lesions healing process.
- The invention is promising for future application in abdominal hernia or associated postoperative infections, ensuring both the infection treatment and antibacterial protection and also the regeneration of damaged tissue after surgical intervention.

Acknowledgment

- The authors gratefully acknowledge the financial support of "Carol Davila" University of Medicine and Pharmacy through Contract no. 23PFE/17.10.2018 funded by the Ministry of Research and Innovation within PNCDI III, Program 1 – Development of the National RD system, Subprogram 1.2 – Institutional Performance – RDI excellence funding projects.

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TRIVALENT CHROMIUM COMPOUND WITH ANTIADIPOGENIC ACTIVITY AND PROCESS FOR SYNTHESIS

Patent Application No. A 00177 / 01.04.2020 – OSIM

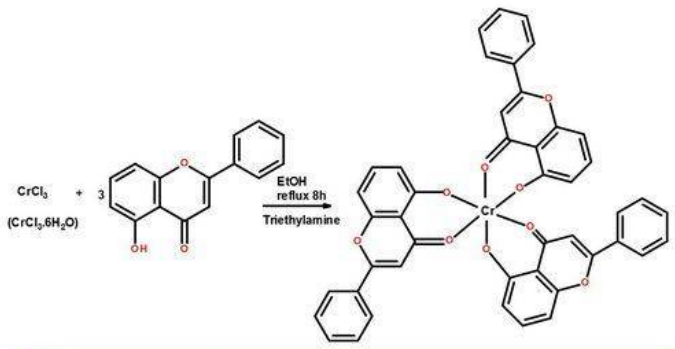
Valentina UIVAROSI, Bianca GĂLĂȚEANU, Alexandra-Cristina MUNTEANU, Ariana HUDIȚĂ, Bruno Ștefan VELESCU, Valeria-Nicoleta VATAVU-GHIȚOI

Class no. 4: Medicine - Health Care - Cosmetics

THE FIELD OF THE INVENTION

The invention reffers to a chromium (III) complex, to a process for synthesis and to the evaluation of the antiadipogenic activity, in respect to its therapeutic potential.

CHEMISTRY



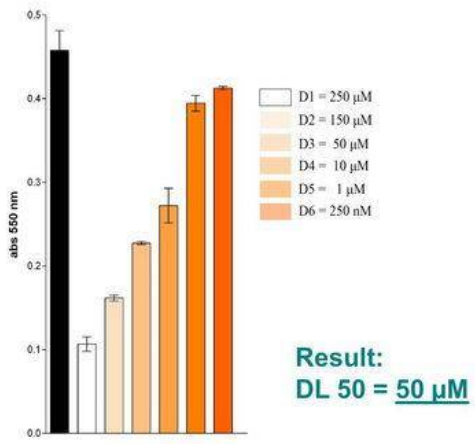
Chemical formula: $CrC_{45}H_{27}O_9$
Elemental analysis calc/found (%): C 70.77/70.20; H 3.53/3.26; **Molar mass**: 763.12 g/mol
Melting points: > 400°C (ligand: 158- 161°C)
IR spectra (KBr pellets) (cm^{-1}): ν(OH)complex, 3064 (very weak)/ν(OH)ligand, 3059 (medium); ν(C=O)complex, 1626 (very intense/ν(C=O)ligand, 1654 (very intense); ν(C-O-C)complex, 1257 (intense)/ν(C-O-C)ligand, 1255 (intense).
UV-Vis diffuse reflectance spectrum (λ_{max}): 275 nm (spin allowed transition $^4A_{2g} \rightarrow {}^4T_{1g}(P)$), 445 nm (spin allowed transition $^4A_{2g} \rightarrow {}^4T_{1g}(F)$), 600 nm (shoulder, transition $^4A_{2g} \rightarrow {}^4T_{2g}$; pattern for octahedral complexes of Cr(III) with ligands with oxygen donor atoms.
Molar conductance (10^{-3}M solution in dimethylsulfoxide): 8.8 $\Omega^{-1}cm^2mol^{-1}$ (nonelectrolyte).

DESCRIPTION

The process for the preparation of the complex consists in dissolving the 5-hydroxyflavone ligand (Primuletin, Pri) in ethanol in the presence of triethylamine, adding the solution thus obtained to an ethanolic solution containing $CrCl_3$, for a L: M molar ratio of 3: 1 and refluxing the final mixture until a red crystalline precipitate is obtained. The hardly soluble compound was filtered off, washed with ethanol and dried by storage at room temperature. Another object of the invention is the use of the chromium (III) compound with 5-hydroxyflavone (Primuletin) as an agent with antiadipogenic activity, useful in the treatment of obesity. The influence of the compound $Cr(Pri)_3$ in the dynamics of the adipogenic differentiation process is highlighted by the evaluation of intracytoplasmic lipid accumulations (characteristic for mature adipocytes) and the expression of perilipine as a marker of adipogenesis.

BIOLOGICAL ACTIVITY

Biological material: adult stem cells derived from human subcutaneous adipose tissue (hASC - human Adipose Derived Stem Cells, LifeTechnologies), grown under standard culture conditions, (37 °C, humid atmosphere and 5% CO_2).



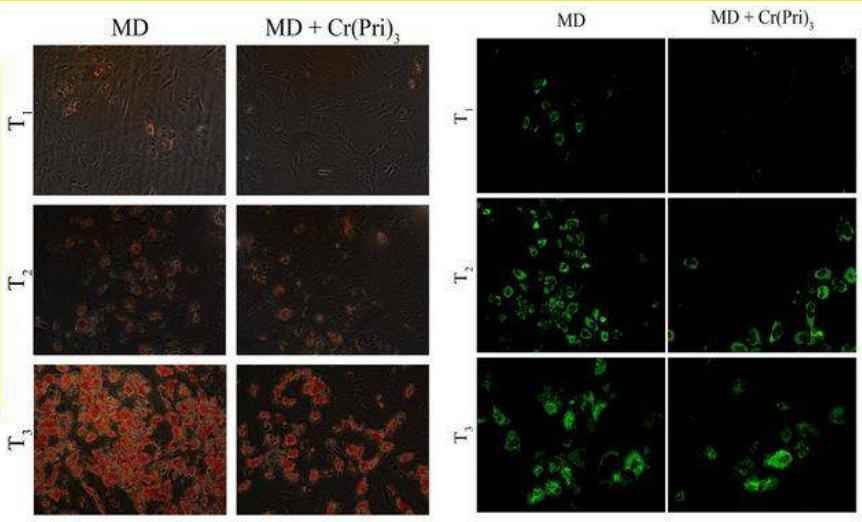
Result:
DL 50 = 50 µM

1. Determination of lethal dose 50 (LD50) of $Cr(Pri)_3$ for hASCs:
MTT test for quantitative evaluation of cell viability (determinations in triplicate); spectrophotometric data processed with GraphPad Prism software
Graphical representation of the viability of hASCs cells at 24 hours of treatment, compared to the untreated control (D1 = 250 µM, D2 = 100 µM, D3 = 50 µM, D4 = 10 µM, D = 1 µM, D6 = 250 nM)

2. The influence of the compound $Cr(Pri)_3$ in the dynamics of the adipogenic differentiation process

Procedure:
• hASCs cells cultured for 21 days in an adipogenic inducing medium (StemPro® Adipogenesis Kit - Life Technologies), differentiation medium (MD) and in differentiation medium supplemented with 50 µM $Cr(Pri)_3$ (MD + Cr $(Pri)_3$).
• adipogenesis studies performed at 7 days (T1), 14 days (T2) and 21 days (T3) after process induction; the results were reported to a culture of hASCs not exposed to these conditions (T0).
Objective: evaluation of intracytoplasmic lipid accumulations (a characteristic feature of mature adipocytes) and perilipine expression as a marker of adipogenesis.

2.1. Evaluation of the accumulation of intracytoplasmic lipid droplets, performed by labeling with the specific histological dye OilRed O.
Observations:
• delay of the adipogenesis process in the sample containing $Cr(Pri)_3$
• at the end of the experiment (T3), the ratio between differentiated cells (which show intracytoplasmic lipid accumulations) and undifferentiated cells is higher in the case of cells exposed to MD compared to those exposed to MD + $Cr(Pri)_3$.



2.2. Evaluation of perilipine protein expression (an adipogenic marker)
Perilipine expression was investigated by immunocytochemistry and fluorescence microscopy.
Observation: perilipine expression increases over time and was more evident in samples exposed to MD compared to those in MD + $Cr(Pri)_3$

ACKNOWLEDGEMENT

This work was financially supported by „Carol Davila" University of Medicine and Pharmacy through Contract no. 23PFE/17.10.2018 funded by the Ministry of Research and Innovation within PNCDI III, Program 1 – Development of the National RD system, Subprogram 1.2 – Institutional Performance – RDI excellence funding projects.

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EUROINVENT
11th European Exhibition of Creativity and Innovation, Romania, 21-23 May 2020

O-ARYL-CARBAMOYL-OXYMINO-DIBENZ [b,e]OXEPINES, A PHARMACEUTICAL COMPOSITION CONTAINING THEM AND THEIR USE (Patent Application A/00859/ 01.11.2018)

Vlad Ilinca Margareta[1], Limban Carmen[1], Nuță Diana Camelia[1], Chiriță Cornel[1], Marineci Dana Cristina[1], Ștefănescu Emil[1], Căproiu Miron Teodor[2], Drăghici Constantin[2], Dumitrașcu Florea[2], Chifiriuc Mariana Carmen[3], Măruțescu Luminița[3], Avram Speranța[3], Dinu-Pîrvu Cristina Elena[1], Missir Alexandru Vasile[1]

[1] University of Medicine and Pharmacy "Carol Davila", Traian Vuia 6, sect. 2, 020956 Bucharest, Romania
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[3] Research Institute of the University of Bucharest (ICUB) and Faculty of Biology, University of Bucharest, 1-3 Ale. Portocalelor, 060101 Bucharest, Romania

The field of invention

The invention consists in the **synthesis of novel compounds with low toxicity**, from the carbamoyloxymino-dibenz[b,e]oxepine class and the demonstration of their antimicrobial effect on reference strains, as well as on microbial strains recently isolated from the clinic, having multidrug resistance phenotypes in the main classes of antimicrobial agents knowing that there are no therapeutic alternatives to treat them.

The originality also consists in a **new methodological approach**, which is based on completing the study of antimicrobial activity with the **evaluation of the influence** of new synthesized compounds **on the ability of microbial strains to adhere to the inert substrate**, in order to establish a **new anti-infective strategy**, named antipathogenic.

Objectives

Synthesis of O-aryl-carbamoyl-oxymino-dibenz[b,e] oxepines (**1a-j**) by a 5-steps method (scheme 1)

Confirmation of structure and purity by elemental analysis and using 1H-NMR, 13C-NMR spectroscopy (Apt, Gcosy, Ghmqc and Ghmbc experiments) and IR spectroscopy

Biopharmaceutical characterization by molecular modeling, determination of drug-like character and bioavailability and identification of pharmacokinetic profile

Determination of acute toxicity after oral administration in mice, performed by the "up & down" method, according to European Guidelines

The study of antimicrobial activity, following the qualitative screening, the quantitative testing (establishing MIC), as well as the study of the influence on the development of microbial biofilms on inert substrate

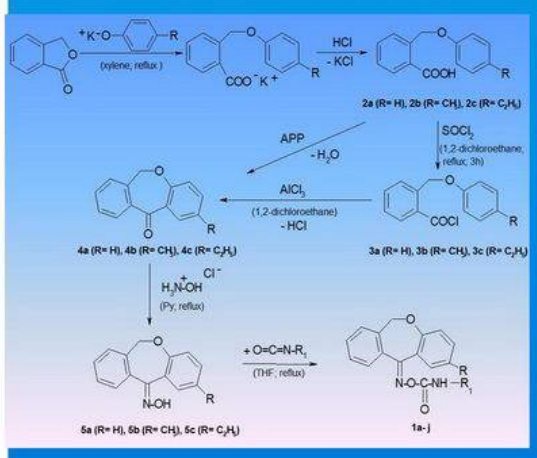
Determination of cytotoxicity by *in vitro* testing, using HeLa and HCT8 cell lines following the detection of apoptosis and necrosis by flow cytometry

Results

- We synthetised and characterised 10 new O-(aryl-carbamoyl)oximes of 6,11-dihydro-dibenz[b,e]oxepin-11(*6H*)one
- The *in silico* studies evidenced an **optimal pharmacokinetic profile** for the synthesized compounds **1a- j**, characterized by an average lipophilic character predicting good cell membrane permeability and intestinal absorption and a **low maximum tolerated** dose for humans; potassium channels encoded by the hERG I and II genes as potential targets; no carcinogenic effects
- The new compounds **1i** and **1j** have a **very low acute toxicity after oral administration**, the lethal doses being higher than 2000 mg / kg body weight
- The obtained compounds exhibited a **higher antimicrobial activity** against the planktonic Gram-positive ***B. subtilis*** and ***S. aureus*** strains and the ***C. albicans*** fungal strain (**Table 1**)
- The quantitative method confirms the results of the qualitative screening, demonstrating that **the most active compound is 1f** (**Table 2**)
- The compounds also **inhibited the ability of *S. aureus, B. subtilis, E. coli* and *C. albicans* strains to colonize the inert substratum**, accounting for their possible use as antibiofilm agents (**Table 3**).
- All the tested active compounds exhibited **low cytotoxicity** levels on the HCT8 cells, ensuring the potential use of these compounds for the development of new antimicrobial drugs with minimal side effects on the human cells and tissues. The compounds **1a, 1b** and **1c** exhibited very low cytotoxicity levels on the HCT8 cells (cellular viability rates over 84%), while the compound **1f** proved to be cytotoxic at the tested concentration of 100 µg/mL (**Table 4**, **Figure 1**).
- All the active compounds induced a slight increase in the S (synthesis) phase of the HeLa cells cellular cycle (**Table 5**).

Advantages of the invention

We obtained and characterised new O-(arylcarbamoyl)oximes of 6,11-dihydro-dibenz[b,e]oxepin-11(*6H*)one having potential for development of new antimicrobial drugs with minimal side effects on the human cells and tissues.



Scheme 1. The pathway for the synthesis of the new dibenz[b,e]oxepins

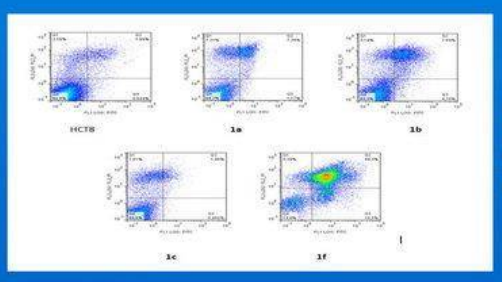


Figure 1. Analysis of apoptosis by flow cytometry. The dot plot figures show the following populations: necrotic (Q1—upper left), late apoptosis (Q2—upper right), early apoptosis (Q3—lower right), and viable cells (Q4—lower left).

Table 1. The results of the qualitative assay of antimicrobial activity of the compounds using an adapted diffusion assay (the growth inhibition diameters in mm)

Chemical compounds / Microbial strains	1a	1b	1c	1d	1e	1f	1g	1h	1i	1j
B. subtilis ATCC 6633	8	7	0	0	0	11	0	0	0	0
S. aureus ATCC 25923	0	0	0	0	0	8	0	0	0	0
P. aeruginosa ATCC 27853	0	0	0	0	0	0	0	0	0	0
E. coli ATCC 25922	0	0	4	0	0	10	0	0	0	0
K. pneumoniae 1771	0	0	0	0	0	0	0	0	0	0
C. albicans ATCC 10231	8	0	8	0	0	12	0	0	0	0

Table 2. The results of the quantitative assay of the antimicrobial activity of the compounds selected by the qualitative screening and the corresponding MIC value (µg/ mL)

Microbial strains / Chemical compounds	1a	1b	1c	1f
B. subtilis ATCC 6633	156	-	-	39
S. aureus ATCC 25923	39	19.5	-	39
E. coli ATCC 25922	625	-	-	-
C. albicans ATCC 10231	39	-	4.8	-

Table 3. The results of the quantitative assay of the antibiofilm

Microbial strains / Chemical compounds	1a	1b	1c	1f
B. subtilis ATCC 6633	4.8	4.8	-	39
S. aureus ATCC 25923	-	-	-	4.8
E. coli ATCC 25922	-	-	1250	78
C. albicans ATCC 10231	4.8	-	1250	-

Table 4. Cytotoxicity assay of the new compounds on HCT cells

100µg/mL	HCT	1a	1b	1c	1f
Necrosis	2.58	7.21	3.14	7.81	5.39
Late apoptosis	1.99	7.39	7.89	1.9	69.3
Early apoptosis	0.844	1.17	4.7	0.46	10.5
Viable cells	94.6	84.2	84.3	89.8	14.8

Table 5. Percentage of HeLa cells in G1, S, G2/M phases as revealed by the cellular cycle assay

	Go/G1	S	G2/M
HELA-control	69.35	24.72	5.12
1a	61.01	37.43	8.46
1b	61.14	37.45	7
1c	61.75	36.48	8.03
1f	53.36	43.56	6.21

AKNOWLEDGMENT
This work was financially supported by „Carol Davila" University of Medicine and Pharmacy through Contract no. 23PFE/17.10.2018 funded by the Ministry of Research and Innovation within PNCDI III, Program 1 – Development of the National RD system, Subprogram 1.2 – Institutional Performance – RDI excellence funding projects.

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NEW MINIPLATE INVOLVED IN FAVORABLE DISTRIBUTION OF THE PERIFOCALE FORCES AT A MANDIBULAR ANGLE FRACTURE

TEODORA SILAGIEVA PITURU
"CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY, BUCHAREST, ROMANIA

Introduction:

A new miniplate with different design and reduced thickness compared to those used in current practice has been designed with a FEA model and verified on experimental stage. The shape of the new miniplate provides superior stability of bone fragments to bar type plates used in current practice.

Methods:

The first stage, the development of the design, was carried out using 3D FEA of a human mandible with angle fracture.

The fractured segments were fixed with the new miniplate near the upper border of the mandible. The load considered was 200N applied perpendicular to the occlusal plane at the position of the incisive teeth. After solving the model with MSC Nastran, the results for displacements and contact forces between the fasteners and cortical bone or miniplate indicated that the goal of the design has been achieved: the control of direction for fastener reactions and minimisations of these forces are immediately near the fracture line.

The experimental stage was aimed towards verifying the miniplate capability in segments stability and bypassing across the fracture line and the required internal loads developed in the mandible during biting. This stage was carried out in three series of load tests and was conducted on sheep mandibles. Two CNC miniplates were machined to specification from Ti6AlV4.

The new miniplate has the ability to transfer away from the bone fracture line the internal forces developed during biting.

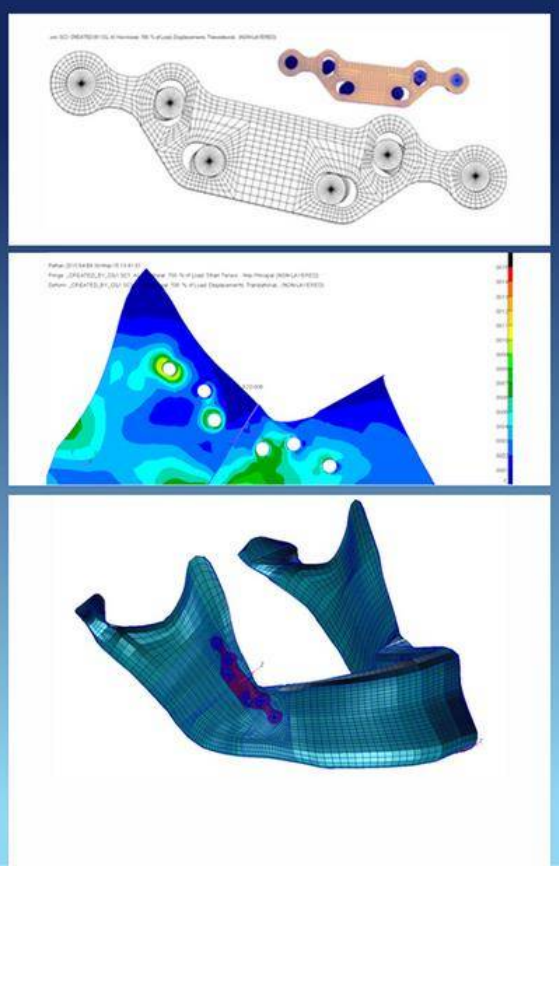
Results:

During the entire testing program it was noticed that both miniplates have good malleability, fact shown by their ability to confirm closely to the surface of the cortical when the screw were tighten to the customary torque values (70Ncm).

The miniplate geometry is effective in determining the direction and magnitude of the forces.

Conclusions:

The aim of creating this new miniplate is to allow the premises for a better healing. This healing is possible by directing the direction and magnitude of forces developed in the interface between the fixing screw and cortical bone during mastication and oclusion.



ACKNOLEDGEMENTS:

The authors gratefully acknowledge the financial support of "Carol Davila" University of Medicine and Pharmacy through FDI-2020-0526 " Supporting excellence in Health domain by optimizing preclinical experimental models".

SUPPORTING EXCELLENCE IN HEALTH DOMAIN BY OPTIMIZING PRECLINICAL EXPERIMENTAL MODELS "CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY BUCHAREST - (MEDEX-III)

Project manager:
Prof. PhD. Pharm. Cristina Elena DINU-PÎRVU

Project no.:
FDI-2020-0526

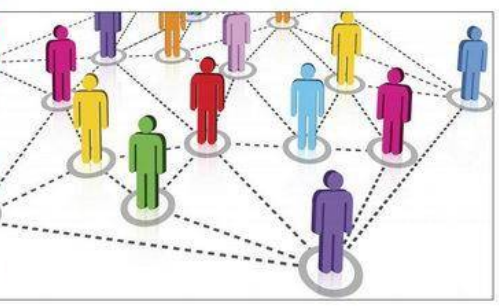
Funding:
MINISTERUL EDUCAȚIEI NAȚIONALE
CNFIS

The aim of the project is to offer an adequate support for research activities within "Carol Davila" University of Medicine and Pharmacy in Bucharest (UMFCD), emphasizing the optimization of preclinical experimental models (in silico, in vitro, in vivo) used in Health domain, in order to increase the complexity of research, and ensuring an efficient transition between basic and applied research.

The project aims at increasing the institutional visibility of "Carol Davila" University of Medicine and Pharmacy by facilitating the access of research teams to programs financed by the European Union within the Horizon 2014-2020 Framework Program for Research and Innovation.

Specific objectives

- O1. Stimulating interdisciplinary excellence activities
  - (i) increasing the openness of excellence research teams towards an integrated, inter- and transdisciplinary approach in the field of Health
  - (ii) supporting new excellence networks in the field of Health Sciences that will allow developing new masters/doctoral programs
- O2. Optimising the performance of research infrastructure by improving functionality of existing equipments
- O3. Ensuring the proper functioning of the biobase within the UMFCD
- O4. Providing support for capitalizing the excellence research results by supporting publication in high impact ISI journals as well as technology transfer and innovation activities

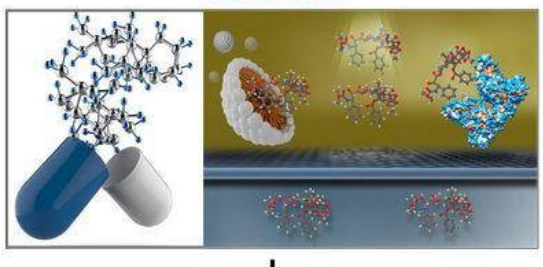


Optimization of the research flow
-identify vulnerabilities
-generating feedback mechanisms

SYNTHESIS / OBTAINING

CHARACTERIZATION

DRUG DESIGN



EVALUATION

CLINICAL TRIALS

1. Organizing two training courses with the themes: (i) Good Practices Regulations and Quality Assurance in Research, (ii) Project Management
2. Organizing a Symposium on "The integrated, inter- and transdisciplinary approach of priority areas applied to Health Sciences"
3. Optimizing the existing research infrastructure
4. Training / specialization courses in EU research centers or cooperation agreements with EU research organizations (minimum: 3)
5. Collaboration protocols with other institutions (minimum: 5)
6. 10 ISI papers in Open Access high impact journals
7. At least one patent application

TOOTHPASTE WITH BEE BREAD (FERMENTED BEE POLLEN)

Patent no. 126742/2014

IONIȚĂ Ana Corina, MITITELU Magdalena, DOGARU Elena, DINU-PÎRVU Cristina Elena

ROMÂNIA

DUPLICAT

ELIBERAT COTITULARULUI BREVETULUI DE INVENȚIE NR. 126742

OFICIUL DE STAT PENTRU INVENȚII ȘI MĂRCI

Brevet de invenție

Nr. 126742

Acordat în temeiul Legii nr.64/1991 privind brevetele de invenție, republicată în Monitorul Oficial al României, Partea I, nr.541, din 08 august 2007.

Titular: IONIȚĂ ANA-CORINA, BUCUREȘTI, B, RO; MITITELU MAGDALENA, CONSTANȚA, CT, RO; DOGARU ELENA, BUCUREȘTI, B, RO; DINU-PÎRVU CRISTINA ELENA, BUCUREȘTI, B, RO

Titlul invenției: COMPOZIȚIE PENTRU PASTĂ DE DINȚI

Inventatori: IONIȚĂ ANA-CORINA, BUCUREȘTI, B, RO; MITITELU MAGDALENA, CONSTANȚA, CT, RO; DOGARU ELENA, BUCUREȘTI, B, RO; DINU-PÎRVU CRISTINA ELENA, BUCUREȘTI, B, 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 27.10.2010, cu condiția plății taxelor anuale de menținere în vigoare a brevetului.

Director General

București, Data eliberării 30.06.2014

FIELD OF THE INVENTION

The invention refers to ***a toothpaste composition*** containing natural origin compounds, with antifungal, anti-inflammatory, immunomodulatory, healing and calming effects, intended for oral cavity hygiene. The product has a homogeneous macroscopic aspect, white-yellowish color, sweet taste, aromatic characteristic smell.

The natural origin products present in the toothpaste composition are ***Bee bread*** (naturally fermented bee pollen) and ***Clove essential oil***. The bioactive components were incorporated into a base containing carboxymethyl cellulose, glycerin, propylene glycol, sodium bicarbonate, calcium carbonate, sodium lauryl sulphate and sodium metabisulfite.

TOOTHPASTE COMPOSITION

BASE

Component	Function
Carboxymethyl cellulose	thickener
Glycerin	humectant
Propylene glycol	humectant/solvent
Sodium bicarbonate	bleaching and abrasive agent
Calcium carbonate	mineralizing, haemostatic agent
Sodium lauryl sulphate	foaming agent
Sodium metabisulfite	antioxidant
Sodium saccharin	sweetener
Water	vehicle

NATURAL COMPONENTS

BEE BREAD

= a fermented mixture of bee saliva, plant pollen, and nectar that the worker bees use as food for the larvae and for young bees to produce royal jelly.

COMPOSITION: 24-35% carbohydrates (fructose, glucose, maltose), 2.5% minerals (Ca, Mg, P, Fe, Na, K, Al, Mn, S, Se, Cu), aminoacids (phenylalanine, leucine, valine, isoleucine, arginine, histidine, lysine, methionine, threonine, tryptophan), vitamins (A, B1, B2, B3, B6, B12, C, PP, E, D, K, H), 1.5% fatty acids, phytohormones, enzymes, flavonoids.

CLOVE ESSENTIAL OIL

COMPOSITION: Eugenol (> 87% of the essential oil composition), eugenyl acetate (8%), caryophyllene, other minor constituents.

Antimicrobial, antiseptic, anti-viral, anti-inflammatory, antioxidant, astringent, analgesic and anesthetic, haemostatic properties.

ANTIMICROBIAL ACTIVITY

Pathogen	Inhibition halo diameter (mm)	
	Base	Toothpaste
Staphylococcus aureus	10	28
Bacillus subtilis	18	32
Mycobacterium smegmatis	16	24
Candida albicans	0	22
Candida tropicalis	8	22
Candida tpseudoropicalis	16	26
Candida krusei	16	28
Cryptococcus neoformans	18	34
Aspergillus niger	18	32

CONCLUSIONS:

The therapeutic properties of the product are due to the high content of essential amino acids, enzymes, vitamin K and oligosaccharides from the bee bread, as well as to the high content of eugenol of clove essential oil. These bioactive components provide antimicrobial, antiseptic, anti-viral, anti-inflammatory, antioxidant, astringent, analgesic and anesthetic properties to the product, making it suitable for use in the treatment of oral mucosal disorders as well as dental pain alleviation. The presence in toothpaste base composition of $CaCO_3$ supplements the intrinsic haemostatic effect of the natural products.

The authors gratefully acknowledge the financial support of "Carol Davila" University of Medicine and Pharmacy through FDI-2020-0526 " Supporting excellence in Health domain by optimizing preclinical experimental models".

Ruthenium(III) complex combination with antiinflammatory activity and synthesis method

Patent application no. A00687/2018

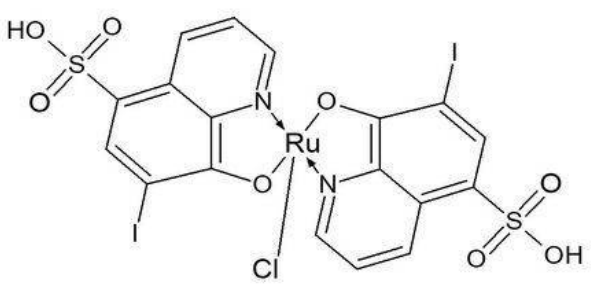
VELESCU Bruno Ștefan, UIVAROSI Valentina, ANUȚA Valentina, ȘEREMET Oana Cristina, NIȚULESCU George Mihai, LUPULIASA Dumitru, ARSENE Andreea Letiția, DINU-PÎRVU Cristina Elena

FIELD OF THE INVENTION

The invention refers to a ***new biological active complex combination*** of Ruthenium(III) with 8-hydroxy-7-iodo-5-quinolinesulfonic acid (ferron). The new complex of Ruthenium(III) with ferron has been synthesized and characterized by elemental analysis, MS-spectra, UV-Vis spectra, and FT-IR spectra.

The complex is a microcrystalline, dark green, water soluble powder. The experimental data pointed out a molar ratio metal:ligand of 1:2, with coordination through the nitrogen and oxygen atoms. The biological active complex presented significant ***anti-inflammatory effect*** in two murine models of inflammation induced with carrageenan and kaolin, respectively.

SYNTHESIS

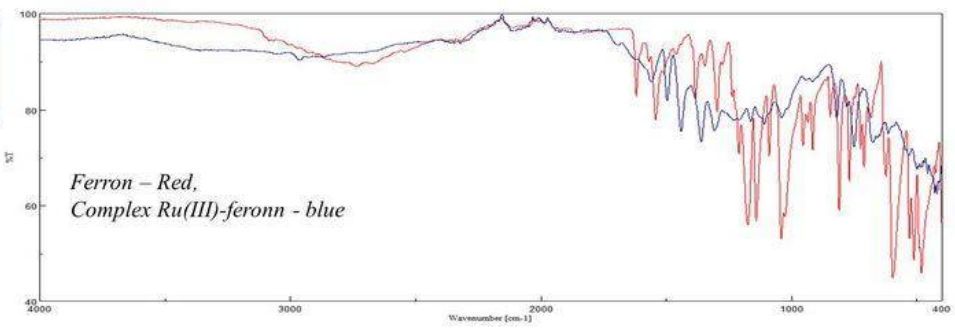


2 mmol of ferron is dissolved in a suitable amount of water, and a saturated aqueous solution of 1 mmol of $RuCl_3$ x nH2O is added. The solution is brought to pH 8 with a 2M NaOH solution. The reaction mixture is brought to near dryness on a water bath, then the reaction mixture is cooled on ice, and cca. 20 mL of ethanol is added. After seeding, it is cooled (4°C) for 2 hours. The precipitate obtained is filtered off under vacuum, washed with ethanol until the washings are colourless. The complex is dried in a desiccator at room temperature.

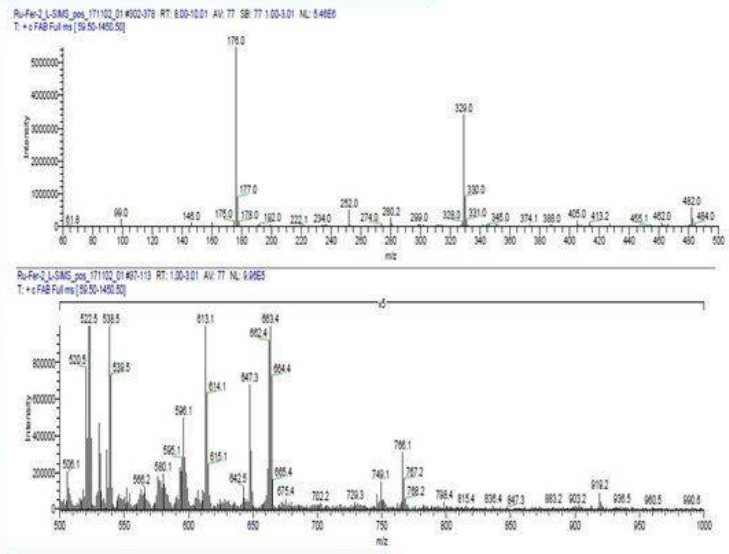
CHARACTERIZATION

Elemental analysis:

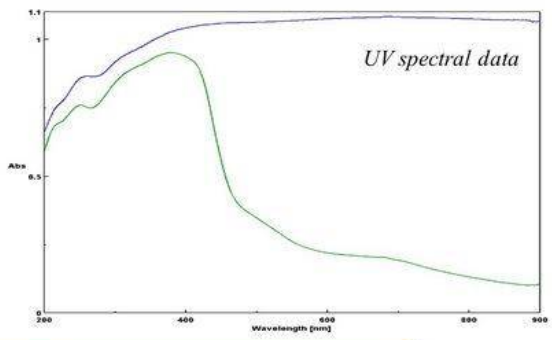
Ru(III)-ferron molar ratio metal:ligand of 1:2. Calculated (%): C 25.77, H 1.44, N 3.34, S 7.65. Found: C 25.80, H 1.36, N 3.29, S .68. Iidentified formula: Ru(C9H5INO4S)2Cl (M = 836,72 g/mol).



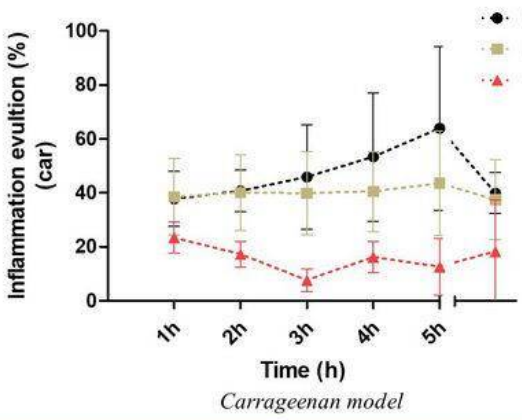
Spectral analysis:



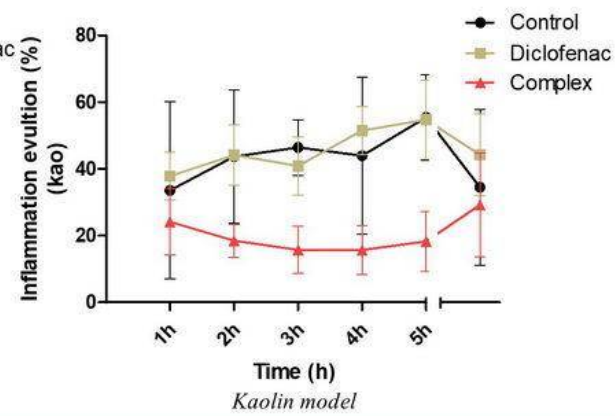
Nominal m/z	Positive ion
352.12	$[Hferron+H]^+$
486.62	$[Ru(ferron)Cl]^+$
504.63	$[Ru(ferron)Cl(H_2O)]^+$
522.64	$[Ru(ferron)Cl(H_2O)_2]^+$
540.65	$[Ru(ferron)Cl(H_2O)_3]^+$
663.4	$[Ru(ferron\text{-}SO_3)_2(H_2O)]^+$



Anti-inflammatory assay



Carrageenan model



Kaolin model

CONCLUSIONS:

The experimental data pointed out a molar ratio metal:ligand of 1:2, with coordination through the nitrogen and oxygen atoms. The biological active complex presented significant anti-inflammatory effect in two murine models of inflammation induced with carrageenan and kaolin, respectively.

ACKNOLEDGEMENTS:

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Towards Environmental, Social, Governance Marketing: a new way to satisfying the needs of consumers.

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Driven Forces

Incorporating driven forces as environmental concerns into marketing strategies, principles and values is a practice that developed in the 80s. Meanwhile, marketing has gained traction and importance bringing a deeper understanding of the relationship between the environment, society, economy and governance. Marketing and marketers are not statics and the evolution has continued to adapt to the needs of customers and consumers designing the new field for "Environmental, Social, Governance (ESG) marketing.

Environmental focus

+

Social and Economical focus

+

Governance focus

Green Marketing

↓

Sustainable Marketing

↓

ESG Marketing

Marketing Evolution

The research analyzes the transition and the implications through the three stages of the marketing evolution: 1) Green marketing, a wider initiative concentrated to reduce the consumers' dependence on non-green products or services and to normalize the environmental damage creating green opportunities with competitive advantage; 2) Sustainable marketing, a broader approach with the aim to create a sustainable economy that is sustainable maneuvering with the environmental costs of the product life cycle. 3) ESG marketing, the holistic management process responsible for identifying, anticipating, and satisfying the needs of customers and society, focusing on Environmental, Social, and Governance factors that generate positive and measurable impact.

Universitatea
Stefan cel Mare

Device for continuous skeletal traction

**CENUȘĂ M., POIENAR M., MILICI L., RATA M., IRIMIA D.,
PENTIUC R. D., LUPU E., AFANASOV C.**

Patent application A/00579 /2019

The invention relates to a device for continuous skeletal traction in the case of fractures of the femur, tibia or fibula.

The device for continuous skeletal traction, according to the invention is mainly composed of an electromagnet (1), an adjustable voltage source controlled by voltage (2), a potentiometer (3), a automatically programmable with a display panel (4), a distance sensor (5) a support and guide system (6) and a towed element (7) and (7 '), the tensile strength of which is determined according to the instructions of the specialist for the correct positioning of the limb.

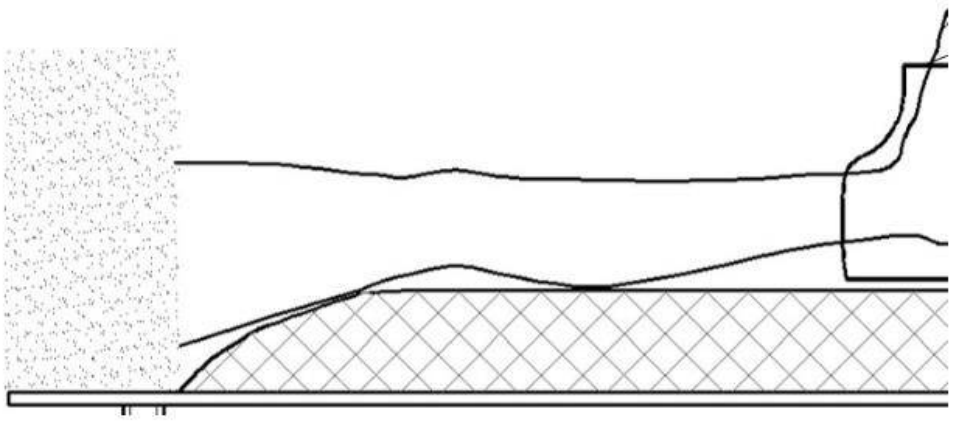


Fig. 1 Side view of the device for continuous skeletal traction

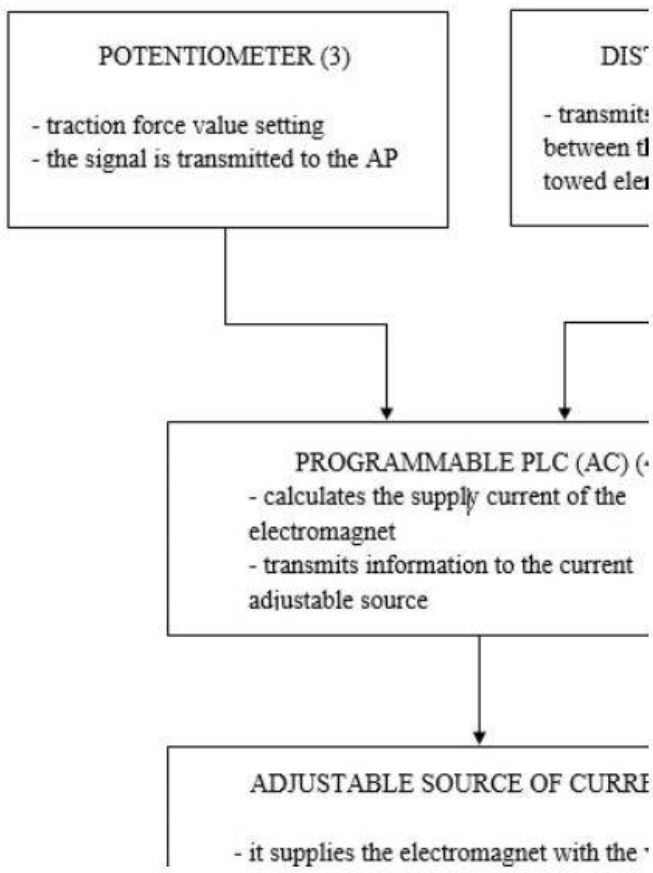


Fig. 2 The block diagram of the device for continuous skeletal traction

AVANTAGES:

- ✓ Allows precise adjustment of the tensile strength;
- ✓ Easy setting and modification of the tensile strength;
- ✓ Constructive simplicity, small volume, the possibility of limiting the maximum traction force and the distance depending on the patient's height.

Universitatea Stefan cel Mare

Automatic de-icing device for power transmissions lines

CENUSA M., POIENAR M., MILICI L., GRAUR A., UNGUREAN C., ATANASOAE P., BOBRIC C. E., POPA C. D.

Patent application A/00580 /2019

The invention relates to an automatic ice remover device for reducing the mechanical demands of the airlines due to the weather conditions.

The automatic ice remover device for aerial power lines, according to the invention, consists mainly of a metallic cylindrical part (1), a helical spring (2), the dynamometric spurs with return (3) and (3`), the movable part ( 4) and the guide system (12), and when the layer of ice reaches the set weight (calculated), the dynamometric spurs (3) and (3`) release the movable part (4) that hits the fixed part (8), the impact between movable part (4) and fixed part (8) leading to the release of ice from of the power line conductor (6).

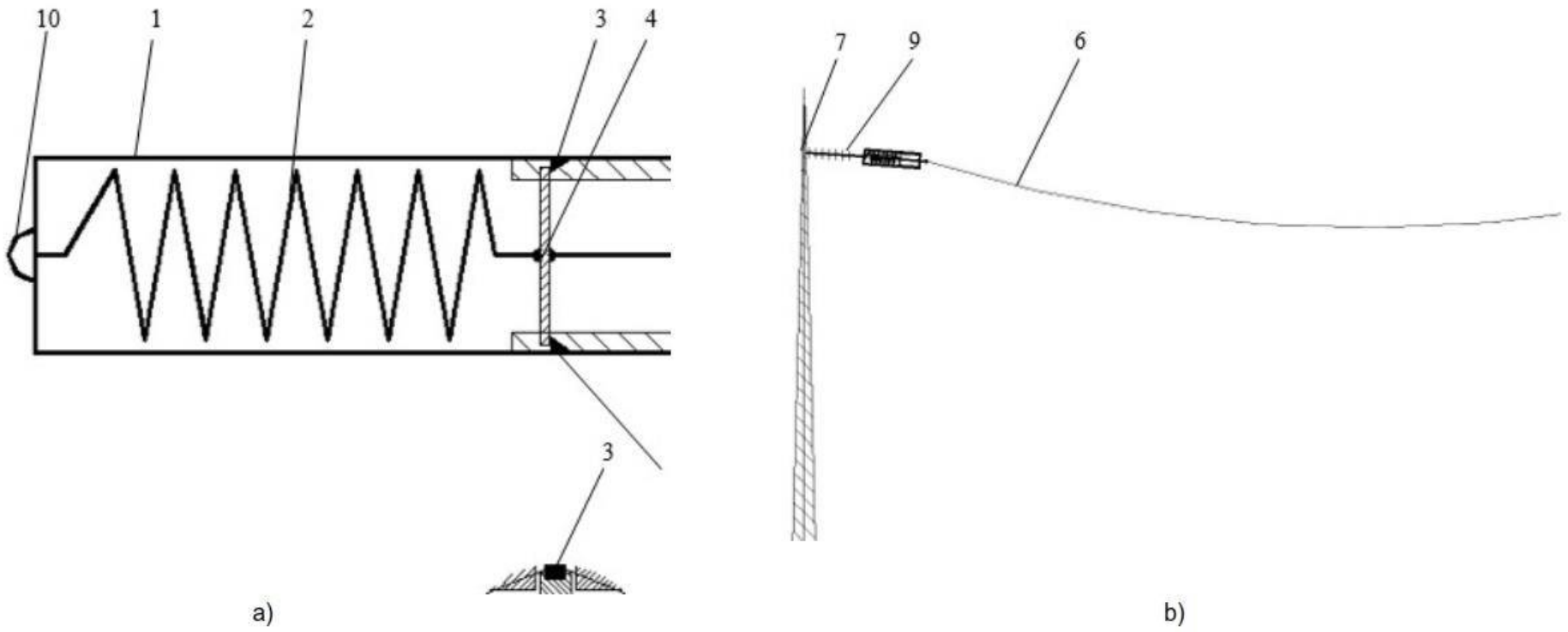


Fig. 1 Ice remover device for aerial power lines: a) constructive detail, b) mounting detail
1- metallic cylindrical part; 2 – helical spring; 3, 3' – dynamometric spurs; 4 – movable part; 5 – rod; 6 - the conductor of the power line; 7, 7' – extension poles; 8 – fixed part; 9 – stretch isolator; 10, 11 – fixing element; 12 - guide system

AVANTAGES:

- ✓ the opening of the aerial electric line automatically when the weight of the layer of ice reaches a certain value;
- ✓ eliminating the negative effects and damage caused by ice in the aerial electrical networks;
- ✓ it is not necessary to remove the line to remove the ice;
- ✓ the device allows the adjustment of the maximum allowable weight of the ice depending on the weight of the line and its configuration, as well as the value of the impulse generated at the trigger.

Universitatea
Stefan cel Mare

Automatic command control system

**TOADER, V. E.; POIENAR, M.; MILICI, M. R.; RAȚĂ, G.;
PRODAN, C.; VLAD, V.; NIȚAN, I.; UNGUREANU, C.**

Patent application A/00581/2019

The invention relates to an automatic command control system, given by a user to a lever, made based on the evaluation of the electrodermal electrical resistance and the contact force.

The automatic command control system according to the invention consists mainly of a lever system (1), provided with a microcontroller acquisition of the electrodermal signal (2), taken over by two electroconductive sensors from a biocompatible material (3) and (3 '), an adapter circuit (4) and a force sensor (5), through which it is determined whether the commands given by the user are valid or the lever was actuated by mistake.

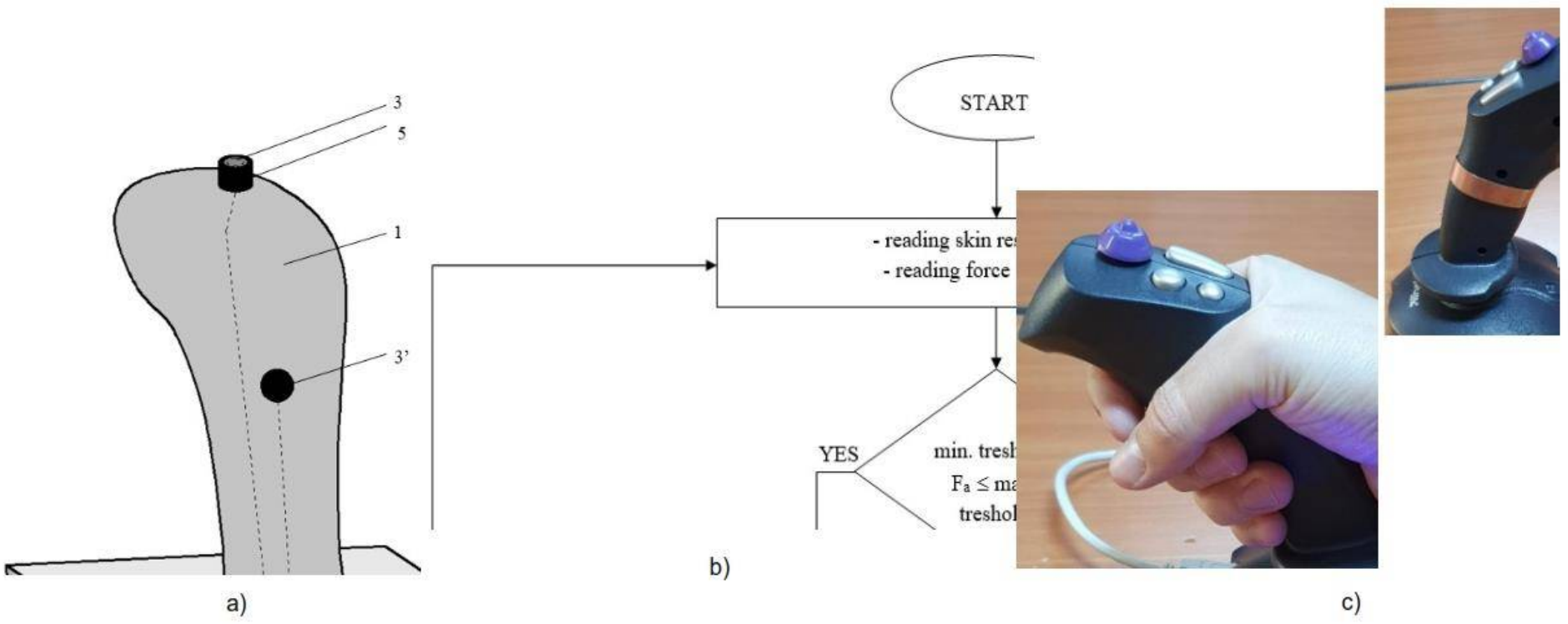


Fig. 1 Automatic command control system : a) overview, b) block diagram, c) prototype

AVANTAGES:

- ✓ The system does not require additional space being placed inside the handle;
- ✓ Immediate execution of validated commands;
- ✓ Constructive simplicity and low volume.

Universitatea Stefan cel Mare

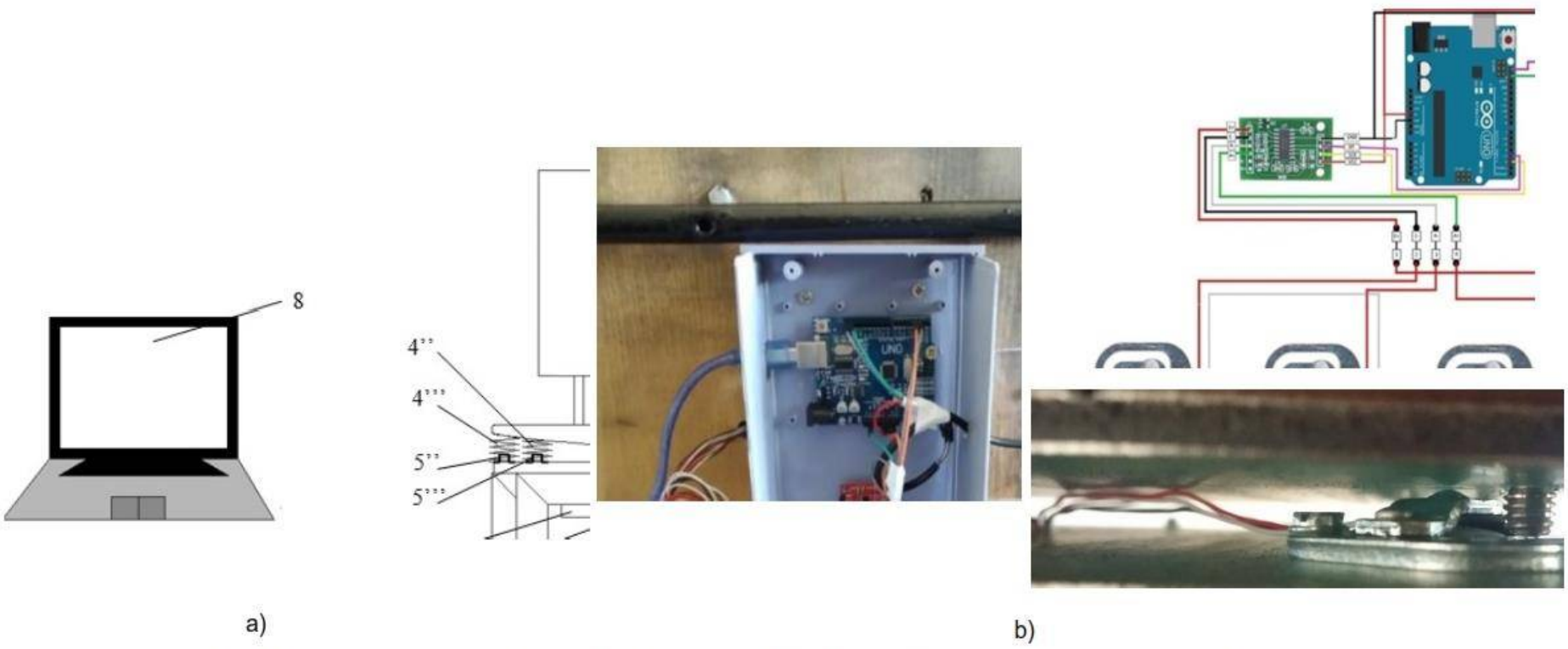
System for monitoring the activity of a person in the office

MILICI, D.; POIENAR, M.; NIȚAN, I.; UNGUREANU, C.; GROSU, O.; POCRIȘ, M.; TOADER, E. V.; MEDRIHAN, N.

Patent application A/005146/2020

The invention relates to a system for monitoring the activity of a person in the office, that is based on the evaluation of the position of the monitored person in the period in which they carry out their activity while sitting, but also during the rest period.

The system of monitoring the activity of a person in the office, according to the invention, consists mainly of a chair (1), which has the seating area made of two overlapping plates (2) and (3), separated by four resorts (4), (4'), (4''), (4 '''), between which are placed, on the corners of the plates, four force sensors (5), (5'), (5 ''), (5 '''), a microcontroller acquisition microsystem (6) that transmits the acquired data to a computer (8) to be saved and processed.



a) b)

Fig. 1 System for monitoring the activity of a person in the office : a) overview, b) constructive details

AVANTAGES:

- ✓ the possibility of identifying the type of activity performed by the person sitting on the chair;
- ✓ the possibility of evaluating the level of involvement in activities of the person sitting on the chair;
- ✓ the possibility of evaluating the time intervals during which the person sat on the chair;
- ✓ the accuracy of the processed data;
- ✓ constructive simplicity.

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

Tomato hybrid USAB 29- Romanian Tomatoes for Supermarket and Processing

Ciulca Sorin, Sumalan Radu, Popescu Cosmin, Bodnarescu Florin, Sumalan Renata

4022/20.05.2019- certificate regarding the registration of the USAB 29 tomato hybrid, issued from "The State Institute for Testing and Registrating of Varieties" from Romania.

MINISTERUL AGRICULTURII ȘI DEZVOLTĂRII RURALE
INSTITUTUL DE STAT PENTRU TESTAREA ȘI ÎNREGISTRAREA SOIURILOR

CERTIFICAT

privind înregistrarea hibridului de tomate
USAB29.

creat de Universitatea de Științe Agricole și Medicină Veterinară a Banatului „Regele Mihai I al României" din Timișoara,
autori: Ciulca Sorin, Sumălan Radu, Popescu Cosmin, Bodnărescu Florin, Sumălan Renata

DIRECTOR GENERAL,
Mihai Popișteanu

Tomato hybrid **USAB 29** - 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, the fruits firmness, the post-harvest storage period and the tolerance to biotic and abiotic stressors. The tomato plants have indetermined growth type, with the medium stem and anthocyanin coloring in the upper third. Leaves of large size, bipenate, coloured intense green. The fruits have large size, flattened shape, intense red color, glossy, with thick pericarp and a strong 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).

USAB 29 F_1 (Sanmartinul Sarbesc ♀ x Pordeanu ♂ - old romanian tomato landraces)

EUROINVENT
Iasi, Romania, 21-23 May 2020
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Hybrid with indetermined growth, with vigorous plants and good adaptability to different cultivation conditions. In greenhousses it pollinates very well, binds 4-7 fruits per floor with an average weight between 80-110g, the production on the first four 2.2-2.5 kg. In the cross section, the fruit has pericarp with a thickness of 6-7.5 mm and a number of 4-6 seminal logs, with attractive commercial appearance, pleasant taste, balanced. Ripe fruits contain 5-6% sugar (BRIX).

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

Sorada F1 hybrid - tasteful tomatoes from the grandma's garden.

Sumălan Radu, Ciulca Sorin, Radulov Isidora, Bodnarescu Florin, Ciulca Adriana

4019/20.05.2019- certificate regarding the registration of the Sorada tomato hybrid, issued from "The State Institute for Testing and Registrating of Varieties" from Romania.

Sorada 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 tomatoes from the grandmother's garden. The plants of this hybrid have indetermined growth, with the strong stem and anthocyanin coloring in the upper third. Leaves of large size, bipenate, coloured intense green. The fruits have medium size, intense red color, glossy, with thick pericarp and reduced firmness. The flowering and ripening period is medium.

The **Sorada** 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 ..."

Sorada F$_1$ (Cruceni ♀ x Rudna ♂ - old tomato landraces)

Iasi, Romania, 21-23 May 2020
www.euroinvent.org

It is a productive hybrid with fruits of average weight (75-90 g), diameter of 51.4 mm and a height of 42.07 mm. In greenhouse conditions it has a very good pollination. In the inflorescence there are on average 5 fruits, round, with high firmness, good cracking resistance and good storage capacity after harvest (over 10 days). The fruit has a pericarp with a thickness of 6-7 mm and 2-3 seminal logs. In the fruit there is a small number of seeds, between 60-80, which are well developed and visibly covered with fine golden brushes. The fruit has an attractive commercial appearance, with a pleasant, balanced taste. At harvest, the fruit has a short pedicel attached, thus increasing the shelf life after harvest. Fresh ripe fruits contain 5-6% sugar (BRIX).

NATURAL PREPARATIONS WITH ANTIFUNGAL ACTION USED AS PROTECTION AGENTS IN LEGUMINOUS CULTURES

Alexa Ersilia[1]*, Sumalan Renata M.[1], Lintia Vasile[2], Negrea Monica[1], Obistioiu Diana[1], Poiană Mariana A.[1], Rus Cristian[1], Tulcan Camelia[1]

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Patent number OSIM RO 133305 A0, RO-BOPI 5/2019, Derwent Primary Accession Number: 2019-49656H

INTRODUCTION

The invention refers to natural antifungal products (NAP) based on essential oils (UEs) from medicinal plants belonging to Lamiaceae (oregano, thyme) and Umbelifere (dill, fennel, coriander) families with protective effect against the fungal specie Verticillium dahliae in vegetable crops in protected or open-field areas, as well as a process of obtaining NAP by a method compatible with organic farming.

The plant disease produces by Verticillium dahliae affects more than 300 plant species. Economic losses caused by the Verticiliosis attack account for up to 50% of total losses mainly in tomato culture.

MATERIALS AND METHOD

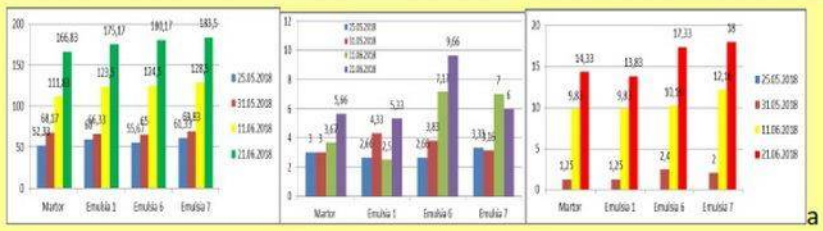
The experimental part of the claimed invention involves following steps:

A. Obtaining of natural antifungal preparations (NAP) extracted from herbs and spices belonging to the Lamiaceae and Umbelifere families;

B. Assessment in vitro antifungal, fungistatic and fungicidal potential of NAP against Verticillium dahliae

C. Evaluation of antifungal potential in vivo under controlled conditions, determination of phytotoxic effects of natural preparations and effects on production and qualitative indices in tomato culture.

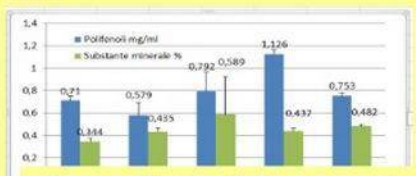
RESULTS AND DISCUSSIONS



a b c

a. Mean value of plant height (cm); b. Average number of flowers c.Media number of fruits on tomato plants Florian variety

The production of vegetables (tomatoes and peppers) in solariums is favored, and flowering and leafing processes are accelerated when using NAP.



Content of mineral substances and polyphenols in tomato samples inoculated with Verticilium dahliae (control).

The in vivo study, under controlled conditions, in phytotron greenhouse, of the antifungal effect of NAP on fungi development to tomato culture, highlighted the inhibitory potential of mycelia growth by applying root and foliar treatments in the vegetation.

Regarding the influence of fungal attack and treatments applied to nutritional properties and active principles of tomato fruits, it is observed that fungal attack negatively influences the content of dry substance and accumulation of mineral substances.

The application of treatment with NAP promotes the accumulation of active polyphenol principles and increases the dry substance content of tomato fruits.

CONCLUSIONS

Due to high bioactivity and the absence of toxicity essential oils (EOs) belonging to Umbelifaere and Lamiaceae families can be used to obtain natural preparation with antifungal activity against Verticillium dahliae in leguminous cultures.

Acknowledgements

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.BG-2016-0126, within PNCDI III, BG-15, entitled "Natural and ecological products with antifungal activity", acronym PNEA.

APRICOTS DELIGHTS

TRADEMARK
M2020 / 00776

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"KING MICHAEL 1ST OF ROMANIA" FROM TIMIȘOARA



Apricots are fruits with an attractive color, typical flavour and valuable nutritional qualities, consumed as raw or sundried, in jams, marmelades, syrups, jellies or spiced sauces.

They are an important food rich in provitamin A and ascorbic acid, which gradually increased throughout the ripening stages. Apricots, also, are a natural source of polyphenols, proteins, carbohydrates, minerals and fibers, which confer them important biological properties like antioxidant, antimicrobial, antimutagenic or anti-inflammatory. Thus, apricots help prevent heart disease, reduce LDL levels and offer protection against cancers

APRICOTS DELIGHTS is an innovative product in the category of sweet-sour-spicy sauces, obtained from apricots, onion and natural powder spices, such as black pepper, ginger, cumin, cinnamon, garlic, chili and cloves. The product has a fine consistency, is aromatic and gives a special flavor to the food with which it is consumed. The product is rich in polyphenols and has high antioxidant activity. Contains no preservatives or other synthetic food additives.

Nutrition data for a serving size of 100 g	Raw apricot	Apricot chutney
Total carbohydrates	11.2	32.035
- Sugar (g)	9.2	29.84
- Dietary fibers (g)	2	2.27
Proteins (g)	1.4	0.24
Total fat (g)	0.4	6.5
Sodium (mg)	1	2.65
Energy value (cal)	48	182.65
Total polyphenols (mg GAE/100g)	52.35±0.14	78.9±0.42
Antioxidant activity (mg Trolox/100g)	148.05 ±0.38	86.52±0.24

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SEA FLAVOR

TRADEMARK
M2020/00811

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BANAT'S UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE
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A range of innovative pate obtained from seafood, vegetable oils, natural spices and vegetables, in different assortments according to the manufacturing recipe. The products are both tasty and healthy, being rich in polyphenols, unsaturated fatty acids, quality proteins and having good antioxidant activity.

Seafood has long time been known for their nutritional properties and benefits to the human body when part of a healthy diet.

Seafood is rich in high quality protein, mineral elements, liposoluble vitamins (vitamins D, A, E), water-soluble vitamins (vitamin B6, niacin, vitamin B12, riboflavin, thiamin), carotenoids and essential fatty acids (especially long chain ω-3 and ω-6 poly-unsaturated fatty acids). Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are the most important ω-3 fatty acids in seafood. These fatty acids are especially important for the health of the cardiovascular system.

Mussels meat is a rich source of omega 3 fatty acids and carotenoids (in particular beta carotene: 0.110-0.481 mg/100g and astaxanthin: 0.100-0.186 mg/100g).

Carotenoids are bioactive compounds with high antioxidant activity, particularly important for sight, skin protection and regeneration, but also for good functioning of the immune system. The mussels are high in protein, having a concentration of over 15% and low in cholesterol. The compounds with the greatest contribution to the antioxidant activity of mussels are polyphenols.

Calamari muscles are a source of high quality protein. They are easily digestible and contain all the essential amino acids. The oil content of fresh calamari is 13±5%, where 29.40% are saturated fatty acids, 23.70% monounsaturated fatty acids and 40.20% polyunsaturated fatty acids. This oil is rich in EPA (9.60% of total fatty acids) and DHA (15.40%), and also in linoleic (5.20%), linolenic (3.10%), arachidonic (2.78%) acids.

Shrimps are an extremely good source of protein and have a low fat and calorie content, making it a healthy choice for consumers. In addition, shrimp meat contains unsaturated fatty acids, such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), essential in the human diet. Shrimps are also a good source of vitamin B12, selenium and astaxanthin - a carotenoid compound with important antioxidant action.

Seafood pâté assortment	Seafood pâté with shrimps and red sweet peppers (P1)	Seafood pâté with mussels and calamari (P2)
Proteins (g)	9.10	9.56
Total fat (g)	21.89	24
- Saturated fat (g)	2.02	2.44
Cholesterol (mg)	69.79	20
Total carbohydrate (g)	3.03	16
- Dietary fiber (g)	0.76	5.56
- Sugar (g)	1.30	0.13
Sodium (mg)	389.10	350.81
Energy value (kcal)	241.47	299.11
Total polyphenols (mg gallic acid/g)	6.93±0.28	5.08±0.20
Antioxidant activity (mg Trolox/g)	18.74±0.20	17.26±0.12

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V-PASS-F

M2020/00935

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Functional Food Product s from 2 types of beans and 2 dry green plants in varying proportions, according to the recipe for manufacturing.

Broad beans *(Vicia faba)*

Soybeans *(Glycine max)*

Pursley *(Portulaca oleracea)* **dried plants**

Tarragon (*Artemisia dracunculus*) **dried plants**

Polyphenol content	136,71 mg GAE/100 g Product
Total Antioxidant Capacity	2311,215 µmol TE/ 100 g Product

- The pre-mix was prepared based on variable proportions of minced dry plants Purslane (*Portulaca oleracea*, *Artemisa Dracunculus)* and beans (broad beans *and* soybeans*)*. All ingredients are of Romanian origin.
- The green plants were dried at 40°C in a oven until reaching the lowest moisture content and maintaining the green color of the leaves. The beans were thermal treated at a temperature which permitted to keep all substances of interest active.
- **Total antioxidant capacity spectrophotometric analysis was performed using** CUPRAC method; the absorbance being recorded at 450 nm wavelength
- **Total Polyphenols content spectrophotometric analysis was performed using** Folin–Ciocalteu method the absorbance being recorded at 750 nm wavelength

The development of DNA analysis for taxonomic evaluations on genus *Thymus*

BEICU Rodica, BOTĂU Dorica,POP Georgeta, IMBREA Ilinca, IHOS Salvina, POPESCU Sorina

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Abstract

The taxonomic interpretation of the species belonging to the genus Thymus (Lamiaceae Family) is very difficult due to the increased variability of the populations, with extremely varied morphological characteristics, but also due to the hybridization of the species. DNA analyzes could be a solution for species identification. In our studies 6 ISSR (Inter Simple Sequence Repeats) and 4 ScoT (Start Codon Targeted) markers were used. Based on statistical evaluation of the results (ANOVA) the similary coeficients were established and a dendrogram was developed emphasizing the corelation both by species and by the location from which they were collected.

Key words: *DNA analysis, taxanomic evaluation, Thymus*

***Thymus jankae* Celak. (original photo)**

***Thymus pulegioides* L. (original photo)**

INTRODUCTION

The species of *Thymus* is taxonomically classified in the Lamiaceae (Labiatae) family, a large family recognized for the large number of medicinal and aromatic species found here. The species of the family, are intensively studied in the chemical-pharmaco-dynamic aspect and widely used for therapeutic purposes in medicine and traditional medicine. The spontaneous species of the genus *Thymus* reveal a great taxonomic diversity, indicating a natural evolution that has allowed the adaptation to different habitats and has created the premises of a divergent evolution based on a great genetic variability. This species biodiversity can contribute to the understanding of fundamental problems related to their origin, evolution and phylogenetic relationships.

MATHERIAL AND METHODS

As **biological materials** 13 Thymus ecotypes collected from different location were analyzed.

DNA isolation and purification: DNA was isolated and purified from approximately 50 mg of fresh bulb material based on modified CTAB method (Doyle and Doyle, 1987).

PCR amplification of DNA samples using 6 ISSR and 4 ScoT molecular markers systems

ISSR (Inter Simple Sequence Repeats) markers			ScoT (Start Codon Targeted Polymorphism) markers		
Nr. Crt.	Primer	Primer sequence (5'-3')	Nr. Crt.	Denumire primer	Primer sequence (5'-3')
1.	UBC810	$(GA)_8T$	1	ScoT 11	AAGCAATGGCTACCACCA
2.	UBC826	$(AC)_8C$	2	ScoT 14	ACGACATGTCGCCACCGC
3.	UBC827	$(AC)_8G$	3	ScoT 35	CATGGCTACCACCGGCCC
4.	UBC846	$(CA)_8RT$	4	ScoT 36	GCAACAATGGCTACCACC
5.	UBC855	$(AC)_8YT$			
6.	UBC873	$(GACA)_4$			
	R = (A, G); Y = (C, T)				

PCR was carried out in a final volume of 25 µl containing 100 ng of DNA template, using GoTaq Green Master Mix (Promega, USA);

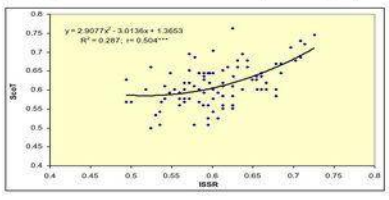
The amplification program consisted of a first denaturing step for 5 min at 95°C, followed by 45 cycles of denaturation at 95°C for 45 sec, annealing at 55°C for 45 sec and extension at 72°C for 2 min, the final step of extension at 72°C for 5 min, according to literature data.

The amplified products were analyzed by 1.8% agarose gel electrophoresis. For each individual all the obtained amplicons were identified and their size was determined using the VisionWorks®LS, (UVP, Anglia) software. Then, they were aligned for all the individuals according to their size and scored with 1 for presence and 0 for absence.

The dendrogram was assessed from a set of variables using DendroUPGMA, software. The program calculates a similarity matrix and transforms similarity coefficients into distances and makes a clustering using the Unweighted Pair Group Method with Arithmetic mean (UPGMA) algorithm.

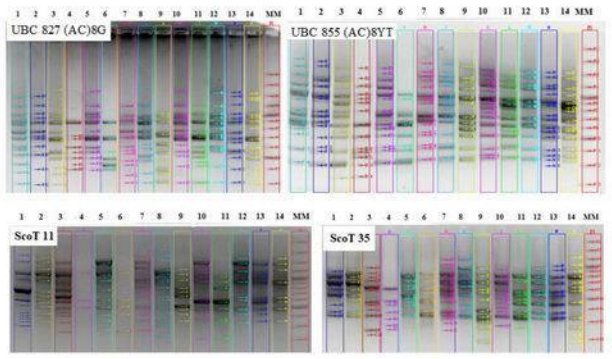
Regression of genetic similarity matrices generated using ISSR and ScoT primer

The very significant value of the correlation coefficient between the genetic similarity matrices identified through the two systems of primers, indicates the existence of a close connection between their ability to emphasize the polymorphism in different Thymus populations.



RESULTS AND DISCUSSIONS

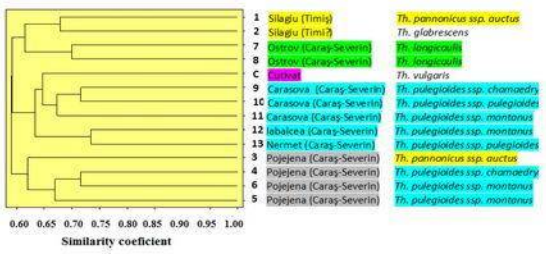
For each collected sample the genomic DNA was extracted and the quality and concentration were determined spectophotometrically. All samples had an OD 260/280 ratio around the 1.8-1.9 range, therefore they were considered to be of adequate quality. Their concentration was very high, therefore all were diluted to 100 ng / µl. In a first step, a bulk of the extracted and diluted DNA samples was amplified with 10 ISSR and ScoT primers and the ones which generated the most clear and discernable fingerprints were selected, namely UBC810, UBC826, UBC827, UBC846, UBC855, UBC873 and ScoT 11, ScoT 14, ScoT 35, ScoT 36.



Based on the amplification with all the primers (6 ISSR and 4 ScoT primers) a total of 287 alleles were emphasised with an average of 28.7 alleles/primer. It turned out that both categories of markers were suitable for assessing variability in the Thymus genotypes. The high average number of alleles / primer places them in the category of high polymorphic markers.

Genetic similarity assessment based on ISSR and ScoT primers

The obtained results allowed to determine the similarity coefficients, which were the basis of the dendrogram.



CONCLUSIONS

The analyzed ISSR markers revealed high polymorphism and reproducible genetic profiles, providing a reliable and convincing analysis method for assessing the genetic variability and relatedness of Thymus species. ScoT primers can be used with higher efficiency for estimating interpopulation diversity at Thymus compared to ISSR primers.

It seems that between these chromosomal regions there is a higher degree of similarity due to the geographical location, compared to the species / subspecies of which it is considered to belong.

Dendrograms allow the assessment of the degree of relatedness of Thymus species. So far no conclusions have been reached regarding the studied subspecies but the analyzes are conclusive at the species level.

References

ALIREZA E., ALIREZA P.-A., AFSANEH N., AMIN A.-R., LIA S., ZAHRA M., MASOUMEH Y.-K. , 2018 Genetic relationships and diversity among wild *Salvia* accessions revealed by ISSR and SCoT markers, Biotechnology & Biotechnological Equipment, 32:3, 610-617

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DEMONSTRATIVE MODEL FOR THE CALCULATION OF HAY PRODUCTION IN TRADITIONAL PASTORAL SYSTEMS

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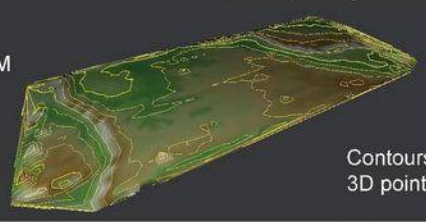
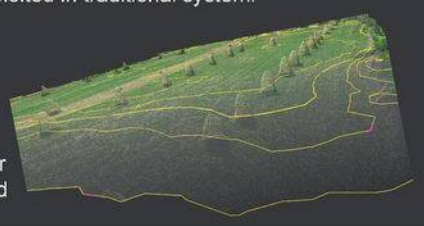
PURPOSE OF THE STUDY

Determination of the volume of hay obtained on a surface unit, by geospatial methods; images taken using UAV technology (drone), processed with specialized software are used.

STUDY AREA

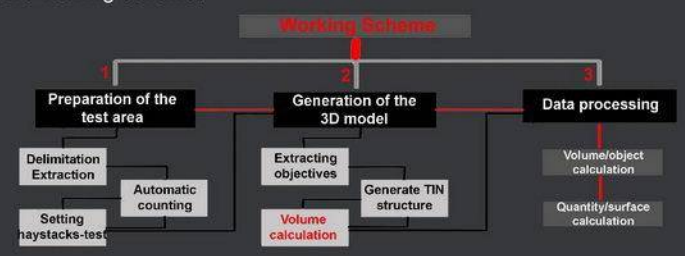
It is located in the hill area, at altitudes around 500 m, on slope lands, exploited in traditional system.





WORK METHODOLOGY

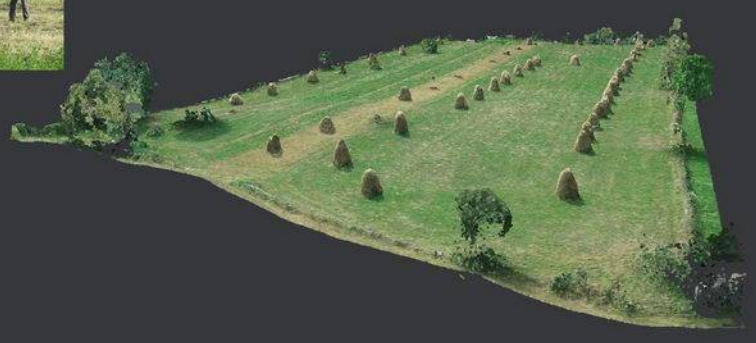
The working methodology was divided into three main stages, divided according to the working scheme:



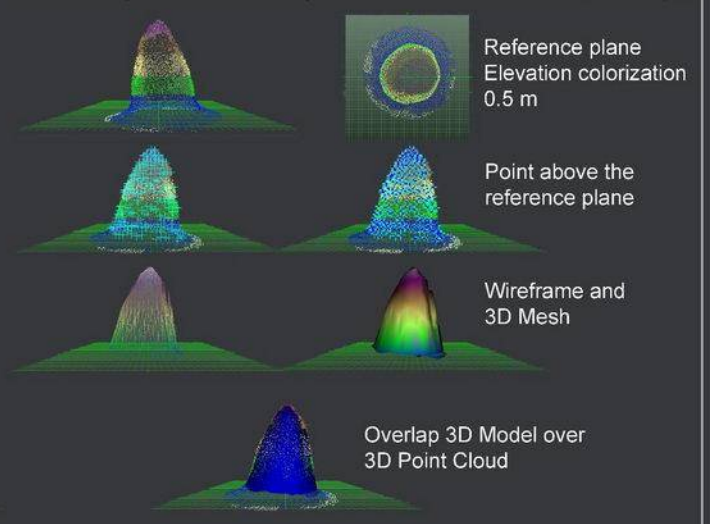
The study area, with a surface of 1.00 ha was extracted from a complex agro-pastoral system (previously scanned by UAV technology); the counting of the haystacks on the considered surface was done automatically, with specialized applications, depending on the total number being established the test-haystacks (A).

On the surface considered there were 49 haystacks (A) of which, 10 haystacks, depending on size and distribution (A), were extracted (A) to be processed separately, in specialized software, in order to calculate the volume.

The volume values obtained for the 10 haystacks will be used when determining the average volume of hay placed manually in a haystack. This will calculate the amount of hay on the entire surface.

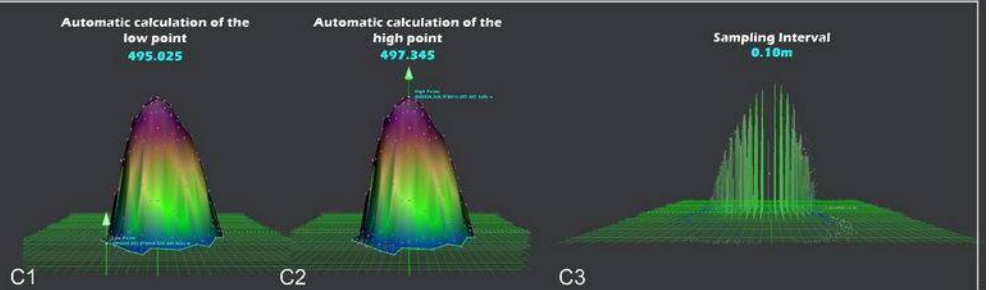


For each of the 10 haystacks, in the Leica Cyclone software, the 3D model was generated, following the model described in the pictures.(B)

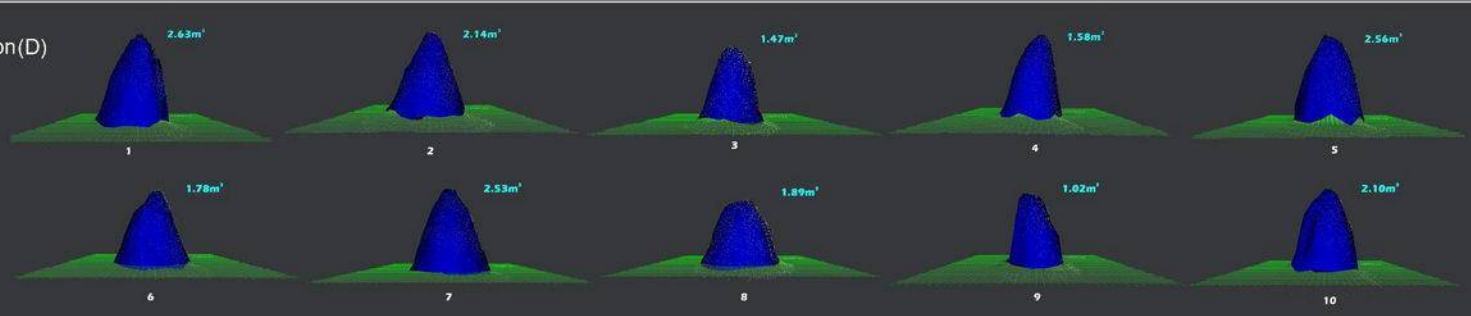


Based on the 3D model, for the calculation of the volume of each haystack, it was done as follows:
- the minimum point was chosen, from the base of the investigated object (C1);
- the maximum point was selected, from the top of the investigated object (C2);
- the "content" of the haystack was created, ie a network of lines was defined based on which the volume was determined.

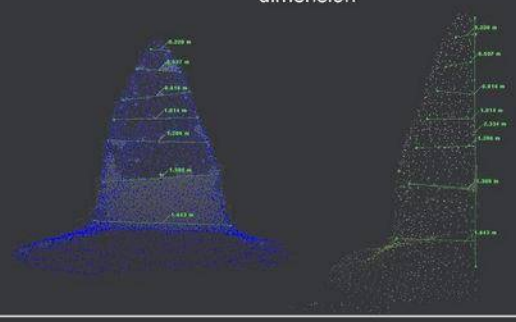
The volume of the10haystacks (D) was calculated above the reference plane, established in the previous stages.



Volume calculation(D)



Cutplane and Diameter dimension



Overlap over the study area

After calculating the volumes, the selected haystacks were superimposed over the area of interest (E)

GENERAL RESULTS

Average volume/ haystack:
1,97 m^3 or 197 kg
($1m^3$ = 100 kg, after placement)
Amount of hay/ surface
9653 kg
Volume of hay/ha:
9.65 tone

PRACTICAL APPLICABILITY

The use of drones in pastoral space investigation and data processing with specialized software has the following advantages:
- remote data acquisition, thus avoided field visits; in this way the user's time and effort is reduced;
- the possibility of investigating large areas, independent of the environmental conditions;
- accuracy of the calculations made, given that point clouds and images with high degree of detail are used;
- the applicability on any type of "object", regardless of its form because no mathematical formulas are used but 3D models that accurately render the shape details;
- obtaining a large volume of information on the investigated surface, useful in other types of analysis.

WORKFLOW APPLIED TO AERIAL IMAGES TO IDENTIFY INVASIVE SPECIES FROM GRASSLAND AND CHANGES DETECTION

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Loredana **Copăcean,** Luminiţa **Cojocariu,** Mihai **Simon,** Cosmin **Popescu**

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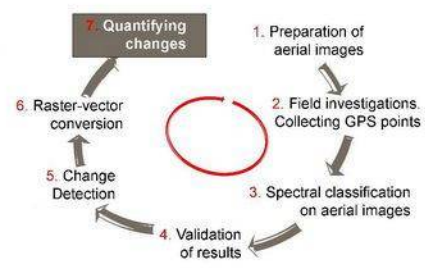
MOTIVATION

The design of the analysis model was based on problems from agricultural practice: spatial expansion of invasive species, with repercussions on the useful surface of grasslands, but also their dynamics over time

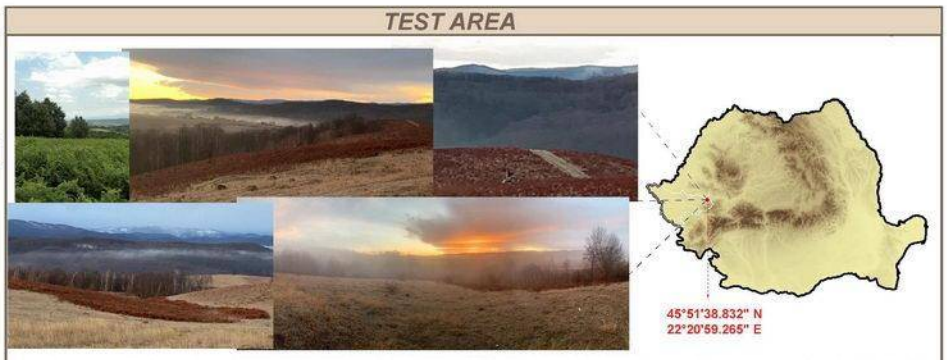
WORKFLOW

High spatial resolution aerial images were used to identify invasive species, but also to analyze spatial-temporal changes.

The use of high spatial resolution aerial images allows high accuracy identification of both the location of invasive species and of occupied surfaces.



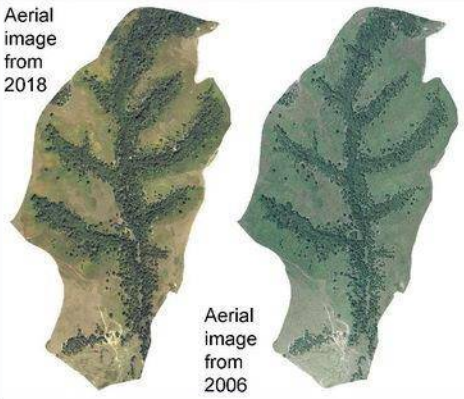
TEST AREA



Geospatial analyzes can be extended over different periods, depending on needs, technical means and available data.

From a physical-geographical point of view, the grassland considered is located at altitudes of approx. 300 m, under specific conditions of low hills.

STAGE 1 – PREPARATION OF AERIAL IMAGES



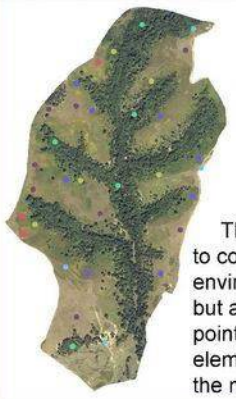
The preparation of the images that will be included in the analysis involves the following operations:

- identification of the images on which the area of interest is located;

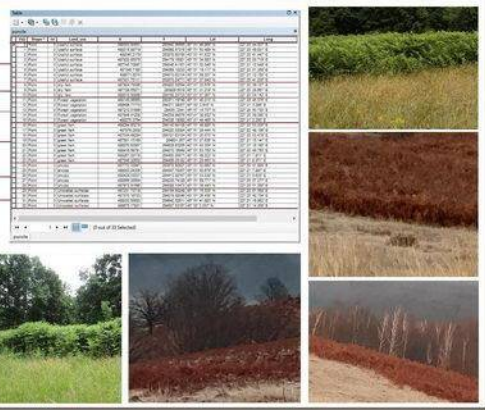
- extracting the area of interest, from the images from the two time periods considered;

- checking or applying geometrical and/or radiometric corrections (depending on the images used).

STAGE 2 – LAND RESEARCH



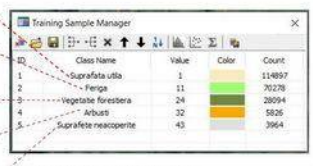
Useful surface
Surface with dry fern
Forest area
Surface with green fern
Surface with shrubs
Uncovered surface



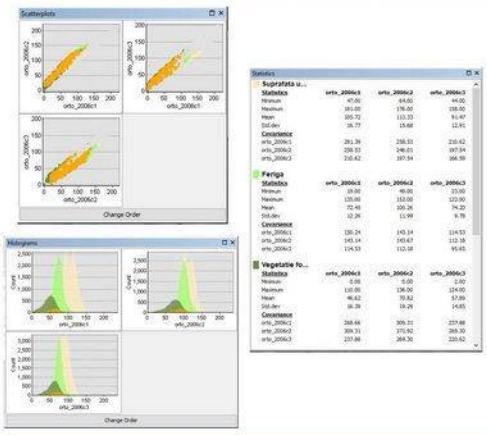
The field research aims to collect information on environmental conditions, but also to collect GPS points for locating the elements of interest on the map.

STAGE 3 – SUPERVISED CLASSIFICATION ON AERIAL IMAGES

Collection of samples used in supervised classification and statistical verification



Training zones are established for each category/type of vegetation, spectral signatures are created and the classification algorithm

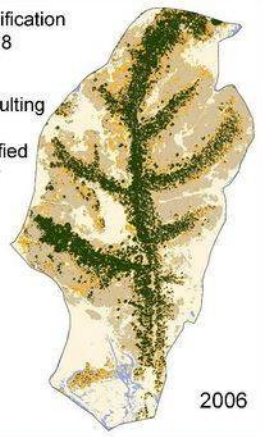


2018

The result of the classification of aerial images from 2018 and 2006.

The raster images resulting from the supervised classification are reclassified and converted into vector format.

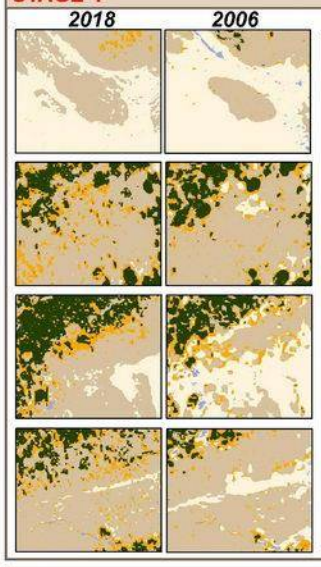
Legend
Land use
2018 and 2006
Useful surface
Forest area
Surface with fern
Uncovered surface
Surface with shrubs



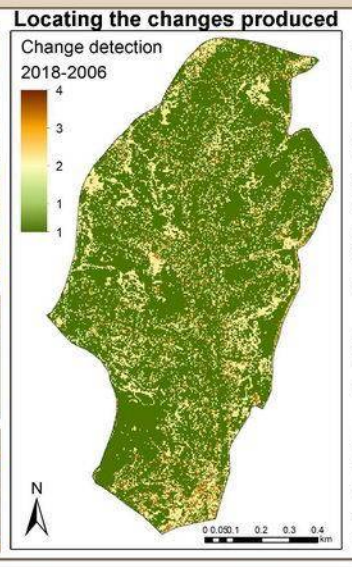
2006

STAGE 4 – CHANGE DETECTION

2018 2006



Locating the changes produced



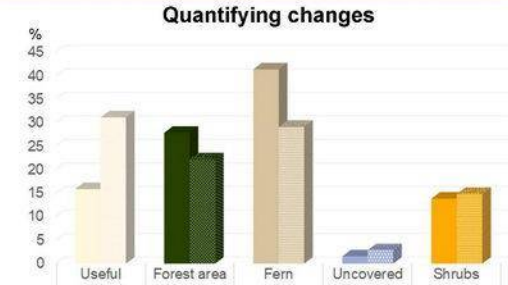
The raster images resulting from the classification process are automatically analyzed in the GIS environment, thus highlighting the differences produced in time and space.

On the new image resulting from the difference of the two classified rasters, both the areas in which the types of vegetation have expanded and the areas of their restriction are marked. It is possible in this way to analyze the distribution of plant species (or other components of geographical space) over a given territory, but also to analyze the model of the spatio-temporal expansion of these formations in the given territory.

By converting raster images into vector format, it is possible to calculate the surfaces for each plant species being tracked. In this way, in addition to locating changes, quantification can be done in time and space.

In the case of grassland considered a case study, between 2018 and 2006, the expansion of invasive species (fern, different shrub species or forest formations) was found, which means reducing the useful surface. The large surface occupied by these formations highlights the phenomenon of abandonment of the grassland.

Quantifying changes



	Useful surface	Forest area	Fern	Uncovered	Shrubs
2018	15.85	27.8	41.27	1.56	13.82
2006	31.08	22.18	29.05	2.87	14.82

Total area of grassland: 107.26 ha

In 2018, compared to 2006, it was found:
- 49% usable area
+ 25.34% forest vegetation
+ 42.07% fern
- 45.64% uncovered area
- 6.75% shrubs.

APPLICABILITY OF THE PROPOSED MODEL

Using the proposed workflow, the following issues can be analyzed:

1. The areas occupied by invasive species. Because invasive species are identified in all environmental conditions, in large areas, especially in the pastoral area, the possibility of their identification and location is of particular importance in agricultural practice.

2. Monitoring the dynamics of invasive formations in time and space. Creating expansion models of plant formations, especially invasive ones with high expansion rate, provides very useful information regarding their control and "recovery" of the affected territories.

3. Identification of the areas that present major risks. The use of GIS tools in the investigation of pastoral space, make s possible the complex territorial analysis, "Where?", "When?" and "on what surface?" it must intervene, thus marking the priority areas, where intervention is mandatory.

4. Generation of prediction models. Based on these models, it can be estimated the direction in which the analyzed territory evolves or the vegetated formations followed, in time and space. Geospatial analyzes can be extended over different periods, depending on needs, technical means and available data.

TECHNICAL ALGORITHM FOR IMPLEMENTING UAV TECHNOLOGY IN THE INVESTIGATION OF PASTORAL SPACE

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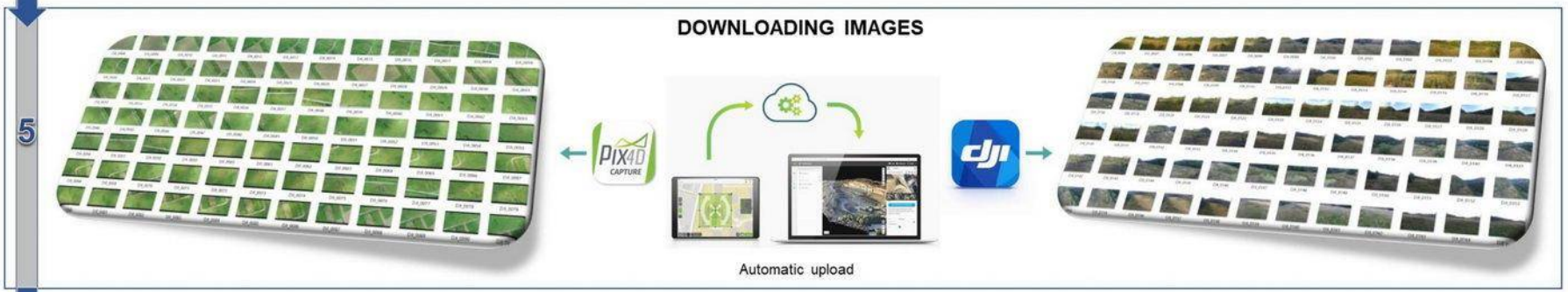

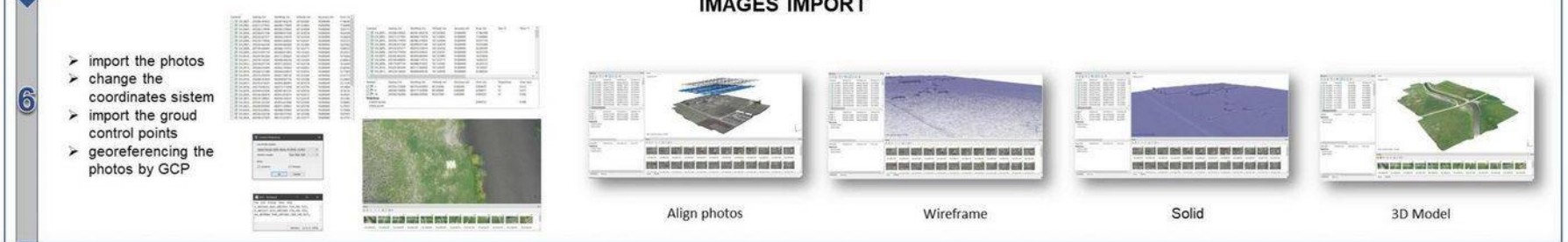

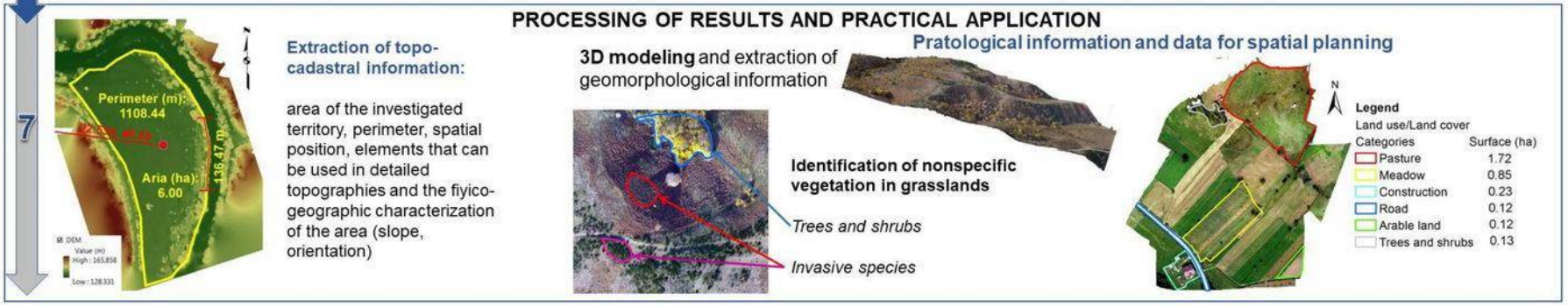

MODEL FOR USING LIDAR - MOBILE MAPPING TECHNOLOGY FOR TOPOGRAPHIC DETAIL ELEVATIONS IN URBAN SPACE

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SCIENTIFIC CONTEXT AND PURPOSE 1

The technical and technological progress recorded in the field of photogrammetry and remote sensing is reflected by remarkable results in other fields of activity, including geodetic measurements. Regarding the topographic details, usually carried out by GNSS equipment and total stations, the use of Mobile Mapping - LIDAR technology is a real advantage, by: the large size of the investigated area, the complexity of the acquired data, reducing the working time, the measurements being made to the precision similar to the usual equipment.

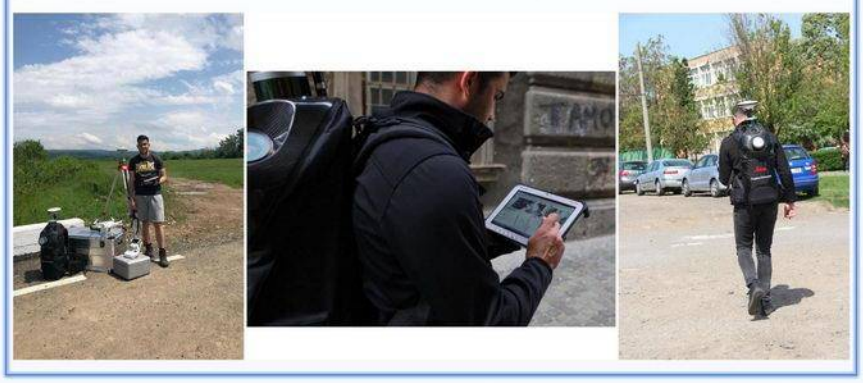
LOCATION OF THE EXPERIMENTAL SITE 2

To exemplify and test the proposed model, an area of Lipova city, Arad County was chosen, which was investigated by mobile mapping. The area consists of 18 streets with a total length of 12 km

WORKFLOW 3

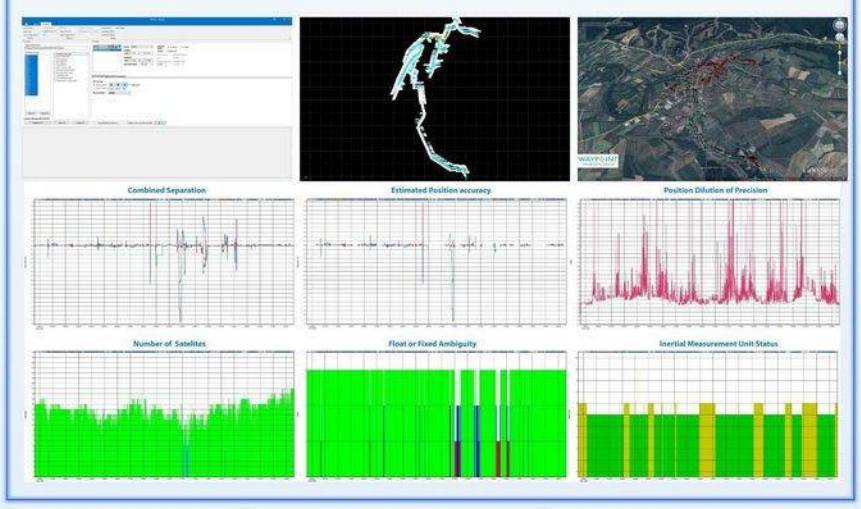
DATA ACQUISITION 4

Data acquisition was made with Leica Pegasus: Backpack equipment, along with a GNSS Leica Viva GS08 Plus equipment, used as Master Base which throughout the scan recorded Rinex data. In this model 18 individual scans were performed, one scan for each street separately. The entire scan lasted approximately 4 hours, during which time all the elements of the investigated streets were captured.



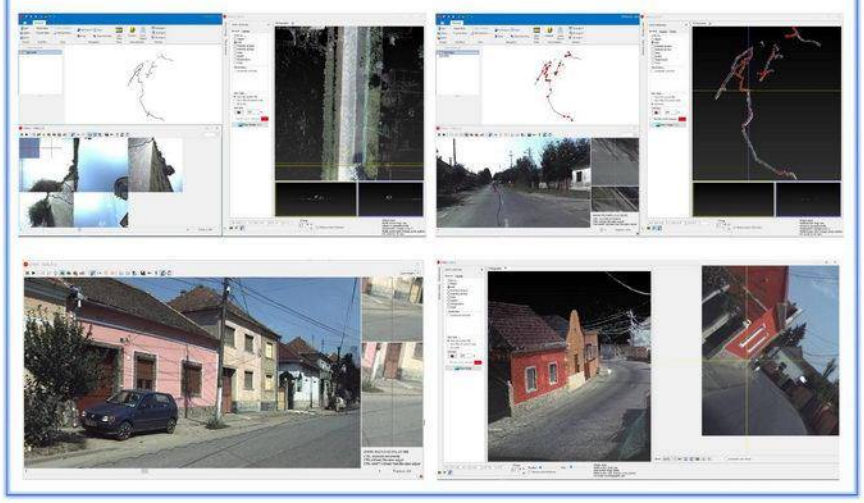
POST-PROCESSING AND QUALITY CONTROL 5

Post-processing was performed using Pegasus Manager software, and accuracy checking was performed with Novatel Inertial Explorer software. Because the GNSS signal was very good throughout the period, it was not necessary to adjust the resulting trajectory using the SLAM (Simultaneous Localization and Mapping) algorithm, the average scan accuracy being 3 cm. For better control we also used ground control points determined by the RTK (Real Time Kinematic) method.



DATA VISUALIZATION 6

Leica Pegasus allows you to quickly check the quality and accuracy of your acquired data from the Pegasus mobile mapping system. It displays the captured mission, and allows the user to seamlessly navigate through the images and point clouds. The Leica Pegasus enables you to take measurements from the imagery and LiDAR data, and to create reports by combining GIS information with Pegasus imagery and LiDAR data.

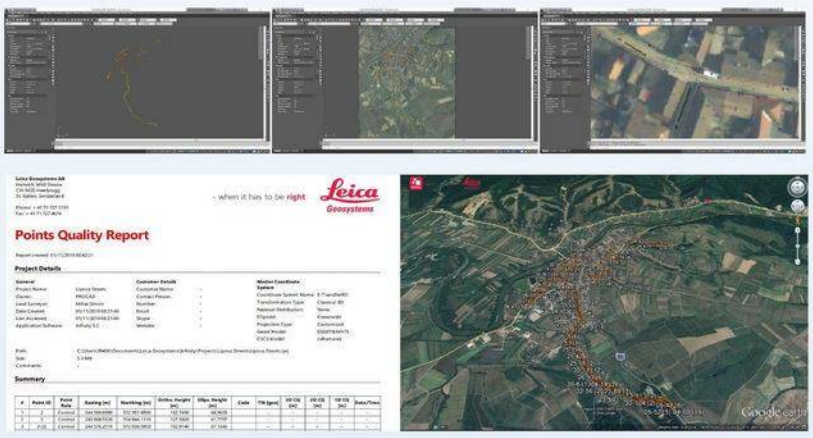


EXTRACTION OF TOPOGRAPHIC DATA 7

After obtaining the 3D point cloud following the post-processing explained above, the project was loaded into the Leica Cyclone Model software where all the tracked items were extracted. We created cross-sectional profiles for the road and extracted all the characteristic elements of a topographic detail measurement.

THE FINAL RESULT 8

Mobile mapping technology does not only allow for accurate and detailed data capture, but also for analysis and evaluation of the data for planning purposes, risk assessment/management, and scenario modelling, transforming the way in which public safety authorities keep their citizens safe.
The final result was processed using the Autodesck AutoCAD Map 3D software, and the report was generated using the Leica Infinity software.



ADVANTAGES AND APPLICABILITY OF USING THE PROPOSED MODEL 9

1. The speed of the measurements (for topographic detail surveys or other types of projects);
2. Obtaining point clouds, therefore a detailed image, in coordinates of the area of interest;
3. Accuracy of the data obtained;
4. The high degree of detail, gives the possibility to use the images obtained in projects such as construction, design, road infrastructure, geodesy and general cadastre, architecture, cartography, etc.
5. LIDAR - Mobile Mapping equipment can also be used in locations where the GNSS positioning signal is missing (underground, inside buildings, etc.);
6. The possibility of using the data obtained in the GIS environment which allows "combining" with other geospatial data or creating non-graphical databases;

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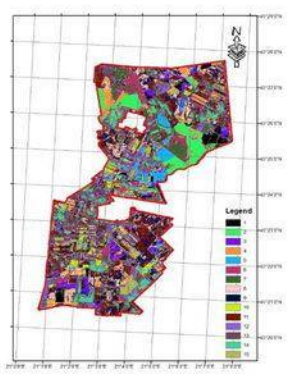
❖Title

REMOTE SENSING IN THE ANALYSIS AND CHARACTERIZATION OF SPATIAL VARIABILITY OF THE TERRITORY

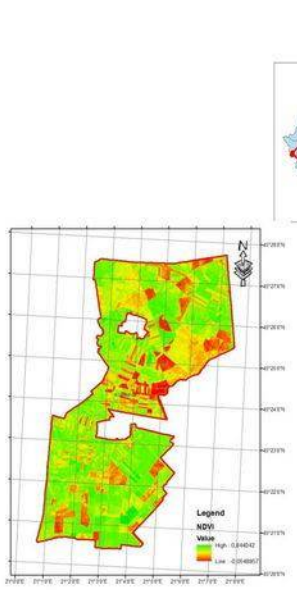
❖Authors & Contact
Cosmin Alin POPESCU, Mihai Valentin HERBEI, Florin SALA
Contact: Prof. Florin Sala, PhD, florin_sala@usab-tm.ro

❖Short presentation

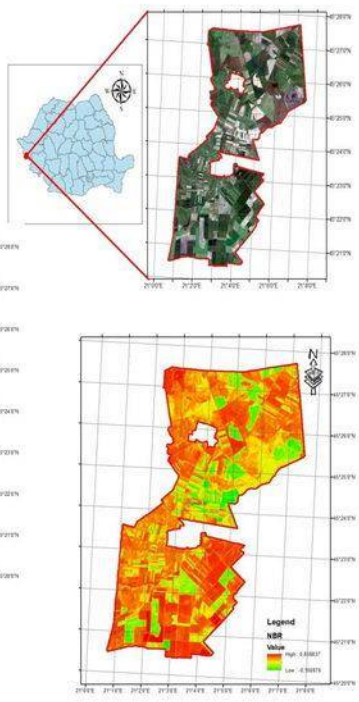
The present research project used satellite images analysis to evaluation and characterization of land spatial variability in the Livezile-Dolat Protected Area, Timis County, Romania. Based on the spectral information, the indices NDVI, SAVI, NBR, GLI, GNDVI and CIgreen were calculated. On the basis of ISODATA algorithm, an unsupervised analysis was performed, and 15 classes resulted. The coefficient of variation (CV) expressed a high variability in terms of the surfaces size on the set of 15 obtained classes (CV_{Class}=43.2658). Based on the NDVI index, 8 groups of values were obtained, covering an area of 6542.801 ha; 9 groups of values covering the surface of 6555.21 ha in the case of SAVI, and 6 groups of values covering the area of 6542.955 ha in the case of CIgreen were obtained. Data series for each index studied (654361 values per series) were analyzed to evaluate the variance (V) and coefficient of variation (CV). The highest value of the variance was identified for the CIgreen index ($V_{CIgreen}$=0.892885), and the lowest at the GLI index (V_{GLI}=0.001912), the other indices having intermediate values of the variance (V_{GNDVI}=0.013837, V_{NDVI}=0.028027, V_{SAVI}=0.063048). Based on the values of the coefficient of variation (CV), a high degree of spatial variability was found in the set of GLI index values (CV_{GLI}=80.40968) and the lowest spatial variability in the GNDVI index data set (CV_{GNDVI}=23.85455), and intermediate values for the other studied indices (CV_{NDVI}=28.76762, CV_{SAVI}=28.76861, $CV_{CIgreen}$=57.57606)..



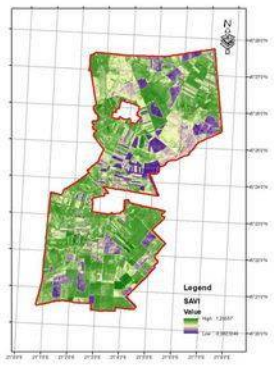
Unsupervised classification of the studied area (Protected Natural Area Livezile-Dolat, Timis County, Romania)



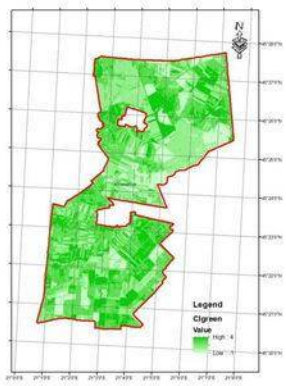
Map with the spatial distribution of NDVI index values



Map with the spatial distribution of NBR index values



Map with the spatial distribution of SAVI index values



Map with the spatial distribution of CIgreen index values

❖Aplicabbility

The unsupervised classification, based on the ISODATA algorithm, of a false color image (NIR-Red-Green), spectral bands 8 (Nir), 4 (Red), and 3 (Green) resulted in 15 classes representing 6557.2 ha from study area. Calculated indices (NDVI, SAVI, NBR, GLI, GNDVI, CIgreen) based on spectral data, bands 8 (NIR1), 8a (NIR5), 12 (SWIR2) and 4 (RED), 3 (GREEN), 2 (BLUE) facilitated characterization of the territory, and they have faithfully surprised the spatial variability of the studied area. A high degree of spatial variability was found in the set of GLI index values (CV_{GLI} = 80.40968) and the lowest spatial variability in the GNDVI index data set (CV_{GNDVI} = 23.85455).

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❖Title

Fe_3O_4 – Water Based Magnetic Nanofluid Influence on Weight Loss of Wheat Seedlings under Controlled Conditions

❖Authors & Contact
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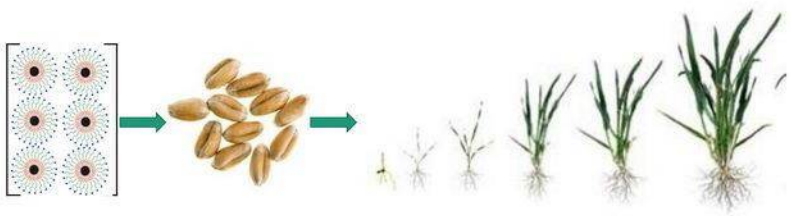
❖Short presentation

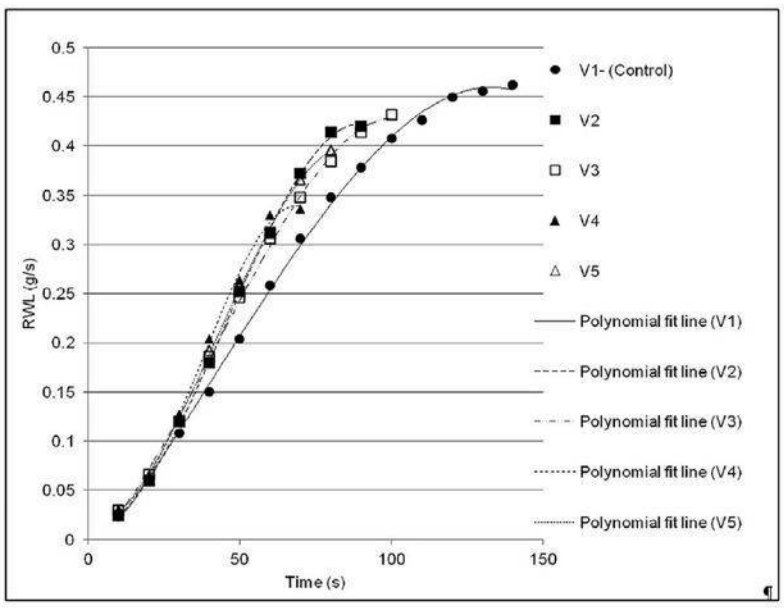
Different species of nanoparticles are of special interest through the perspective of nanobiotechnologies in agriculture as they can be used for controlling plant growth, effective use of nutrients and plant resistance to various stresses factors. The present research project and studies explored the effect of a biocompatible aqueous magnetic nanofluid (MNF) with Fe_3O_4 nanoparticles in different concentrations (0.0%, 0.05%, 0.1%, 0.5% and 1%) on wheat seedling, *Triticum aestivum* L. Alex cultivar. Wheat seedlings, aged 10 days, were analyzed in terms of biomass accumulation, soluble carbohydrate content and rate of weight loss by drying under controlled conditions. The parameters analyzed describe the total drying time (Tt), the drying time needed for reaching the maximum weight loss rate (tm), medium rate (RWLavg) and maximum rate (RWLmax) of weight loss.

Total drying time was higher ($p<0.01$) in the variants treated with MNF (1515.00±45** - 1725.00±25*** seconds) than in the control variant (1380.00±60 seconds). RWLmax was lower under the influence of MNF (0.336 – 0.432 g/min) compared to the control variant (0.462 g/min), $p<0.01$.



$$RWL_{Mt} = -1.895E-07t^3 + 2.307E-05t^2 + 0.00391t - 0.02289$$
$$RWL_{V2} = -1.177E-06t^3 + 0.0001593t^2 - 0.000264t + 0.01195$$
$$RWL_{V3} = -5.769E-07t^3 + 7.315E-05t^2 + 0.002835t - 0.0098$$
$$RWL_{V4} = -2.667E-06t^3 + 0.0003014t^2 - 0.00379t + 0.04114$$
$$RWL_{V5} = -1.182E-06t^3 + 0.0001503t^2 - 0.0003636t + 0.009429$$

where: RWL – Rate of Weight Loss (g/min); t – Time (sec).



❖Aplicabbility

Fe_3O_4 – water based magnetic nanofluid can be used for:

- ➢Control of water regime in wheat seedlings
- ➢Control of sugar content in wheat seedlings
- ➢Favorable influence of chlorophyll content and photosynthesis process in wheat plants
- ➢Methods and models of plant nutrition control, based on nanotechnologies

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❖Title

Model of Color Parameters Variation and Correction in Relation to "Time-View" Image Acquisition Effects in Wheat Crop

❖Authors & Contact
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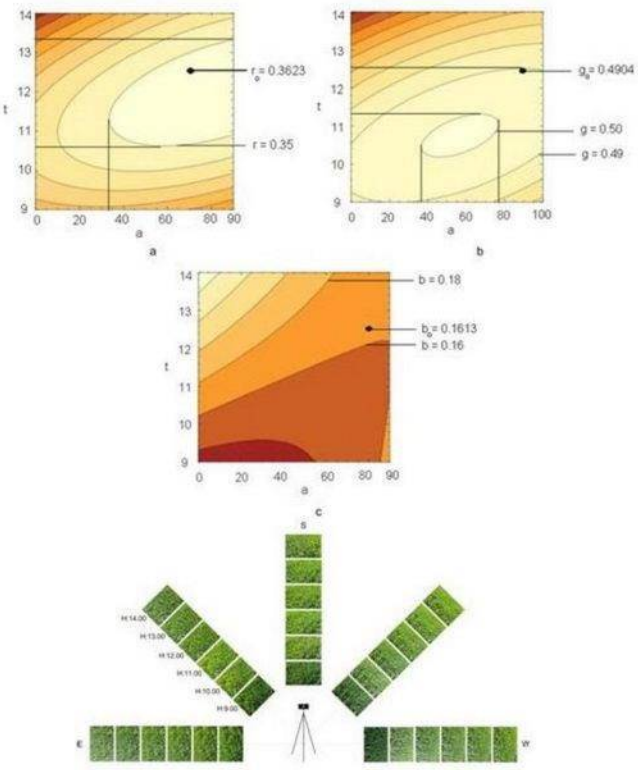
❖Short presentation

❑Many images of agricultural crops are made at different times of the day, images with different spectral information about the same crop in relation to conditions when the picture was taken. A set of 30 digital images of a wheat crop in the BBCH 3-Stem elongation code 32–33 stage was captured between 9 am and 14 (UTC+3), in the 0°-180° variation range of the image acquisition angle on the E-W axis (cardinal directions). A high variation of the spectral data given by the combination of the hour (h) and angle (a) at which the images were captured was found. The interdependence relationship between the analyzed parameters (r, g, and b), and the time (t) and the angle (a) of image acquisition was assessed with the linear correlation coefficient. By calculating the roots of the mathematical expressions of the correlation coefficients dependence on the angles (a) or times of day (t), the optimal angle and time were determined as a combination of the two variables for capturing images and obtaining optimal r_o, g_o, b_o values. The correction coefficients of the normalized r, g, and b values obtained out of the optimal field were determined Please define it if appropriate.

➢Following image acquisition in the field, it has been noticed that the time and the angle at which images were captured are the factors leading to different r, g, and b values. Their series were characterized by high variation coefficients (5, 6, 22% respectively), therefore the hues resulted after acquiring the image of the same subject differed. This could lead to false interpretations in the assessment of the physiological status of plants and crop wheat characterization based on color parameters data. As a result, a correction is required of the variation values of the two factors.

➢The determined constant level curves can provide important information about the selected angle-time combinations. If it is impossible to fall within ranges close to the optimal values, the optimal r, b, and g values can be estimated based on the multiplication with the calculated correction coefficients;

➢This study may describe only a particular case from among the numerous concrete situations provided by the combination of crop/directions/angle and solar light, but it can represent a calculation model for other particular cases in agricultural holdings



❖Aplicabbility

Model of Color Parameters Variation and Correction in Relation to "Time-View" Image Acquisition, can be used for:

➢Controlling the way of taking images in different field crops

➢Creation of working models in crop imaging analysis

➢Developing of some applications in smart agriculture

➢Optimization in studies of the vegetal carpet and of some terrestrial surfaces

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❖Title

Assessment model for the imbalance in N and PK fertilization for maize: Case study for the Western part of Romania

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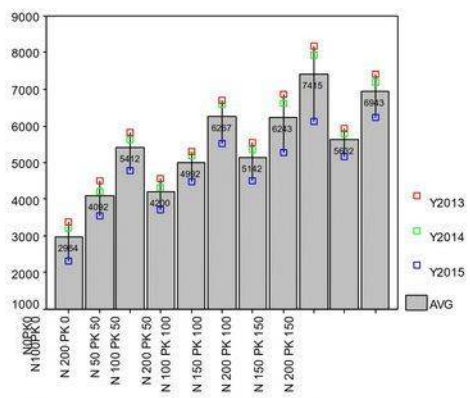
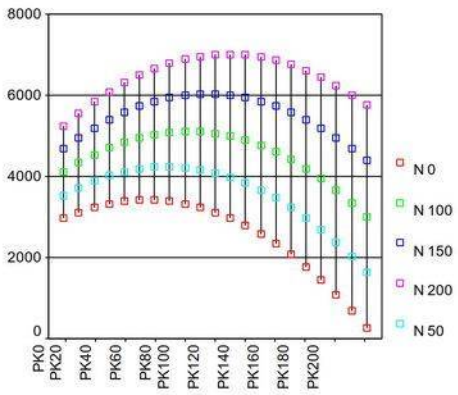
Florin SALA, Ciprian RUJESCU, Andrea FEHER
Contact: Prof. Florin Sala, PhD, florin_sala@usab-tm.ro

❖Short presentation

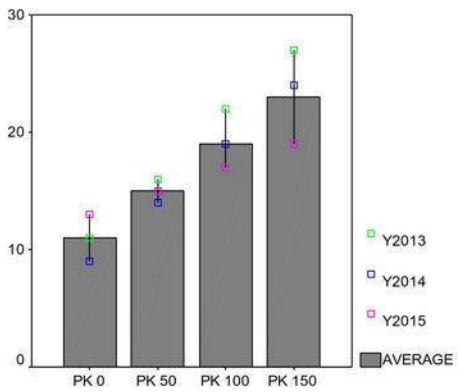
❑The main aim of the research project was to assess the profit increase in maize, starting from the yield response according to the nitrogen quantity applied on different PK backgrounds. Answers were searched for on the causes for the low interest in applying nitrogen fertilizers for maize in Romania. Maize yield response curves were determined according to quantities of N and PK. The production functions obtained facilitated the determination of adjusted yield values, based on the N quantities in the 0-200 kg range, active ingredient (a.i.) ha^{-1} for multiples of 50 for different PK levels, within the 0-150 kg range, a.i. ha^{-1} . Four distinct cases were analyzed, the average during 2013-2015 and each year independently. The slope (m), indicating the tangent the straight line creates with the abscissa axis, represented an indicator of the growth speed of the dynamic process represented by the yield in relation with the allotted N and PK doses. The slope related to the PK = 0 up to PK = 150 levels, displayed a growing trend ($m_{2013-2015}$ = 11.4-23.4; m_{2013} = 11.2-27.73; m_{2014} = 9.8-24.8; m_{2015} = 13.1-19.1), as the four sets of data analyzed strengthen the level of trust in a well-known principle of physiology and nutrition of plants - the synergic effect of nutrition factors..



Maize yield ($kg \cdot ha^{-1}$) based on nitrogen quantities and cumulated phosphorous and potassium quantities



Graphical distribution of the maize yield ($kg \cdot ha^{-1}$) based on the cumulated PK quantities at different levels for applied N



Graphical representation of average maize yield increase for 1 kg of nitrogen, at different cumulated PK levels

➢Due to a low level of fertilization with P and K (0-10 kg ha^{-1}), respectively, the average production increase for 1 kg of nitrogen, applied to the surface unit (ha), is also low, approximately 10-12 kg ha^{-1}. Considering the current nitrogen purchase price and capitalization of maize, application of nitrogen is not very attractive.
➢It is also noticeable that an increase in the PK soil enrichment effort would also indirectly assume an increase in the efficiency for use of nitrogen, thus immediately indicating a growing interest of several farmers concerning supplementation of nitrogen allotment to corn.
➢This can also be accomplished by means of a long-term policy for supporting farmers' efforts in this particular regard.

❖Aplicabbility

Assessment model for the imbalance in N and PK fertilization for maize, can be used for:

➢Comparative analysis of fertilization efficiency with different nutrients at crops

➢Developing models of fertilization in relation to soil conditions, fertilizer resources and economic aspects

➢Optimization of the fertilization balance in different agricultural crops

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Morphology Characterization of a Plowed Land Through Fractal Analysis

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Abstract: The present study aimed to evaluate the micro-morphology of a plowed land surface by fractal analysis based on aerial images taken at different heights. The soil in the study area is of chernozem type, it was plowed in autumn and partially levelled under the influence of climatic conditions in the winter period. The images were collected in March and at the altitudes of 1m, 5m, 10m, 15m and 20m using a drone DJI Phantom 3. Fractal analysis was done using box-counting method and the fractal values (D) and multifractal values (Dmf) have been determined by binarized images analysis, based on pixels BW (D_{BW}), B+BW (D_{B+BW}) and W+BW (D_{W+BW}). In the case of fractal analysis based on low altitude (1m and 5m) large amplitudes of variations have been captured regarding the micro-morphology of the studied area, as a result of the varying terrain surface given by the roughness and irregularity degree, by the various glomerular structures regarding size and weight, by vegetation residue from the previous crops, by the weeds grown, by the furrows tilting and disposition on the ground, a number of variants being identified that are well separated based on fractal dimensions. There have been registered fractal and multifractal properties of the studied areas. Between the fractal values and the height of image acquiring, interdependency relations have been identified in conditions of statistic certainty. These relations have been described by polynomial equations of 2nd degree in the case of fractal dimension D (R^2 = 0.991; p= 0.009), fractall dimension D_{BW} (R^2 = 0.998; p = 0.002), and of the fractal dimension D_{W+BW} (R^2 = 0.984; p = 0.016) and by a sigmoid function in the case of fractal dimension D_{B+BW} (R^2 = 0.994; p< 0.001). Fractal analysis facilitated the characterization of the studied area compared to the micro-morphology particularities of the plowed land and the altitude of image acquiring, the cluster grouping of the fractal dimension based on Euclidean distances being performed in conditions of statistical certainty (Cophenetic coeff. = 0.843).

Keywords: aerial images, fractal analysis, fractal geometry, land morphology, precision agriculture

• Introduction

Geomorphometry as a science that studies the digital terrain modelling for qualitative and quantitative characterization of the landscape, agricultural and non-agricultural areas, the plots and parcels, had benefited greatly from interdisciplinary applications and solutions. As a bland the sciences of soil, geography, engineering, computer science, math, and imaging based on satellite images, aerial or terrestrial, GIS, this field has been revolutionized and greatly powered with the help of applications and implications in earth sciences, precision agriculture, environmental monitoring, etc. Extensive studies have been made in this direction, emphasizing the different segments, or having an integrating character with the purpose of clarifying certain theoretical and practical aspects [17].

Agricultural lands surface and the soil in these cases, is very heterogeneous. The need to characterize the surface of the soil and agricultural land has been considered for a long time in relation to various factors, and fractal analysis is a method commonly used in the study, characterization and modeling of land and soil [35, 2].

Fractal analysis was used to characterize the rough surfaces of the different materials, based on fractal dimension [16, 14, 15], the soil being a culture medium with varying degrees of textures and surface roughness [24, 26, 25]. The soil was studied with high certainty by fractal analysis, in order to be characterized in terms of microrelief and micro topography and other specific features [28] in relation to natural and technological influence factors such as: precipitation and ground water regime [11, 30], soil erosion and degradation [37, 3, 34], desertification [38], use of the land and mechanical works of the soil [32, 33, 13], crop plants and associations of natural vegetation [29, 12, 36].

This study aimed to characterize the morphology and fractal geometry of the surface of the plowed field by fractal analysis, and to evaluate the change in fractal dimension in relation the acquiring altitude of the sample images.

• Material and method

The study was conducted in the Didactic Station of BUSAMVB Timisoara, plot of land A519/1, topo coordinates 45°78'43"N 21°21' 26"E. The land was plowed in autumn, the soil type being chernozem. Climate condition in the period autumn -winter, by frost-thaw and precipitation have influenced the soil furrows resulted from the plowing, thus a partial levelling was resulted.

Acquiring digital images. Images were taken with the help of the drone DJI Phantom 3, from different heights: 1m (figure 1), 5m (figure 2), 10 m (figure 3), 15 m (figure 4) and 20 m (figure 5), using a resolution of 12 MP.

Fractal analysis. Digital images of the area have been subjected to the fractal analysis (box-counting method) in order to obtain fractal dimensions (D) and multifractal (Dmf), D_{BW}, D_{B+BW} and D_{W+BW}. For the fractal analysis the software ImageJ [20] and HarFA [39] have been used.

Statistical processing of results. Processing and statistical analysis of the data was done using for statistical calculation module from the application EXCEL, Office 2007, software SPSS and PAST.

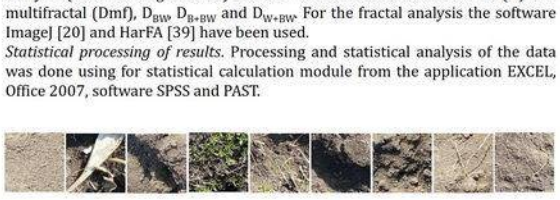


Figure 1 b. Image segments representative for the description of particular distinct cases of micro morphology at ground level.

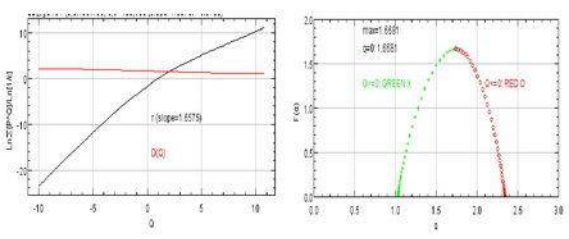


Figure 2. Graphic representation on fractal properties in the micromorphology of the studied land

• Results and discussions

Soil furrows over the season, under the influence of alternating frost-thaw and precipitation became chopped, thus resulted a partial levelling/smoothing of the soil. From the individual analysis of the images 1 – 27, the medium fractal values have been obtained, table 1, under the conditions of statistic certainty (R^2 = 0.989). Based on the distribution diagrams, differentiated behaviours were observed fractal and multifractal properties.

Table 1. Spectral values for characterizing soil micro morphology based on the images from the 1 m height

Variants	D	D mf	Slope	D_{BW}	D_{B+BW}	D_{W+BW}	R^2	SE	CV
V_1	1.846	1.668	1.665	1.752	1.599	1.992	0.995	0.04	0.0057
V_2	1.794	1.702	1.903	1.886	1.883	1.939	0.980	0.04	0.0110
V_3	1.696	1.693	1.908	1.883	1.933	1.895	0.983	0.04	0.0148
V_4	1.838	1.656	1.750	1.928	1.936	1.932	0.994	0.03	0.0110
V_5	1.818	1.656	1.720	1.915	1.943	1.891	0.990	0.03	0.0115
V_6	1.638	1.518	1.887	1.837	1.964	1.822	0.978	0.05	0.0170
V_7	1.808	1.656	1.780	1.923	1.943	1.903	0.993	0.03	0.0116
V_8	1.826	1.668	1.730	1.886	1.802	1.981	0.990	0.04	0.0128
V_9	1.838	1.668	1.771	1.936	1.869	1.969	0.994	0.03	0.0130

By analysing the obtained data (fractal dimensions) based on Euclidean distances, the cluster grouping of the variants was done according to the reality from the field, with a high degree of confidence (Cophenetic coefficient = 0.843). In the present study conditions, the most realistic cluster grouping has been done based of the values D_{W+BW}. For the overview images, acquired from the variable heights between 1m and 20m, fractal analysis led to the fractal and multifractal variables, shown in Table 2. Binarized images and interactive 3D surface plot are presented in Figure 3.

Table 2. The fractal dimensions resulted from the overall analysis of the images acquired at different heights

H (m)	D	D mf	Slope	BW	B+BW	W+BW	R^2	SE	CV
1	1.8872	1.9362	1.9905	1.8744	1.9188	1.9499	0.999	0.025	0.0108
5	1.8885	1.7925	1.8247	1.8661	1.9775	1.8017	0.998	0.023	0.0107
10	1.8947	1.7931	1.8473	1.812	1.9873	1.7283	0.999	0.024	0.0106
15	1.8988	1.9819	2.0757	1.7415	1.9931	1.641	0.999	0.023	0.0103
20	1.907	1.9888	2.0707	1.6497	1.9961	1.5408	0.999	0.024	0.0102

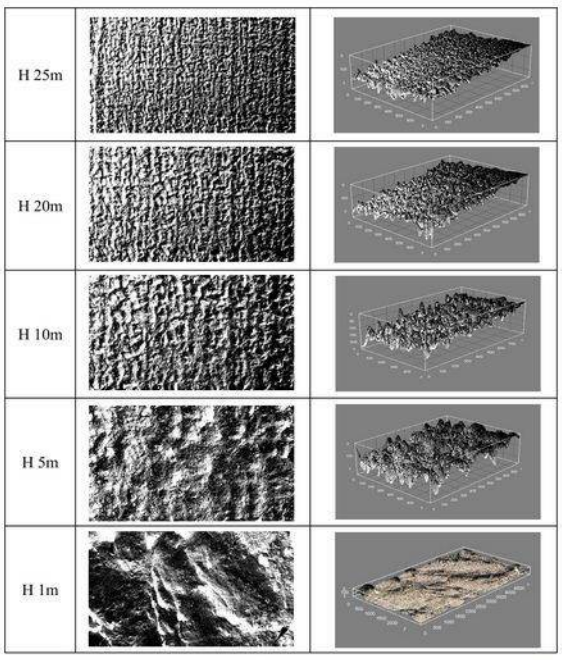
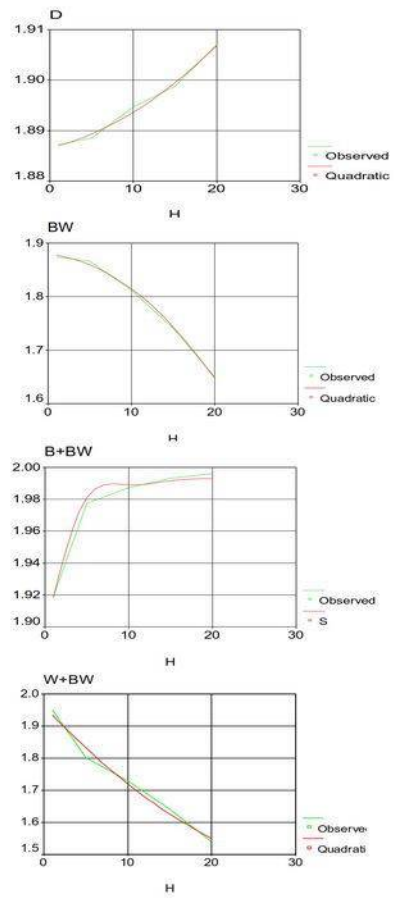


Figure 3. Bynary image and interactive 3D surface plot resulted from the analysis of the digital images of the studied area, acquired from different heights (H 1m; H 5m, H 10m, H 15m, H 20m).

Analysing the interdependency relations between the height of the image acquiring and the fractal values, these have been described by 2nd degree polynomial functions under conditions of statistical certainty . Thus, variation of the fractal dimension D according to the height of the images acquiring has been described in the equation (1), under conditions of statistical certainty (R^2 = 0.984 to 0.998; p < 0.001 to 0.016), graphical distribution of the particular values being represented in figure 4a – 4d.



• Conclusions

Fractal analysis facilitated the accurate analysis of the surface geomorphology for a plowed land, partially levelled by weather conditions, based on digital images acquired at varied altitudes. Based on the low altitude images (1m and 5m), large amplitudes of variation were captured regarding the micro-geomorphology of the plowed field and fractal and multifractal properties have been identified. Between the fractal dimensions and altitude of the images acquiring, there has been recorded a high correlation described using 2nd degree polynomial functions and sigmoidal functions, under conditions of statistical certainty.

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❖Title

Management of *Hibiscus rosa siensis* L. propagation by optimizing the growth substrates and biostimulators combination

❖Authors & Contact
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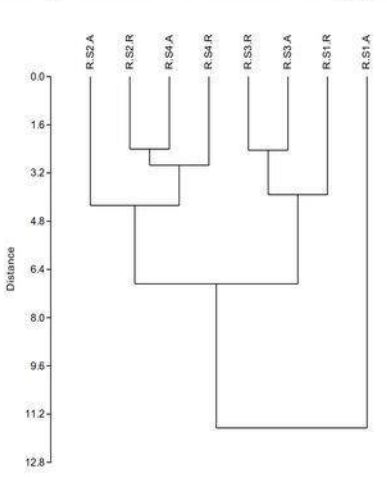
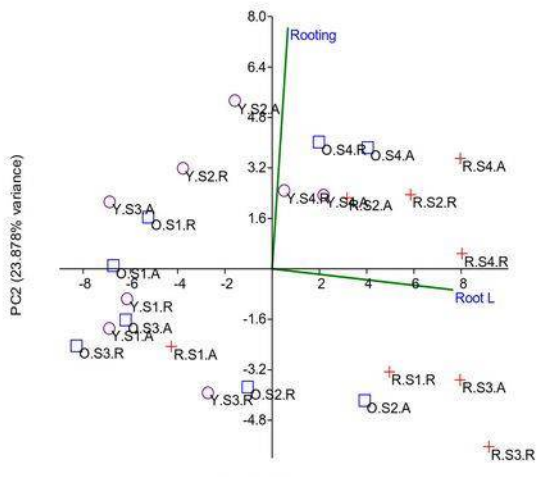
❖Short presentation

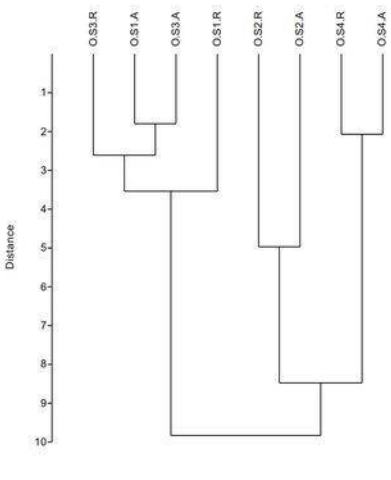
❑The aim of the research project was to evaluate the influence of biostimulators and growth substrates on rooting of cuttings, in order to improve the vegetative propagation through cuttings in Hibiscus rosa sinensis L.. Three varieties of Hibiscus (red flowers - R, yellow flowers - Y, and orange flowers - O), two growth biostimulators (Radistim - R, and Atonic - A) and four rooting substrates were used (sand - S1, sand:perlite - S2, sand:peat - S3, sand:peat: perlite - S4). From the combination of the three variables (biological material, biostimulators, and rooting substrates) resulted in 24 experimental variants. Cluster analysis facilitated for each studied hibiscus genotype obtaining a dendrogram in statistical safety conditions. In the case of the red hibiscus variety, there was a high affinity between R.S2.R (LSD0.5%) and R.S4.A (LSD5%), and between R.S3.R (LSD5%) and R.S3.A (LSD5%) variants, under conditions of Coph.corr = 0.899. In the case of the yellow hibiscus variety, a high affinity was found between Y.S4.R (LSD5%) and Y.S4.A (0.1%), and between Y.S2.R (LSD0.5%) and Y.S2.A (LSD5%) variants, in conditions of Coph.corr = 0.809. In the case of the orange hibiscus variety, there was a high affinity between O.S4.R (LSD0.5%) and O.S4.A (0.5%), respectively between O.S2.R ad O.S2.A (LSD0.5%) variants, under conditions of Coph.corr = 0.859. By PCA analisys, PC1 explained 76.122% of variance and PC2 explained 23.878% of variance, and was obtained a distribution chart and a breakdown of variants in relation to the quality indices of the rooting process.



Clustering of variants in the case of *Hibiscus rosa sinensis* L. - red variety



PCA - grouping of variants as a result of the interaction [genotype x biostimulator x substrate]; R – root, Y – yellow, O – orange; S1, S2, S3, S4 – substrates; R, A – biostimulators



Clustering of variants in the case of *Hibiscus rosa sinensis* – orange variety

➢The independent variables used, such as growth biostimulators (Radistim, Atonic) and rooting media (sand, sand:perlite, sand:peat, sand:peat:perlite) differentially influenced the vegetative propagation, through cuttings, in *Hibiscus rosa sinensis* L., varieties red, yellow, and orange.
➢Cluster analysis and PCA led to obtaining cluster groups and PCA distribution, under statistical safety conditions, based on which the best variants for obtaining vigorous plants were found, in order to optimize vegetative propagation in Hibiscus.

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USING GIS TECHNOLOGY IN PROCESSING AND ANALYZING SATELLITE IMAGES

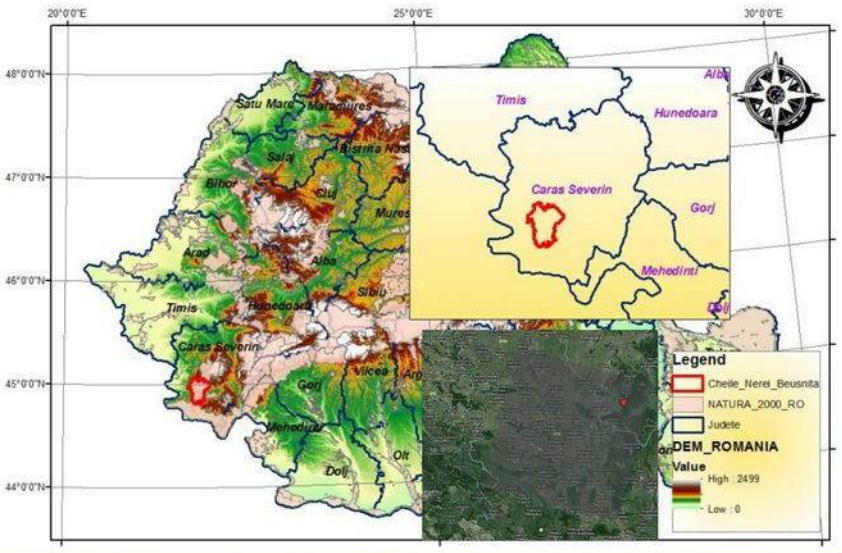
Case study Cheile Nerei Beusnita National Park Romania

Authors:
Assoc. Prof. Herbei Mihai Valentin, PhD; *Prof. Florin Sala, PhD*

Overview

The purpose of this study is the analysis and classification of the land from National Park Cheile Nerei Beusnita, Romania, based on satellite images and GIS technology. Analysis and classification of the land corresponding to the reference area was on based on satellite images Landsat 8. Processing and analysis of the images was performed using ArcGIS software, by means of two algorithms, ISO Data and K Means, with a variation in the number of iterations in order to evaluate the precision of the analysis process. In order to characterize the reference area we used the combination of spectral bands 432 (RED-GREEN-BLUE) and for analyzing and classifying the land, the band combination 543 (NIR-RED-GREEN) was chosen. By analyzing the satellite images based on the two algorithms, the results obtained were close regarding the size of the land surfaces according to the 7 user-defined classes. Under the conditions of a change in the number of classes, by defining a higher number, or by arbitrary classification without operator intervention, when achieving a complete classification based on digital information found in the base image, significant differences started to appear between results. At the same time by increasing the number of iterations, we recorded an increase in the analysis and classification accuracy while significantly increasing working time.

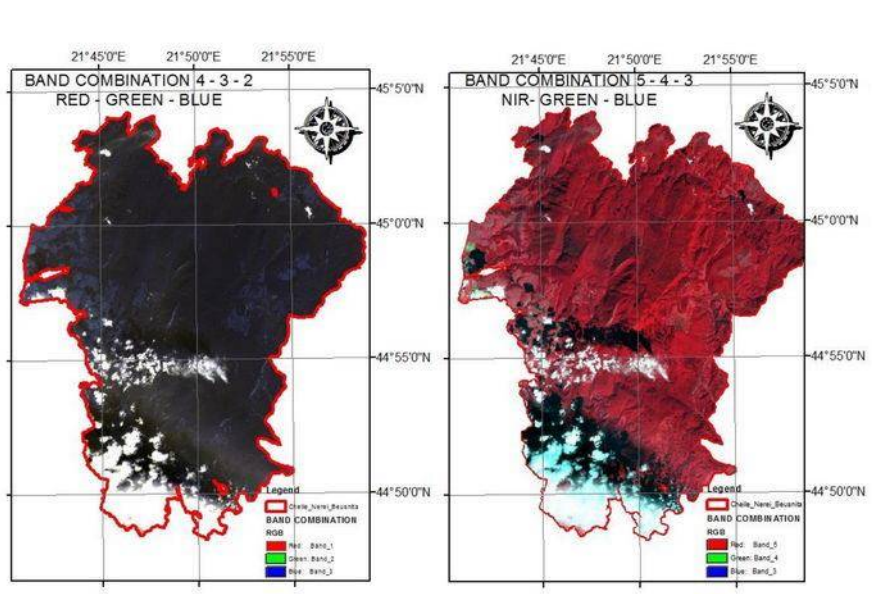
Location of the studied area



ISO DATA ALGORITHM			K MEANS ALGORITHM		
CLASS	TYPE	PERCENT	CLASS	TYPE	PERCENT
1	deciduous forests	*43.52*	1	deciduous forests	*46.43*
2	green meadows and grassy farmland	*26.33*	2	green meadows and grassy farmland	*27.11*
3	peak	*11.15*	3	peak	*8.84*
4	land with soil up to date	*6.35*	4	land with soil up to date	*6.47*
5,6	cloud	*12.1*	5,6	cloud	*9.07*
7	conifer forests	*0.56*	7	conifer forests	*2.08*

Classification process

The image obtained according to the combinations of spectral bands 543 (NIR - RED - GREEN), useful in the study of vegetation, remote sensing analysis and delineation of the built space of the one covered with vegetation, was subjected to unsupervised classification process based on two algorithms, algorithm ISODATA – 1 iteration and algorithm K-Means - 3 iterations.



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CHARACTERIZATION OF THE ARBOREAL VEGETATION FROM DENDROLOGICAL PARK BAZOȘ, ROMANIA, BASED ON SATELLITE IMAGES

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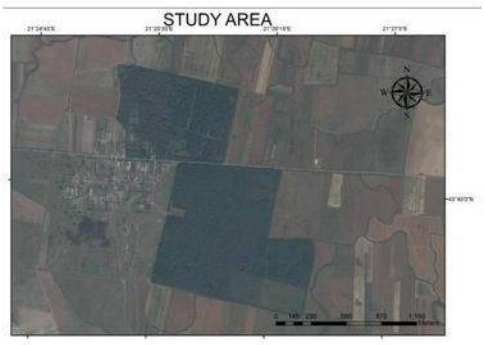
INTRODUCTION

The purpose of this study is creating a spectral analysis of arboreal vegetation in Dendrological Park Bazoș, Romania. The survey is based on Landsat 8 satellite images, over a period of 258 days including inactive and active growing time periods. From the analysis of satellite images we obtained the spectral bands R, G, B and IR(NIR, MIR) based on which the indices NDVI, NDBR and NDMI were calculated used in the characterization of the arboreal vegetation. Indices NDVI, NDBR and NDMI have recorded **minimum values** during the inactive vegetation periods and they had an ascending distribution in the early stages of active vegetation, over the course of March and April. They recorded **maximum values** in the month of May (NDBR and NDMI) and in June-July for NDVI, and then beginning with August – September there has been a descending distribution of vegetation indices characterization. Indices distribution regarding the duration in days for the study period was described in polynomial function of 4th range, in terms of statistical certainty (NDVI: $R^2 = 0.953$, $p<0.01$; NDBR: $R^2 = 0.965$, $p<0.01$; NDMI: $R^2 = 0.926$, $p<0.01$). Based on the spectral data from NIR band the prediction of the studied indices was done with high statistical certainty: NDVI vs NIR ($R^2 = 0.896$, $p=0.13$; $F=24.97$; RMSEP = 0.0379); NDBR vs NIR ($R^2 = 0.922$, $p=0.015$; $F=82.59$; RMSEP = 0.0166); NDMI vs NIR ($R^2 = 0.984$, $p=0.016$; $F=24.68$; RMSEP = 0.0138).

CHARACTERIZATION OF THE VEGETATION INDICES

In terms of statistical accuracy of the experimental data analysis, it was carried out by appropriate mathematical and statistical methods (p, R^2, test F). To assess interdependencies between certain spectral bands and indices used to characterize the arboreal vegetation in the studied area, the regression analysis was used from which resulted polynomial functions with the related accuracy parameters.

$$NDMI = (NIR - IR)/(NIR + IR)$$
$$NDVI = (NIR - R)/(NIR + R)$$
$$NDVI = (NIR - R)/(NIR + R)$$



NDVI index variation connected to the time period, over the range studied, has been described by equation (1) in terms of statistical accuracy ($R^2 = 0.953$, $p<0.01$)
NDBR index variation regarding the time period, over the range studied, has been described by equation (2) in terms of statistical accuracy ($R^2 = 0.965$, $p <0.01$) the particular distribution of the data is shown in Figure 3.
NDMI index variation reported to the time period, over the range studied, has been described by equation (3) in terms of statistical accuracy ($R^2 = 0.926$, $p <0.01$) the particular distribution of the data is shown in Figure 4.

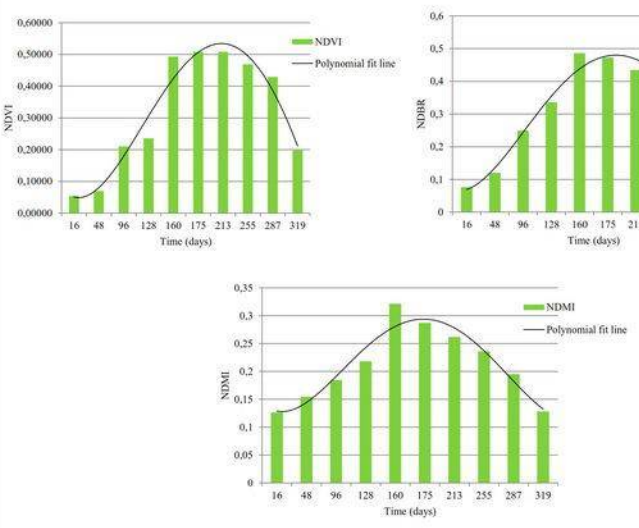
$$NDVI = 0.0003x^4 - 0.0105x^3 + 0.09x^2 - 0.1725x + 0.144 \quad (1)$$

$$NDBR = 0.0005x^4 - 0.0114x^3 + 0.0778x^2 - 0.0944x + 0.0968 \quad (2)$$

$$NDMI = 0.0003x^4 - 0.0075x^3 + 0.0528x^2 - 0.0951x + 0.1785 \quad (3)$$

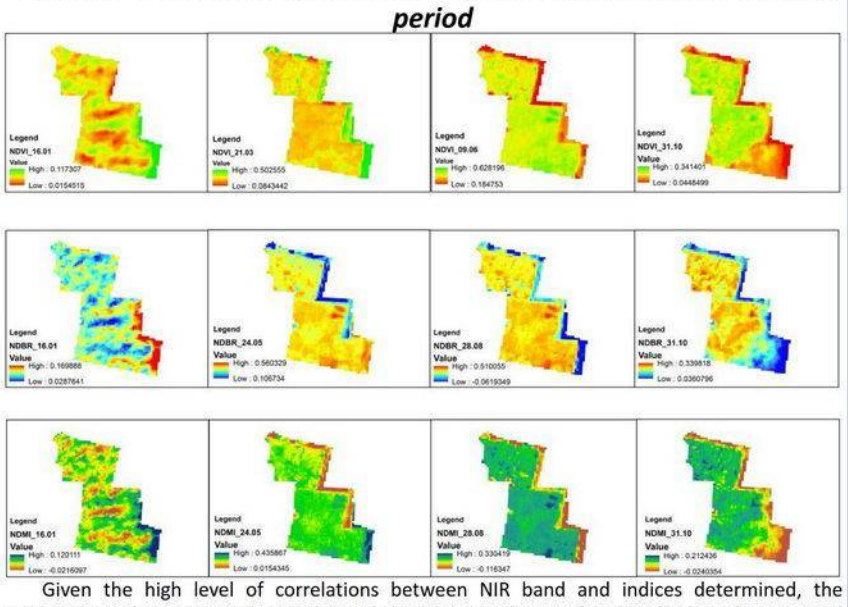
where: x – time (days during the determinations)

Particular distribution of NDVI, NDBR, NDMI values during the study period



APLICABILITY

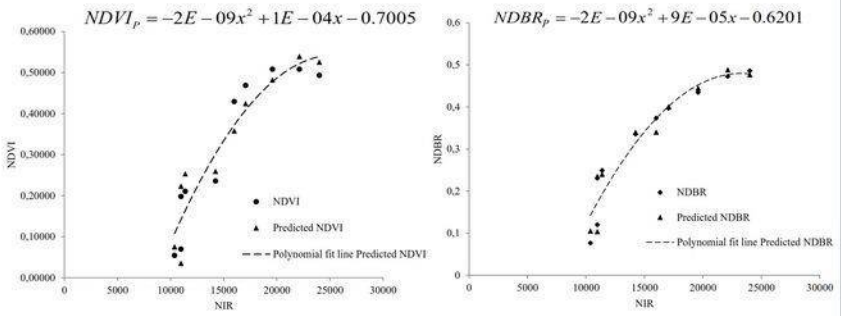
Spectral distribution of indices NDVI, NDBR and NDMI in the study period

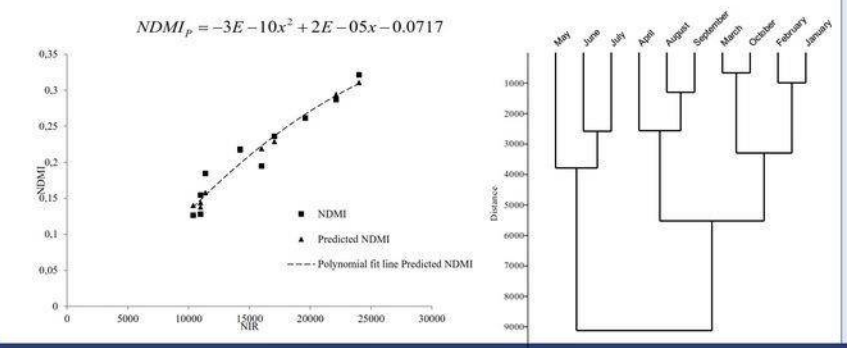


Given the high level of correlations between NIR band and indices determined, the regression analysis was used to evaluate the predictive relation of each index based on spectral values from NIR band.

The prediction for NDVI values, based on recorded spectral data in the NIR band, was possible with high statistical accuracy (R2 = 0.896, p = 0.13; F = 24.97; RMSEP = 0.0379). The predictive relations of NDBR values, based on spectral data recorded in the NIR band was also possible with high statistical accuracy (R2 = 0.922, p = 0.015; F = 82.59; RMSEP = 0.0166). The predictive relation of NDMI based on spectral data recorded in the NIR band was possible with high statistical accuracy (R2 = 0.984, p = 0.016; F = 24.68; RMSEP = 0.0138).

The relation of dependence between indices with NIR band





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FRACTAL CHARACTERISATION OF THE CORK CAMBIUM IN *FRAXINUS ANGUSTIFOLIA* VAHL. DEPENDING ON IMAGE CAPTION DISTANCE

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❖FRACTAL ANALYSIS DURING VEGETATION

Fractal geometry advanced and introduced by Mandelbrot (1983) is the proper tool for different analyses in the plant kingdom for the description and characterisation of the plants on the whole or of plant representative parts. Fractal analysis is a very accurate study instrument: it is used in different fields since the box-counting method is highly used (Liebovitch and Toth 1989; Nežádal et al., 2001). Fractal analysis was used in the study and characterisation of different textures and forms to develop representation models (Xu et al., 2012; Zhao et al., 2013). Together with classical methods used during vegetation, fractal analysis has been used to study the vegetal cover, individual plants or just plant parts through box-counting (Buczkowski et al., 1998) or multiscale fractal dimension, developed based on the Minkowski method (Costa and Cesar, 2000). In the study of plants, fractal analysis has been used to identify plant species based on the complexity of leaf limb and to analyse tree age depending on stem fractal geometry (Bruno et al., 2008; Backes et al., 2009; Cope et al., 2012; Du et al., 2013; Sala and Boldea, 2014). Da Silva et al. (2015) analysed and characterised over 50 species of Brazilian flora through fractal analysis of the images of median nerve cross sections and Sala et al. (2017) used fractal analysis to characterise and differentiate five cultivars of *Malus domestica* Borkh. Fractal geometry of the bark in the species *Fraxinus angustifolia* Vahl. is analysed in this study through fractal analysis depending on high resolution digital image caption distance.

❖FRACTAL CHARACTERISATION OF THE CORK CAMBIUM DEPENDING ON IMAGE CAPTION DISTANCE

Fractal analysis of the bark in the species *Fraxinus angustifolia* Vahl. (ash) was done on binarised images (Figure 1) through the box-counting method developed by Voss (1985) and frequently used in fractal analysis (Li et al., 2009; Long and Peng, 2013). For fractal analysis, we used the soft HarFA v5.5.31 developed by Zmeskal et al. (1999). Geometry analysis of the stem bark based on digital images produced pixel-based fractal dimensions such as black and white (BW), black + black and white (B+BW), and white + black and white (W+BW), respectively, after the general relation (1), shown in Table 1 below. The ANOVA single factor test for Alpha = 0.001 pointed out the existence of variance in trial data and of fractal values, respectively, depending on the variation factor (digital image caption distance).

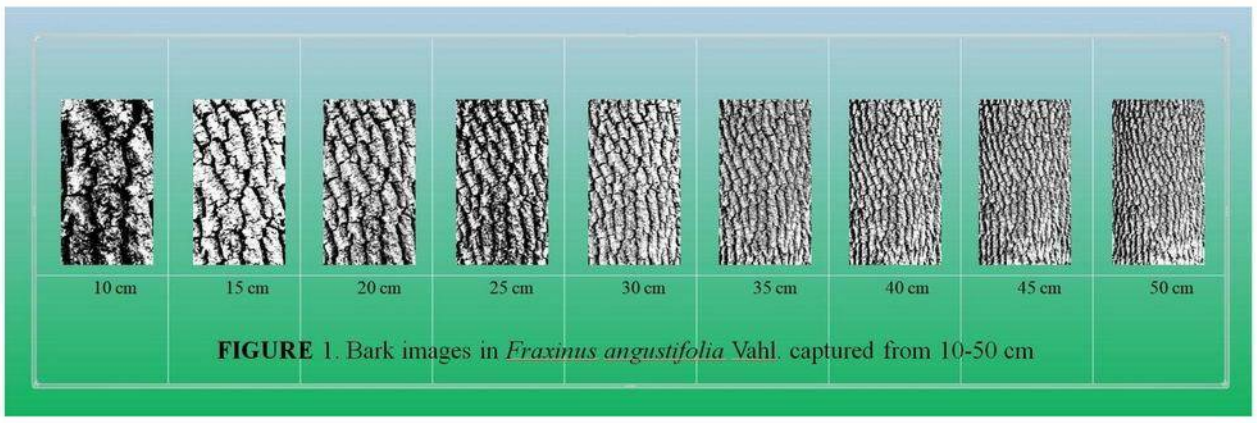

FIGURE 1. Bark images in *Fraxinus angustifolia* Vahl. captured from 10-50 cm

The interdependence between fractal dimensions and image caption distance was described by the relations (2), (3), and (4) under statistics safety conditions, $R^2 = 0.882$, $p = 0.00165$, $F = 22.371$ for relation (2), $R^2 = 0.918$, $p = 0.00055$, $F = 33.498$ for relation (3) and $R^2 = 0.932$, $p = 0.00031$, $F = 41.292$ for relation (3).

$$D_{BW} = -8.844E-05x^2 + 0.00845x + 1.715 \quad (2)$$

$$D_{B+BW} = -0.0001307x^2 + 0.009977x + 1.777 \quad (3)$$

$$D_{B+BW} = -8.584E-05x^2 + 0.006714x + 1.841 \quad (4)$$

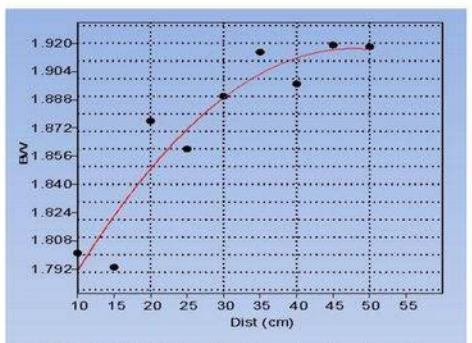

FIGURE 2. Distribution of the D_{BW} values depending on image caption distance in the stem of *Fraxinus angustifolia* Vahl.

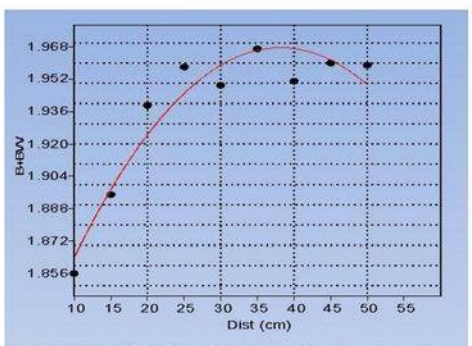

FIGURE 3. Distribution of the D_{B+BW} values depending on image caption distance in the stem of *Fraxinus angustifolia* Vahl.

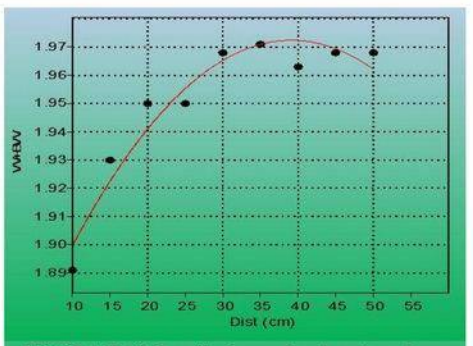

FIGURE 4. Distribution of the D_{W+BW} values depending on image caption distance in the stem of *Fraxinus angustifolia* Vahl.

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ANTIMICROBIAL APPLICATIONS OF Linaria vulgaris L.EXTRACTS IN THE MEDICAL AND COSMETIC FIELD

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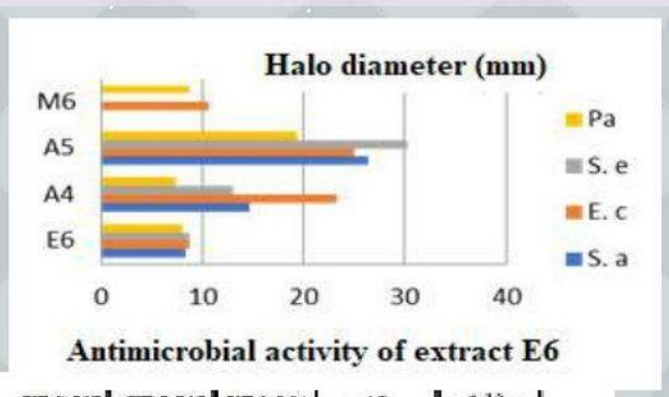
INTRODUCTION

In Romania, there are many species of plants that have medicinal properties but only about 300 are harvested and used, the rest being lost due to lack of knowledge or disinterest. The genus Linaria comprises annual or perennial plants considered as weeds, which are found everywhere and do not involve additional costs because they grow in a diversified habitat. They can be harvested even from unpolluted areas and have beneficial effects, not yet explored. The species chosen for this study is Linaria vulgaris L. which has a composition rich in polyphenols, terpenes, alkaloids, organic acids, mineral substances, sugars, pectins. They can be used in the medical field but also in cosmetics, due to the anti-acne, emollient, anti-inflammatory, purifying properties. The main objective was the antimicrobial screening of the extracts of Linaria vulgaris L and the establishment of the extracts with possibilities for use in the medical and cosmetic field.

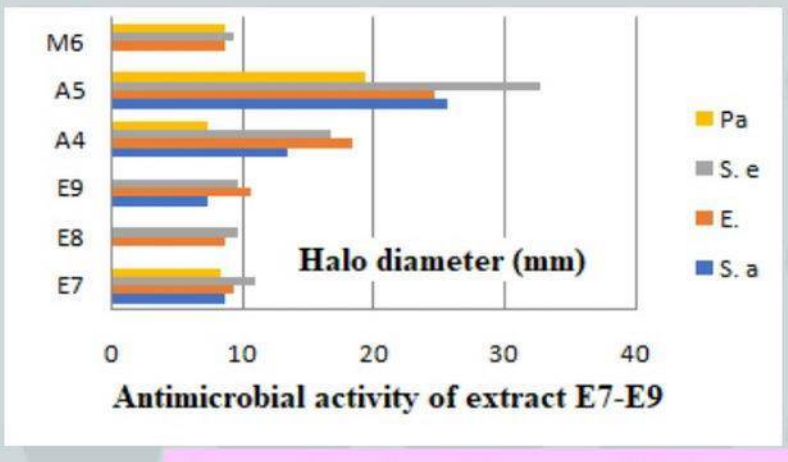
MATERIAL AND METHODS

Extracts from roots (E6), stems (E7), leaves (E8), and flowers (E9), from Linaria vulgaris L were analyzed microbiologically, compared to controls: ethanol (M6), ampicillin (A4) and cefotaxim (A5)), using the Kirby Bauer method (with minor modifications).
Pathogenic and pathogenic conditioning microbial species have been chosen that produce internal and external diseases, namely: Staphylococcus aureus (Sa), Escherichia coli (Ec), Staphylococcus epidermidis (Se), Pseudomonas aeruginosa (Pa). In addition, the possibility of occurrence of mutations materialized by the appearance of resistance to the studied microbial species was also pursued. The evaluation was performed using ISSR (Inter-Simple Sequence Repeats) markers.

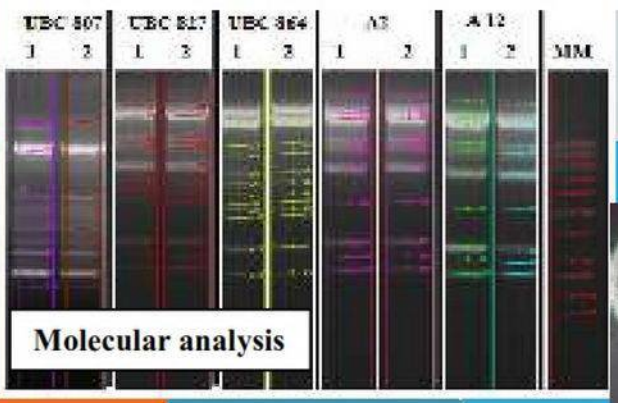
RESULTS AND DISCUSIONS



Antimicrobial activity of extract E6



Antimicrobial activity of extract E7-E9



Molecular analysis

In general, most species are sensitive to extracts E7, E8, E9. S. epidermids is most affected by the extracts tested and cefotaxim. Preliminary molecular results show that by exposing the species Staphylococcus epidermidis for a shorter period to the linaria extract, no resistance is induced and no mutagenic effects occur. But, it should be noted that the exposure was made in the short term.

CONCLUSIONS

The bacteria most affected by the linear alcoholic extracts were S. epidermidis (at E7), followed by E. coli (at E9). Short-term treatment with linaria extract products does not induce resistance in Staphylococcus epidermidis cells.

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Although phytotherapy recommends only flowers, the alcoholic extracts of *Linaria vulgaris* L. selected, which have a greater inhibitory effect on the bacteria were: E7 (stems) followed by E9 (flowers).

Antimicrobial properties of the essential oils obtained from medicinal species belonging to the *Lamiaceae* family

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Introduction

The purpose of this study is to determine the antimicrobial activity of volatile oils obtained from species of the L*amiaceae* family. To achieve this goal, the following objectives were set: cultivation of microbial strains in cultured plaques, evaluation of diameters of inhibition zones obtained after application of essential oils, use of gentamicin and fluconazole as reference substances, determination of minimum inhibitory concentrations after application of essential oils, determination of concentration bactericidal minima after application of essential oils.

Material and methods

The antibacterial activity was established by both the standardized subculture diffusometric method and the dilution method with the determination of MIC (minimum inhibitory concentration) and MBC (minimal bactericidal concentration). For each oil, a plate was plated on the microcompress with oil and 2 control microcompresses Fluconazole were used as reference for the antibiotic activity.

The essential oils obtained from species belonging to the family L*amiaceae* were used. Antimicrobial activity was tested on seven bacterial strains (*Salmonella enterica serotype typhimurium, Shigellaflexneri serotype 2b, Enterococcus faecalis, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus*) and two types of Candida (*Candida albicans and Candida parapsilosis)*.

Results and discussions

Conclusions

For each oil, a plate was plated on the microcompress with oil and 2 control microcompresses. The positive control consisted of a microcompressed gentamicin of 10 µg and 120 µg of the strain of *Enterococcus faecalis*, respectively. For the *Candida strains* the positive control was a microcompressed Fluconazole 10µg. Oils to which an inhibition area diameter of more than 15 mm was obtained were considered to have antibacterial activity and further tested by the dilution method.

UV	K. pneumoniae	S. flexneri	S. enterica	E. coli	P. aeruginosa	S. aureus	E. faecalis	Candida albicans	Candida parapsilosis
59	10 mm	10 mm	10 mm	10 mm	9 mm	10 mm	10 mm	10 mm	10 mm
23	21 mm	20 mm	20 mm	20 mm	17 mm	21 mm	21 mm	22 mm	22 mm
38	21 mm	20 mm	22 mm	22 mm	15 mm	21 mm	22 mm	33 mm	33 mm
22	6 mm	9 mm	9 mm	9 mm	6 mm	10 mm	9 mm	10 mm	10 mm
20	13 mm	14 mm	10 mm	14 mm	6 mm	20 mm	19 mm	30 mm	30 mm
31	29 mm	28 mm	28 mm	29 mm	15 mm	29 mm	28 mm	32 mm	32 mm
45	6 mm	6 mm	6 mm	10 mm	6 mm	20 mm	16 mm	20 mm	19 mm
30	6 mm	6 mm	9 mm	10 mm	6 mm	21 mm	20 mm	20mm	21mm
57	6 mm	6 mm	10 mm	11 mm	6 mm	22 mm	21 mm	20mm	20mm
24	15 mm	13 mm	13 mm	15 mm	10 mm	23 mm	24 mm	20mm	20mm
68	25 mm	20 mm	20 mm	26 mm	12 mm	26 mm	24 mm	20mm	20mm
21	10 mm	11 mm	9 mm	9 mm	6 mm	16 mm	15 mm	19mm	18mm
34	6 mm	6 mm	6 mm	6 mm	6 mm	22 mm	20 mm	20mm	20mm
42	25 mm	26 mm	25 mm	27 mm	16 mm	23 mm	22 mm	20mm	20mm

For oils 59 and 22, no antibacterial activity was recorded, while oils 20, 45, 30, 57, 24, 21, 34 were active only on Gram-positive and fungal rats.

The other oils (23 - *Origanum majorana* L., 38 - *Mentha smithiana* L., 31 - *Origanum majorana* L., 68 - *Mentha* x *piperita* L. and 42 - *Satureja montana* L.) had inhibitory activity on all reference strains tested.

References

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[2Nelson RR. In-vitro activities of five plant essential oils against methicillin-resistant Staphylococcus aureus and vancomycin-resistant Enterococcus faecium. J Antimicrob Chemother [Internet]. 1997 Aug 1
[3]. Soković M, Glamočlija J, Marin PD, Brkić D, van Griensven LJLD. Antibacterial effects of the essential oils of commonly consumed medicinal herbs using an in vitro model. Molecules [Internet]. 2010 Oct 27 [cited 2019 May 22];15(11):7532–46. Available from: http://www.mdpi.com/1420-3049/15/11/7532

Fermented beverage from blackberries

author Taran Madalina Elena

Abstract: The product has been designed taking into account the requirements of our current eating habits and harnessing the potential in terms of superior capitalization of berries which currently is recovered in the rough without bringing added value to a percentage of the national economy. Works of obtaining the product or held in Alba Iulia . In the paper i sought to obtain a fermented beverage from berries that benefit human health by harnessing the properties of blackberries .

Introduction

The purpose of the work was the creation of a type of alcoholic beverage fermented with a high contribution of biologically active compounds and a special aroma. From the very beginning we must clarify one fundamental thing: the distinction between this drink and wine.

Material and method

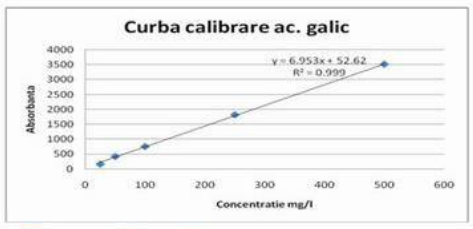
The technological scheme for obtaining the beverage comprises the following processes: reception, sorting, washing, crushing, maceration, fermentation together with the auxiliary materials, decanting, clearing, stabilization, filtration, bottling.

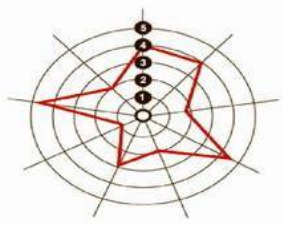
Results and discussions

The antioxidant capacity of the fermented beverage from the blackberries was determined by applying the PHOTOCHEM principle by photoluminescence.

The total phenol content was determined by the spectrophotometric method by the Foil-Ciocalteu method.

Specification	Antioxidant capacity mg/l equivalents ascorbic acid	Total polyphenols mg/l gallic acid equivalents
Fermented beverage from blackberry	4,32	162,00





Conclusions

The fermented blackberry drink has many healing qualities and falls into the category of proactive foods (probiotics).

The fermented blackberry beverage is a product that can be included in the traditional slow food group.

Electric generator with adapted magneto and heat source obtained from exhaust gases

Autor: Jerlăianu Marian

-Operation under various environmental conditions;
-Long-term use;
-The source of electricity allows for the rapid decoupling from the engine;
-Simple and efficient structure;
-Low noise when functioning;
-Constructive variant that has an electric generator and reduced mass.

MB-UGV-1

Autor : Murar Bogdan

ADVANTAGES

Remote control;

Posibility to develope AI in Python;

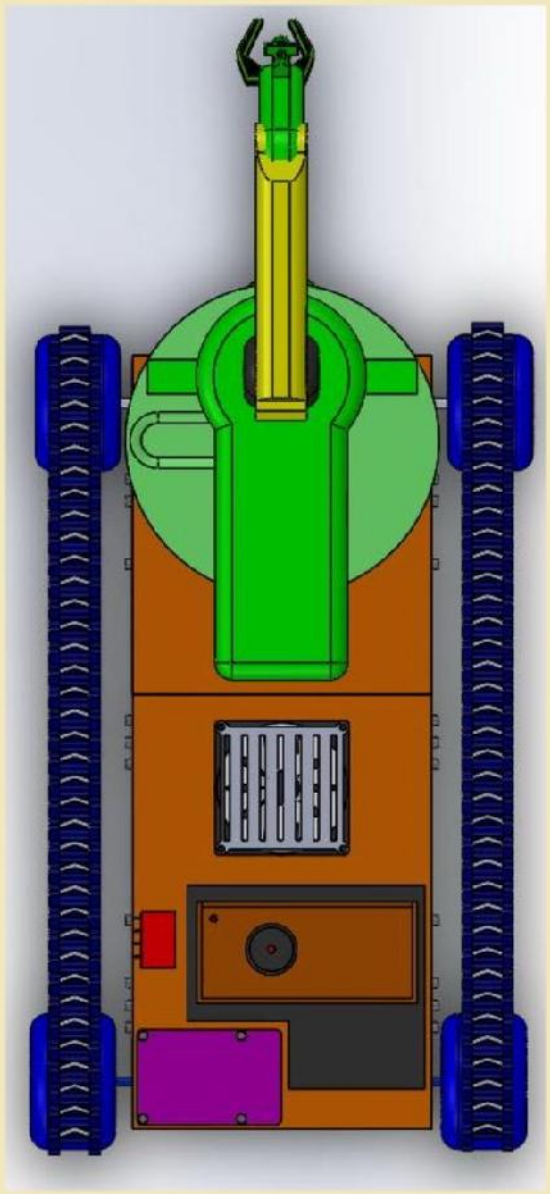
Low costs ;

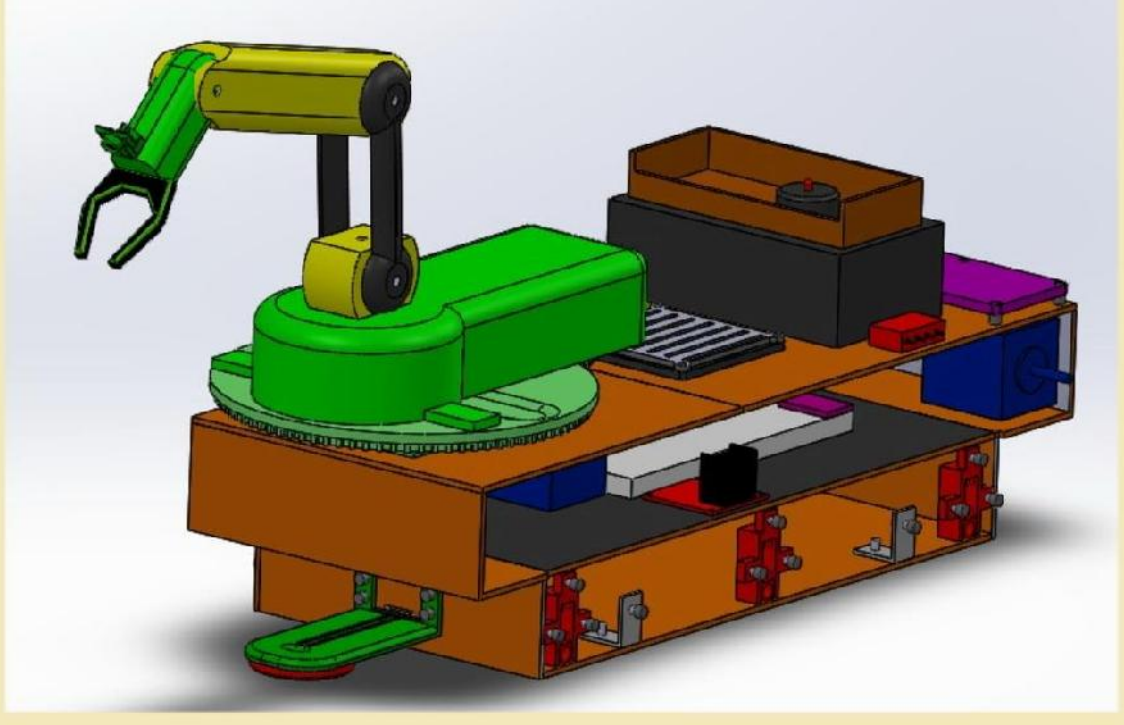
Printed parts and easy to replace;

Simple controller;

Posibility to control from computer or smartphone;

Images from robot can be seen from multiple devices via IP link;





Method and security system for civil airports protection against terrorist attacks with portable ground-to-air missiles

Octavian IONESCU, Emil PRICOP, Gabriela IONESCU
Petroleum-Gas University of Ploiesti, Ploiesti, Romania
Patent: RO 129740 B1 / 30.06.2016

Field of invention

Security, protection, safety – antiterrorism, disasters and accidents.

Original approach

The invention relates to a system for protecting the civil airports against terrorist attacks with portable soil-air missiles and to a method for its implementation in the existing missiles. The proposed system consists of an electronic rocket launch locking device mounted on the launch tube and an identification device installed on the missile. Each device has a unique code stored in the internal memory that cannot be altered. System operation is based on emitting the declared lost equipment codes and checking the coincidence between the received codes and the ones stored in the memory of launch device. In case of code correspondence, the launcher automatically locks up.

Technology description

The proposed system (figure 1) has the following key components:

- CA - Commercial Aircraft,
- A1 and A2 - emission antennas located on commercial airplane;
- As1, As2, ... Asn - network of emission antennas;
- MANPAD - portable air defence missile;
- MS - launching mechanism;
- LT - launching tube;
- RFT 1, RFT2 – safety mechanisms for launch blocking.

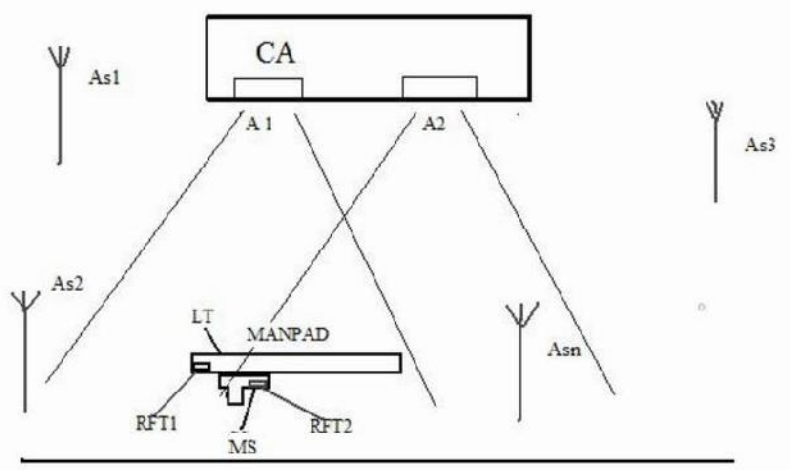


Fig. 1 – Proposed system architecture

The antennas A1, A2 and As1 .. Asn have their own storage and independent command systems. The codes of "lost" MANPADS are stored in those memories and updated regularly by using USB media.

The codes are broadcasted periodically at well-defined time intervals (maximum 10 seconds). The receivers RFT1 and RFT2, installed on MS and LT, receive all the broadcasted codes. If they identify their own code in broadcasted sequence the launch will be blocked by using a specially designed decoupling circuit mounted on the MANPAD LT.

Technology merits

- The proposed system is not invasive and could be installed easily on any type of existing and developing MANPAD
- The proposed system is based on a simple and reliable solution;
- The implementation of the system relies on a comprehensive database with the serial number of all the "lost" missiles;
- To this moment is the most reliable method to defend civil airports against terrorist attacks by using MANPADS.
- Although the idea and patent were issued several years ago, the new IoT and WSN technologies could be easily used to implement an improved system version.

System demonstrator manufacturing

The demonstrator of the proposed system was made off components available on the shelves at the time of patent development (basically by using ZigBee modules). The results proven the viability and reliability of the system.

With the latest developments in the IoT field, the specific technologies (WSN, IoE) are candidates for an improved version of the system with a reduced cost.

Furthermore, several states producing MANPADS decided to use RFIDs to keep tracking these devices. Thus, this patent could be implemented at large scale in the near future.

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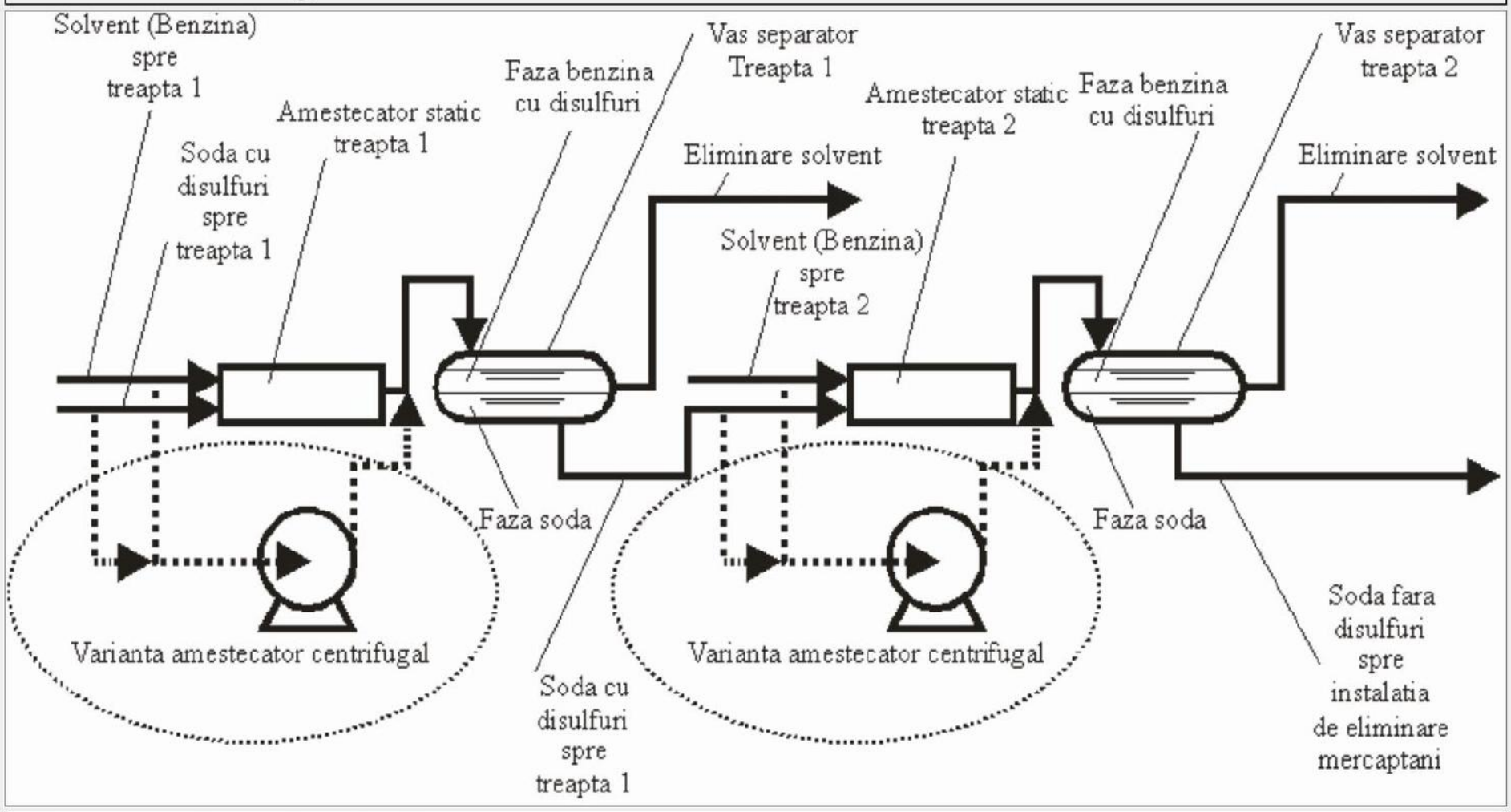
PROCESS FOR SEPARATION OF DISULFIDES FROM USED CAUSTIC SODA FROM MEROX INSTALLATION

Florin Oprea, Elena-Mirela Fendu, Marilena Nicolae, Victor Vlad

OSIM Patent no.130690/30.10.2018

The patent refers to a process for removal of disulfides from caustic solutions resulted from the elimination of mercaptans in the mercaptan oxidation process (MEROX).

The process is carried out in two contacting steps, each taking place in a static or centrifugal mixer (centrifugal pump) and a horizontal separator vessel. The extraction solvent, used in the same ratio in both steps, consists in a fraction of hydro treated gasoline. The solvent ratio is between 0.5:1 and 3:1 by weight, the contacting and separation steps developing at temperatures between 30-60ºC and pressures between 1-6 barg.



Proposed method advantages

- The method reduces investment costs by more than € 50 000 by removing an extraction column and corresponding automation equipment from the conventional diagram of the process.
- The operation of the process is significantly simplified.
- The proposed solution reduces operational risks, increasing process safety.

TIMISOARA

W SUPER ABSORBING AIR FILTER

Filtru de aer supraaspirant W

Brevet: 121674

Autor: **Corneliu Birtok Băneasă**

The super-aspirating W air filter is able to capture, accelerate, recover and reverse the flow of air used to form the fuel mixture for internal combustion engines.

Filtru de aer supraaspirant W, captează, prerăcește, recuperează, crește și inversează fluxul de aer utilizat la formarea amestecului carburant al motoarelor cu ardere internă.

Problema tehnică pe care o rezolvă filtrul de aer W pentru motoare cu ardere internă conform invenţiei, constă în creşterea volumului de aer filtrat disponibil pentru alimentarea motorului cu ardere internă.

The technical problem that the air filter W solves for internal combustion engines according to the invention, is to increase the volume of filtered air available to supply the internal combustion engine.

Prin utililazarea filtrului de aer supraaspirant se obţin următoarele avantaje :

- captarea fluxului de aer indiferent de pozitia de montaj;
- inversarea fluxului de aer cu 180º;
- cresterea fluxului de aer;
- accelerarea vitezei aerului la intrarea si iesirea din filtru;
- recuperarea fluxului exterior de aer.

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CYLINDRICAL MULTI-HOLLOW BRIQUETTE PRODUCED OF FERROUS PULVEROUS WASTE
BRICHETĂ CILINDRICĂ MULTICAVĂ DIN DEȘEURI FEROASE PULVERULENTE

Brevet: 127756 / 30.08.2019

Autori: **HEPUȚ TEODOR, CRIȘAN EUGEN, ARDELEAN ERIKA, SOCALICI ANA, ARDELEAN MARIUS**

Invenția se referă la o brichetă cilindrică multicavă, obținută din deșeuri feroase pulverulente și mărunte, cu granulație sub 2 m, ce poate fi utilizată în siderurgie la agregatele de reducere. Forma cilindrică multicavă a brichetei asigură creșterea suprafețelor de reacție, respectiv, a vitezei de reducere a oxizilor de fier, comparativ cu brichetele clasice, cu efecte pozitive asupra productivității, consumurilor de energie și a gradului de utilizare a reducătorului.

The invention relates to a cylindrical multi-hollow briquette obtained from ferrous pulverous and small waste with a grain size of less than 2 mm, said briquette being used in ferrous metallurgy in the wind furnaces producing the refining iron or in the installations for direct reduction of iron in order to produce iron sponge. The multi-hollow cylindrical shape of the lighter ensures the growth of the reaction surfaces, respectively of the speed of reduction of iron oxides, compared to conventional lighters, with positive effects on productivity, energy consumption and on the degree of usage of the reductant. Also, using them in reducing ovens ensures a good permeability to gases of the material column.. Ferrous waste in the composition: steel plant dust, furnace dust, furnace agglomeration sludge and iron scale sludge.

Utilizarea brichetei în încărcătura agregatelor de elaborare a materialelor metalice conduce la avantaje de ordin tehnologic, economic şi ecologic: utilizarea în vederea reciclării a unei game largi de deşeuri feroase pulverulente şi mărunte provenite din industria siderurgică, deşeuri depozitate pe halde cât şi a celor provenite de pe fluxurile curente de fabricație respectiv rețetă şi tehnologie de fabricație simplă.

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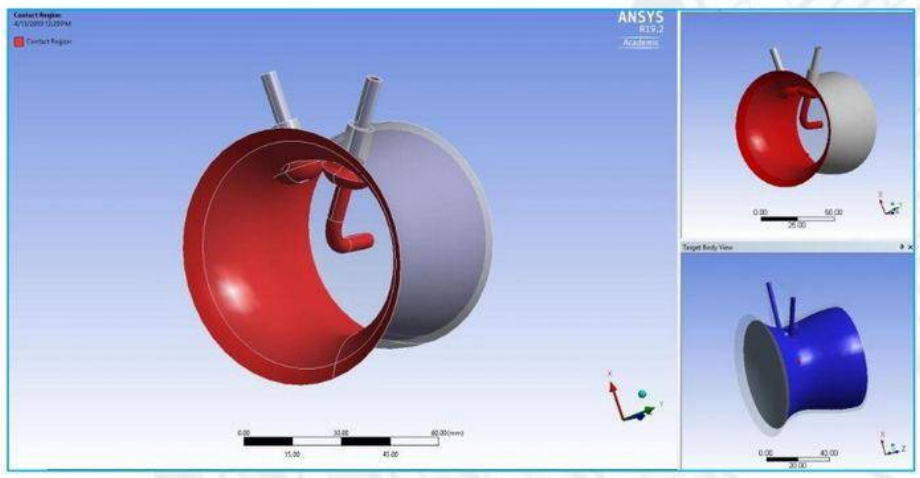
Analysis of the fluid dynamic behaviour through the air collector following the installation of pressure outlets

Influența prizelor de presiune asupra curgerii aerului pe traseul de admisie

Autori: **Robert Bucevschi, Ana Socalici, Adina Budiul Berghian, Corneliu Birtok Băneasă**

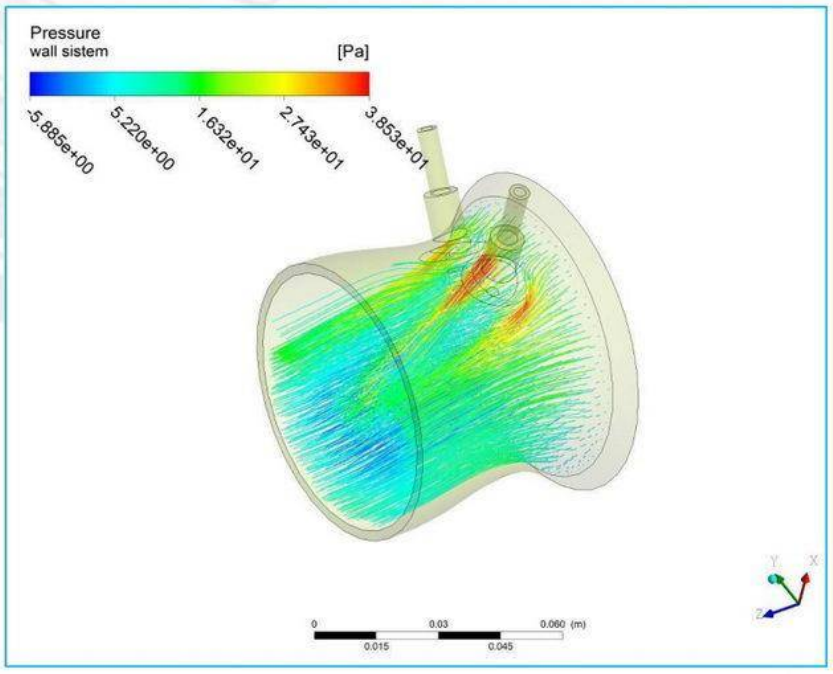
Pe traseul de admisie al motoarelor cu ardere internă se înregistrează două categorii de pierderi: gazodinamice și termice. În vederea creșterii fluxului de aer proaspăt, fiecare element al admisiei trebuie analizat din această perspectivă. Acest studiu se bazează pe rezultatele simulărilor CFD și își propune să analizeze influența a două prize de presiune montate pe suprafața interioară a difuzorului de intrare al filtrului de aer.



Defined contact surfaces between solid

On the intake route of internal combustion engines there are two categories of losses: gas-dynamic and thermal. In order to increase the fresh air flow, each element of the intake must be analyzed from this perspective.

This study is based on the results of CFD simulations and aims to analyze the influence of two pressure sockets mounted on the inner surface of the air filter inlet diffuser.



Fluid flow direction pressure diagram (lateral view).

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DRIFT super-aspirating air filter
Filtru de aer Supraaspirant DRIFT

Autor: **Corneliu Birtok Băneasă**

Brevet 125034/30.07.2013

Filtrele de aer supraaspirante DRIFT sau multifuncţionale sunt destinate automobilelor competiției de Drift. Acestea reduc pierderile gazodinamice și termice contribuind la creșterea gradului de umplere al cilindrilor motori. Filtrele de aer supraaspirante DRIFT îndeplinesc, pe lângă sarcina principală de filtrare a aerului şi următoarele funcţii:

- captează aerul;
- cresc viteza de curgere a aerului aspirat;
- prerăcesc aerul.

DRIFT or multifunctional super-aspirated air filter

DRIFT or multifunctional super-aspirated air filters are dedicate for Drift competition cars. These reduce the thermal, the gas and dynamic losses by contributing to the increase of the filling degree of the motor cylinders. In addition to the main air filtration task, the DRIFT super-aspirating air filters perform the following functions:

- captures air;
- increase the speed of suction air flow;
- prairie the air.

Câmpul termic în zona filtrului de aer captat cu o cameră cu termoviziune

Filtru supraaspirant YXV

Filtru sport

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Laboratorul lui DEXTER

Autor: Corneliu Birtok Baneasa

Proiecte creative, materiale didactice, standuri experimentale privind ingineria autovehiculelor concepute si realizate de elevi, studenti, tineri talentati, destinate studiului de laborator.

Creative projects, teaching materials, experimental stands for the construction of road vehicles designed and made by students, teenagers, students not for only the laboratory study.

Scopul realizarii acestor proiecte este transpunerea cunostintelor teoretice in aplicatii practice, personalizate, destinate asimilarii principiilor de functionare ale mecanismelor si a sistemelor autovehiculelor rutiere.

Puterea minții creative

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CP4 experimental stand - "DEXTER" Laboratory

Stand experimental CP4 – Laboratorul lui "DEXTER"

Autori: **Corneliu Birtok Băneasă, Tudor Dinu Ioniță,**
Adina Budiul Berghian

Standul experimental CP4 este destinat întreținerii și reparării în condiţii de laborator a pompelor de injecţie CP4, respectiv stabilirea gradului de uzură a elementelor componente: arborele de acţionare; pistoanele de injecţie; cilindrii elementelor de injecţie; tacheţi etc. Stand didactic conceput şi realizat cu sprijinul Asociației CorneliuGroup cercetare-inovare prin programul educațional Laboratorul lui "DEXTER".

The experimental stand CP4 is intended for the maintenance and repair in laboratory conditions of the injection pumps CP4, respectively to determine the degree of wear of the component elements: the drive shaft; injection pistons; injection cylinders; follower etc.

The CP4 stand is designed and realized with the support of the CorneliuGroup Association research-innovation through the educational program "DEXTER" Laboratory.

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Engine cylinder head experimental stand - "DEXTER" Laboratory

Standul experimental Chiulasa – Laboratorul lui "DEXTER"

Autori: **Adina Budiul Berghian, Robert Popa, Corneliu Birtok Bănească**

Standul experimental Chiulasa este destinat întreținerii și reparării în condiţii de laborator a chiulaselor, respectiv stabilirea gradului de uzură a elementelor componente: supape; ghiduri; scaune supape; tacheţi; culbutori etc. Stand didactic conceput şi realizat cu sprijinul Asociației CorneliuGroup cercetare-inovare prin programul educațional Laboratorul lui "DEXTER".

Engine cylinder head experimental stand is intended for the maintenance and repair in laboratory conditions of the cylinder heads, respectively to establish the degree of wear of the component elements: valves; guides; valve seats; tappets; knobs etc.

The engine cylinder head experimental stand is designed and realized with the support of the CorneliuGroup Association research-innovation through the educational program "DEXTER" Laboratory.

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Air by Corneliu – Weekend inventions

Invenții de Weekend – Air by Corneliu

Autor: **Corneliu Birtok Băneasă**

Invenții de weekend – Air by Corneliu sunt concepte creativ-inovative destinate unei plaje largi de consumatori și urmăresc creșterea calității vieții prin utilizarea produselor prietenoase cu mediul.

Weekend Inventions - Air by Corneliu are innovative creative concepts for a wide range of consumers and aim to increase the quality of life by using environmentally friendly products.

MicroU
alternativă ecologică şi multifuncţională la etuiul de ochelari, cu rol de protecţie și, totodată, de curățare a acestora, fără a mai apela la şerveţelele umede, greu reciclabile;

BircoR
suport pentru săpun din materiale naturale (rocă) de forme și dimensiuni diferite. BircoR: reduce stresul, îmbunătățește dexteritatea, ne aduce mai aproape de natura;

Sapunul natural
AIR by CORNELIU o explozie de imaginație, originalitate, inventivitate, culori, armonie, miresme și forme.
Acesta înglobează o largă paletă de uleiuri esențiale, antioxidanți, vitamine, produse apicole, coloranți naturali, fară SLS/SLES.

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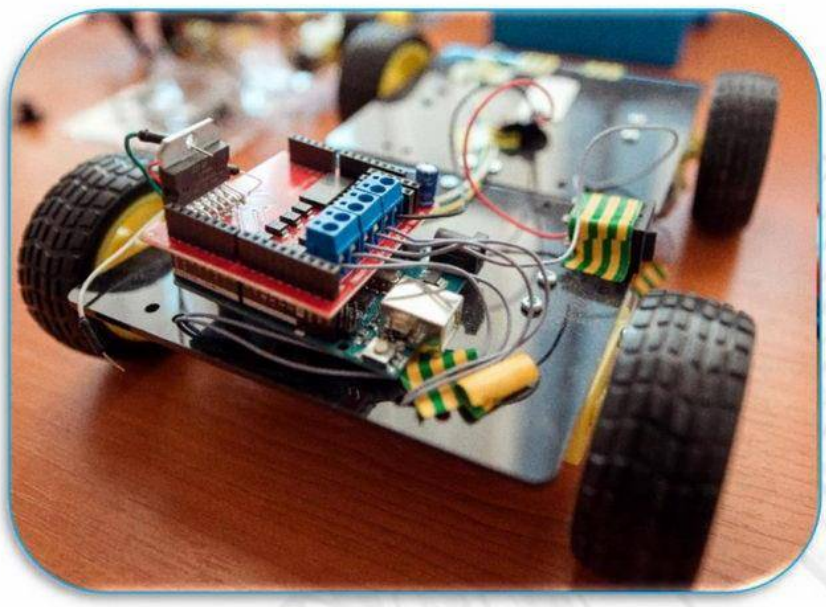
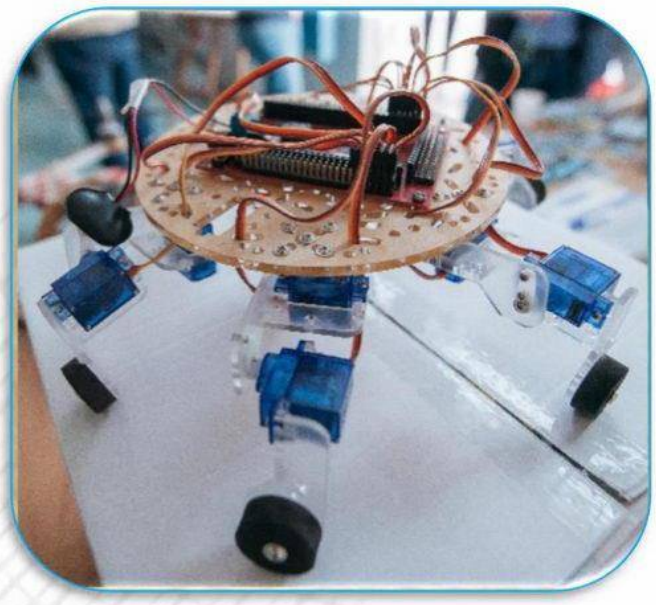
Echipa RoboFIH
RoboFIH Team

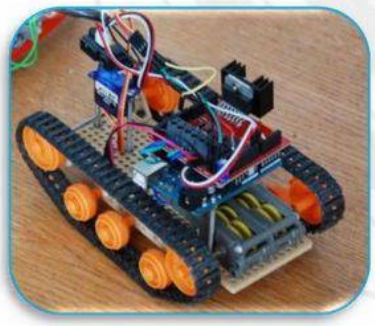
Autor: **Ovidiu Gelu Tirian**

RoboFIH - Echipa de robotică a Facultății de Inginerie Hunedoara. Scopul principal al echipei este destinat studiului și construcției în condiții de laborator a robotilor autonomi (urmăritori de lumină, cu senzori pentru detectarea obstacolelor etc.) și a liniilor flexibile de producție.





RoboFIH - The robotics team of the Faculty of Engineering Hunedoara. The main purpose of the team is for the study and construction of autonomous robots (light trackers, obstacles detection sensors, etc.) and flexible production lines under laboratory conditions.



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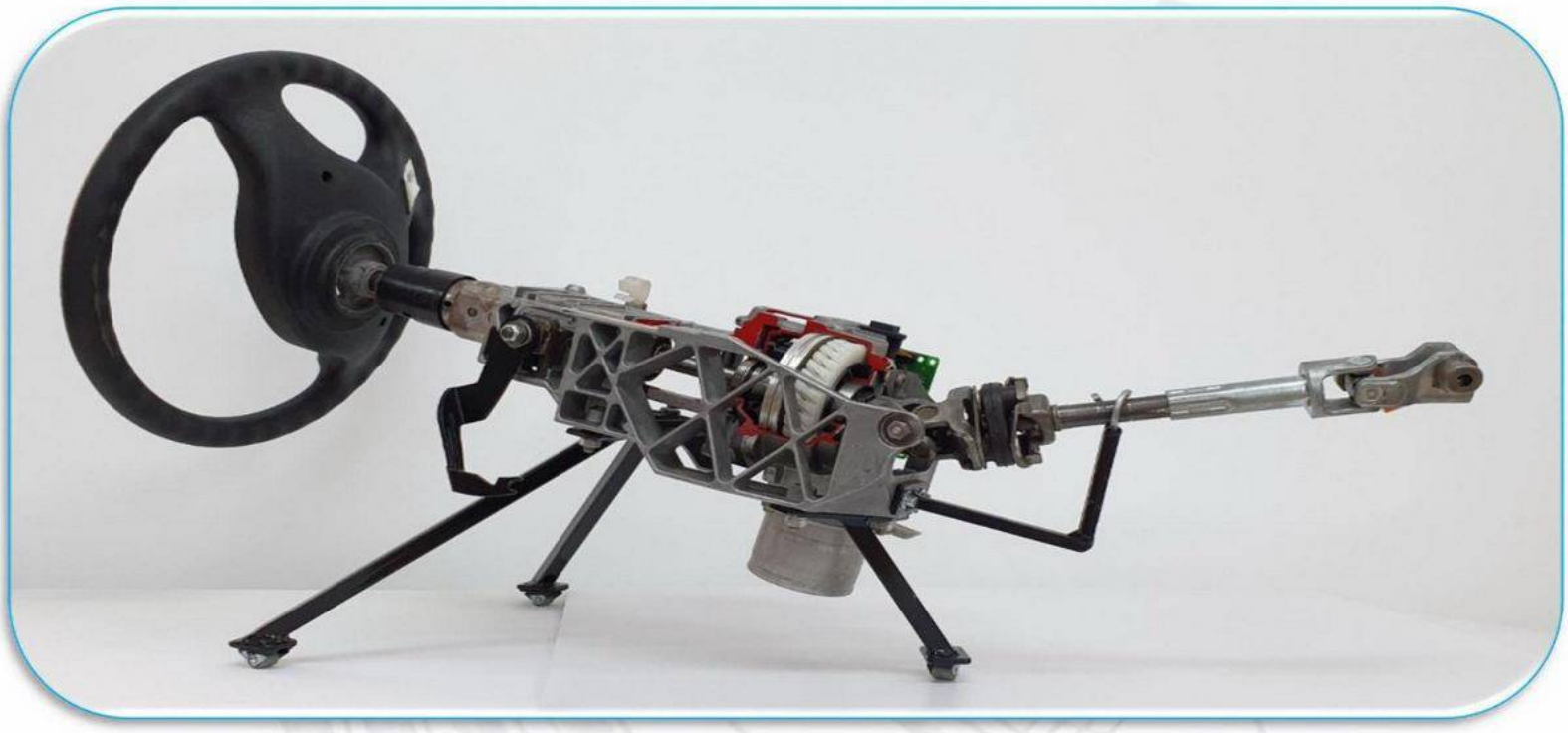
Servodirecție electrică - Laboratorul lui “DEXTER”

Power Steering - "DEXTER" Laboratory

Autor: **Amalia Dascăl, Corneliu Birtok Băneasă**

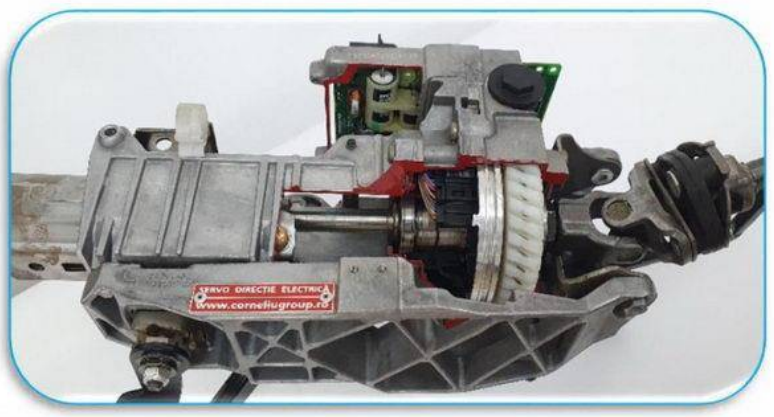
Stand didactic destinat studiului în condiții de laborator a sistemului de direcție, respectiv a modulului de servodirecție electrică din cadrul autoturismelor. Stand didactic conceput şi realizat cu sprijinul Asociației CorneliuGroup cercetare-inovare prin programul educațional Laboratorul lui “DEXTER”.



Experimental stand intended for the study in laboratory conditions of the respective steering system of the electric power steering module within the cars. The stand is designed and realized with the support of the CorneliuGroup Association research-innovation through the educational program "DEXTER" Laboratory.

Senzor

Reductor



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Ambreiajul cu volantă cu masă dublă și hidrotranformatorul - Laboratorul lui “DEXTER”

Double table flywheel clutch and hydrotransformer "DEXTER" Laboratory

Autor: **Camelia Pinca Bretotean, Stanciu Andrei Marius, Corneliu Birtok Bănească**

Stand didactic destinat studiului în condiții de laborator a ambreiajului cu volantă cu masă dublă și a hidrotranformatorului din cadrul autoturismelor. Stand didactic conceput şi realizat cu sprijinul Asociației CorneliuGroup cercetare-inovare prin programul educațional Laboratorul lui “DEXTER”.

Teaching stand for the study in laboratory conditions of the clutch with double flywheel and the hydrotransformer four internal combustion engine. The stand is designed and realized with the support of the CorneliuGroup Association research-innovation through the educational program "DEXTER" Laboratory.

Hidrotransformator

Ambreiaj cu volantă cu masă dublă

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SeptoBirCor

Autor: **Corneliu Birtok Băneasă**

SeptoBirCor este un dezinfectant pentru mâini pe bază de ingrediente naturale (alcool, produse apicole, uleiuri antiseptice).

SeptoBirCor are un efect dublu: mâinile sunt dezinfectate și, în același timp, sunt hidratate, eliminând efectele secundare (deshidratare, iritare, fisuri ale pielii etc.).

SeptoBirCor este un produs prietenos cu mediul din seria Invențiilor de Weekend, marca Air by Corneliu, cu scopul de a îmbunătăți calitatea vieții.

SeptoBirCor is a hand sanitizer based on natural ingredients (alcohol, bee products, antiseptic oils etc.).

SeptoBirCor has a dual effect: the hands are disinfected and at the same time are hydrated, eliminating side effects such as dehydration, irritation and cracks in the skin.

The **SeptoBirCor** is an environmentally friendly product from the range of Weekend Inventions under the brand Air by Corneliu, with the aim to increase the quality of life.

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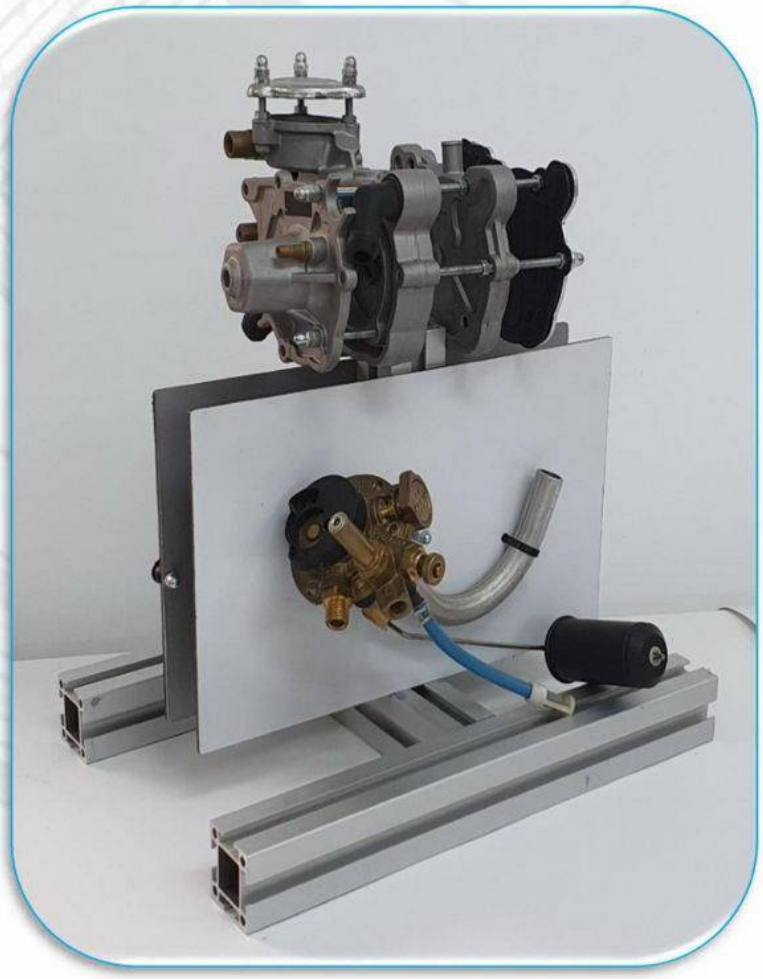
Instalație de alimentare GPL - Laboratorul lui “DEXTER”

LPG fueling system for the car - "DEXTER" Laboratory

Autori: **Sorin Aurel Rațiu, Corneliu Birtok Bănească**

Stand didactic destinat studiului în condiții de laborator a instalației de alimentare cu combustibil gazos GPL al motoarelor cu ardere internă. Stand didactic conceput şi realizat cu sprijinul Asociației CorneliuGroup cercetare-inovare prin programul educațional Laboratorul lui “DEXTER”.



Teaching stand for the laboratory study of the LPG gas fueling plant of internal combustion engines.

The stand is designed and realized with the support of the CorneliuGroup Association research-innovation through the educational program "DEXTER" Laboratory.

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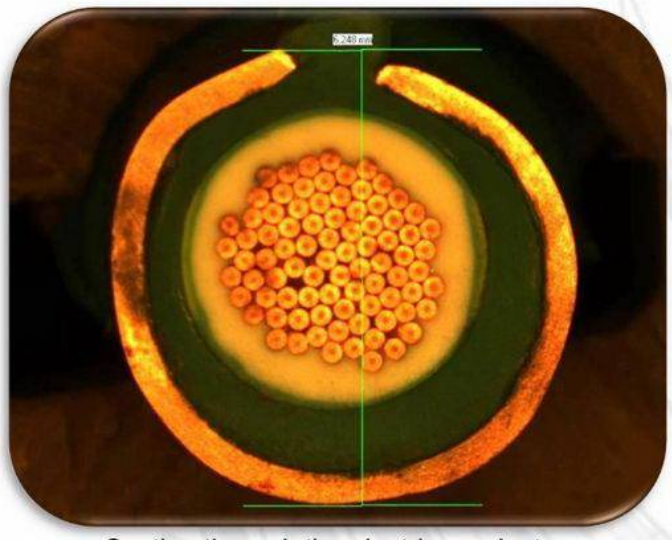
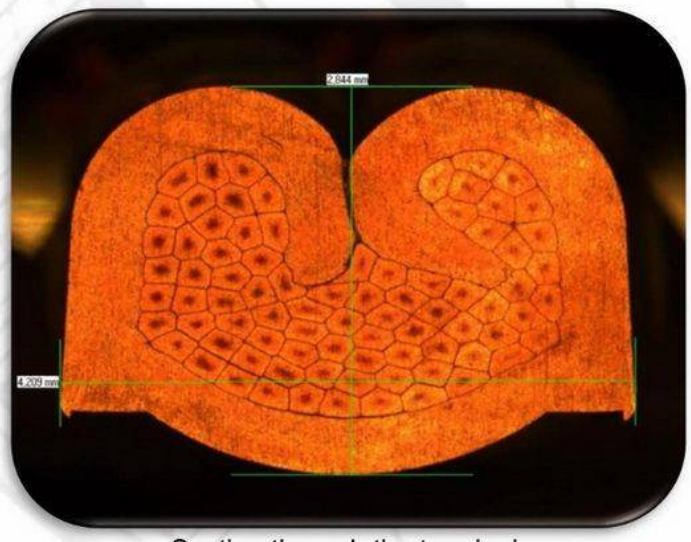
Încercarea la tracţiune a izolaţiei cablurilor electrice folosite în construcţia autovehiculelor
The attempt to traction of the insulation of the cable lay-ups from cars

Autori: **Teodor VASIU, Adina BUDIUL BERGHIAN, Corneliu BIRTOK BANEASA**

Funcţionarea maşinilor este rezultatul corectitudinii fabricaţiei şi a montajului elementelor constructive și a componentelor de legătură. Cablurile, ca şi componente ale instalaţiilor electrice ale autovehiculelor, sunt supuse unor încercări care vizează condiţiile de funcţionare şi izolaţiile. Rezultatele obținute în urma încercărilor de tracțiune sunt prelucrate cu un software specializat Weibull++7, care permite determinarea parametrilor de fiabilitate a montării cablurilor, putându-se face aprecieri cu privire la calitatea materialelor utilizate la fabricarea izolaţiilor și a corectitudinii montajului lor.



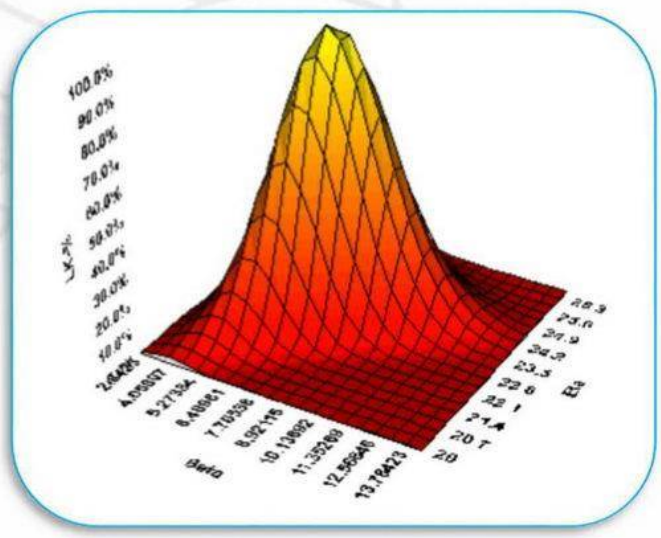
Section through the electric conductor



Section through the terminal

The correct operation of the cars is the result of correctness output of the execution and the fitting ensembles, building blocks and the marks components. The cable lay-ups, as components of the electric plant, are submissive of attempts which visa the workstations and the insulation.

The results, obtained abaft their attempts to traction, are processed with specialized software Weibull++7, who permits the determination of reliability parameters of the cable lay-ups and therewith we can do appreciations about material quality used to the manufacture of the coatings and the correctness they were made.



Likelihood function surface

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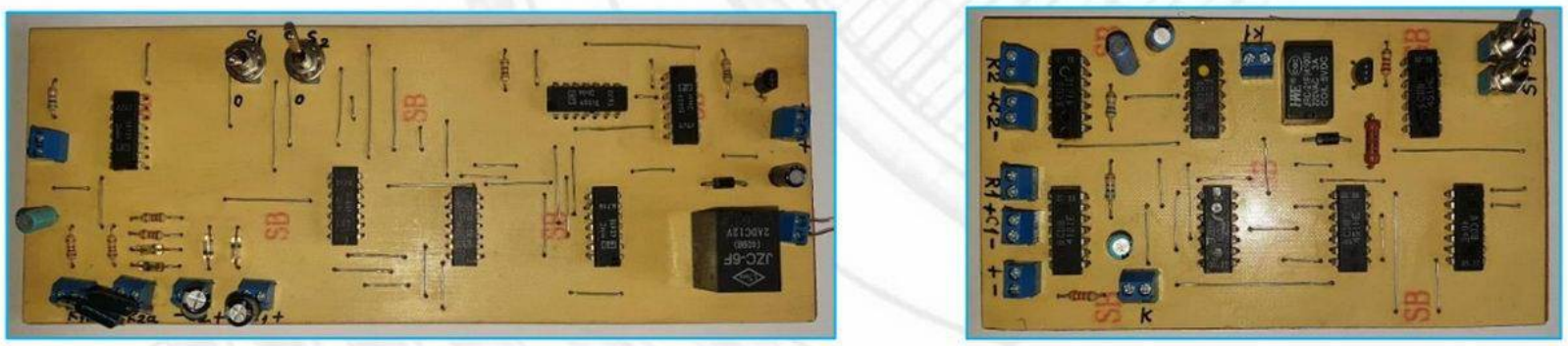
Releu electronic de timp cu toate funcțiile uzuale

Electronic time relay with all the usual functions

Nr. Brevet: RO 129042

Autori: Popa Gabriel Nicolae, Popa Iosif, Deaconu Sorin Ioan

Releu electronic de timp cu toate funcţiile uzuale realizează, în funcţie de poziţia unor comutatoare de setare, întârzierea atragerii sau întârzierea eliberării sau menţinerea în stare atrasă un anumit timp sau întârzierea atragerii cât şi a eliberării armăturii mobile a unui releu electromagnetic, releul electronic având în alcătuire trei porţi ŞI-SAU-NU care formează cu comutatoarele de setare un comutator electronic, prin care se transmite comanda de la un contact electric exterior către releul electromagnetic, întârzierile fiind realizate cu ajutorul a două circuite electronice de timp realizate din rezistențe, condensatoare și diode.



a. b.

Releu electronic de timp realizat cu circuite CMOS (a) și TTL (b)

The electronic time relay with all the usual functions performs, depending on the position of some setting switches, the delay of the attraction or the release or the retention in the attracted state for a certain time or the delay of the attraction or the release of the electromagnetic relay's mobile armature, the electronic relay having three AND-NOR gates performing with the setting switches, an electronic switch, through which the control is transmitted from an external electrical contact to the electromagnetic relay, the delays being realized by means of two time electronic circuits made of resistors, capacitors and diodes.

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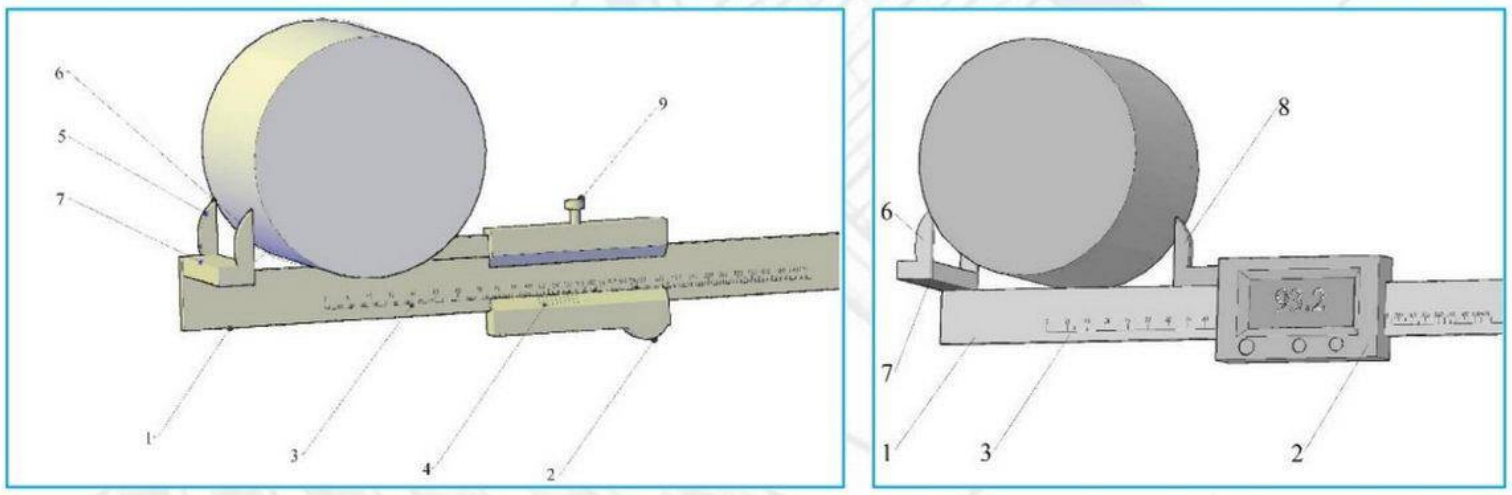
Șubler mecanic

Mechanical calliper

Nr. Brevet: RO 130441

Autori: Nekula Fridrich, Popa Gabriel Nicolae, Popa Iosif

Invenția se referă la un șubler mecanic cu cursor, cu posibilitate de afișare digitală, destinat în principal măsurării diametrelor exterioare mari. Șublerul, conform invenției, este alcătuit dintr-o parte fixă, prevăzută cu o scală formată dintr-o zonă liniară și o zonă neliniară, pe partea fixă fiind montate, prin intermediul unei traverse perpendiculară pe partea fixă, două brațe exterioare și dintr-o parte mobilă pe care este montat un braț exterior, prevăzut cu o scală liniară și cu un șurub de blocaj.



a. b.

a. Șubler mecanic pentru măsurarea diametrelor mari; b.Șubler cu afișare digitală pentru măsurarea diametrelor mari

The patent relates to a mechanical calliper with slider, with the possibility of digital display, intended mainly for measuring the large outer diameters. The calliper, according to the invention, is composed of a fixed part, provided with a scale formed by a linear area and a non-linear area, on the fixed part being mounted, by means of a perpendicular beam to the fixed part, two outer arms and from a movable part on which an outer arm is fitted, provided with a linear scale and with a locking screw.

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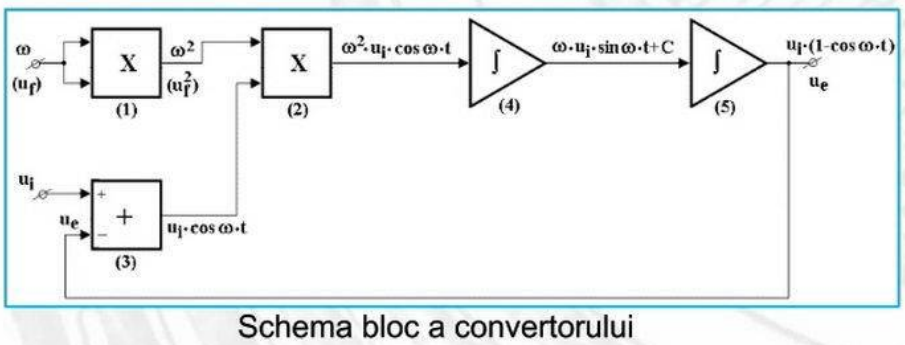
Convertor liniar tensiune continuă-semnal sinusoidal de frecvenţă variabilă

DC linear voltage-sinusoidal signal variable frequency converter

Nr. cerere brevet: 00795

Autori: Popa Gabriel Nicolae, Popa Iosif, Deaconu Sorin Ioan

Convertorul liniar tensiune continuă-semnal sinusoidal de frecvenţă variabilă, asigură la ieşire un semnal periodic de formă sinusoidală care depinde de tensiunile continue aplicate pe două intrări: pe una dintre intrări se aplică o tensiune continuă care modifică liniar frecvenţa semnalului de la ieşire, iar pe cealaltă dintre intrări se aplică o tensiune continuă care modifică liniar amplitudinea semnalului de la ieşirea convertorului. Convertorul liniar tensiune continuă-semnal sinusoidal are în componenţă şapte blocuri funcţionale: două circuite analogice de înmulţire, două circuite analogice de diferenţă, un amplificator neinversor şi două circuite de integrare.



Schema bloc a convertorului

Realizare practică

The DC linear voltage-sinusoidal signal variable frequency converter provides a periodic sinusoidal signal at the output that depends on the DC voltages applied on two inputs: a DC voltage is applied to one of the inputs, which linearly modifies the frequency of the output signal, and on the other of the inputs applies a DC voltage which linearly changes the amplitude of the signal from the output of the converter. The DC linear voltage-sinusoidal signal variable frequency converter comprises seven functional blocks: two analog multiplication circuits, two analog difference circuits, one non-inverting amplifier and two integration circuits.

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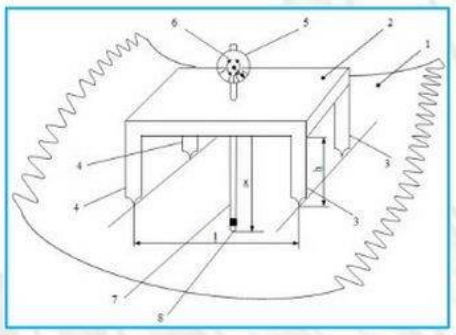
Dispozitiv pentru măsurarea diametrelor mari interioare sau exterioare

Device for measuring the large inner or outer diameters

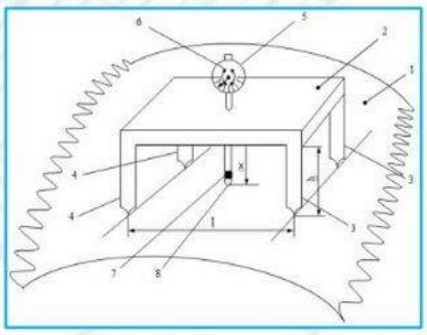
Nr. cerere brevet: 00543

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

Dispozitivul de măsurare a pieselor de diametre interioare sau exterioare mari este format dintr-un cadru metalic de formă dreptunghiulară, din patru brațe metalice care au aceeași înălțime, dintr-un comparator, care poate fi mecanic sau cu afișare digitală, cu cadranul cu scală neliniară (pentru cazul comparatorului mecanic), dintr-o tijă mobilă care are la capăt o piesă de contact cu sferă. Scara neliniară are două zone: pentru măsurarea diametrelor interioare (suprafețelor concave) și pentru măsurarea diametrelor exterioare (suprafețelor convexe). Comparatorul este montat în centrul dreptunghiului (la intersecția diagonalelor) suportului dispozitivului de măsurare.



a.



b.

a. Măsurarea diametrelor interioare mari cu dispozitivul de măsurare; b. Măsurarea diametrelor exterioare mari cu dispozitivul de măsurare

The device for measuring parts of large inner or outer diameters is formed by a rectangular metal frame, four metal arms having the same height, a comparator, which can be mechanical or with digital display, with the non-linear scale dial (for the mechanical comparator), from a movable rod with a ball contact piece at the end. The non-linear scale has two areas: for measuring the inside diameters (concave surfaces) and for measuring the outside diameters (convex surfaces). The comparator is mounted in the center of the rectangle (at the intersection of the diagonals) of the support of the measuring device.

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HORIZON 2020

PRETZEL

http://pretzel-electrolyzer.eu/

Novel modular stack design for high PREssure PEM water elecTrolyZer tEchnoLogy with wide operation range and reduced cost PRETZEL

INTRODUCTION

The aim of PRETZEL project is to develop a new polymer electrolyte membrane electrolyzer (PEMEL) for hydrogen production, upscaling a patented design approach based on **hydraulic cell compression**.

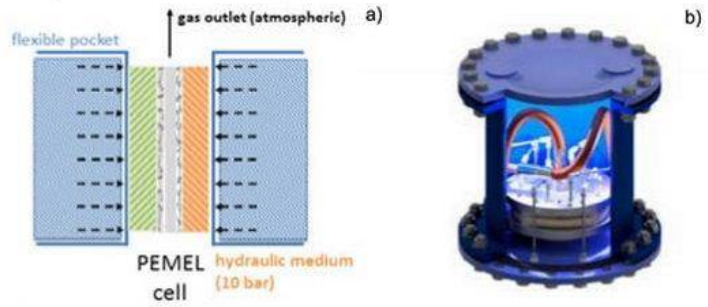


Fig. 1. a) Principle of homogeneous hydraulic cell compression; b) stack design for hydraulic compression.

AMBITION

All subsystems needed to properly operate a PEMEL stack will be integrated in a housing, equipped with a hydrogen detection and ventilation system.

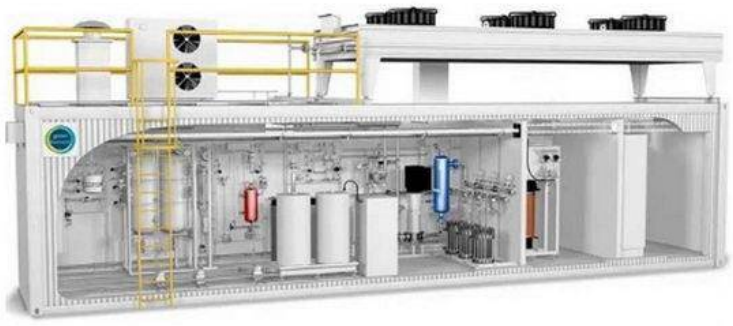


Fig. 2. Schematic drawing of a PEMEL system as container solution by iGas energy.

OBJECTIVES

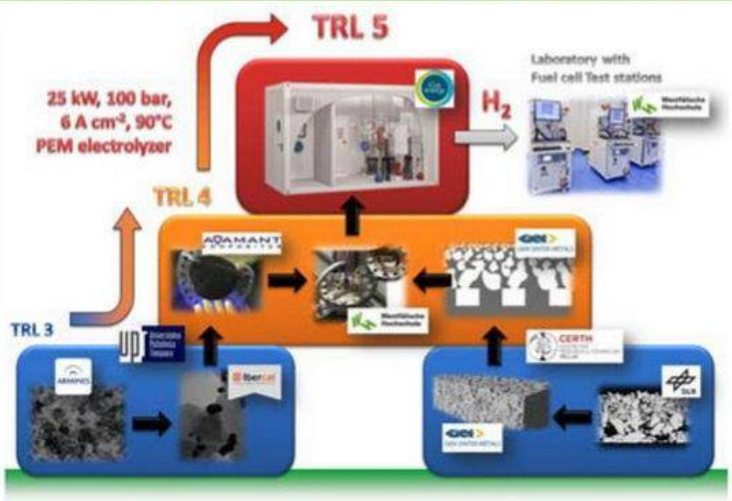
- Develop and manufacture a high pressure PEMEL stack based on the novel principle of **hydraulic compression**.
- Produce innovative components for the high pressure PEMEL stack that can operate at **high temperature and current density**.
- Setup and undertake continuous procedures to **evaluate the component and stack development process** through all phases against the project specifications.
- Integrate the stack with the new components into a **high pressure PEMEL test facility** to validate the overall performance and operational criteria.
- **Disseminate and exploit the project results** in order to prepare the market penetration of the new technology.

PERFORMANCE TARGETS

The central objective of **PRETZEL** is the development of a new water electrolysis system with a maximum energy consumption of **25 kWh,** with a production capacity of **4.5 m^3 H_2 / h** at rated power, at a pressure of **100 bar** and water temperature of **90°C**.

- High system efficiency > 70%
- H_2 output pressure of 100 bar
- Rapid response of below 1 second for a hot start and below 10 seconds for a cold start
- Rated current density of 4 A cm^{-2}
- Water temperature of 90 °C
- Specific stack costs of below 500 €kW^{-1}
- Specific system costs in the range of 750 €kW^{-1}

CONCEPT & METHODOLOGY



PARTNERS

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This project has received funding from the Fuel Cell and Hydrogen 2 Joint Undertaking under the European Union´s Horizon 2020 research and innovation programme under grant agreement No 779478.

PROCEDEU DE TRATARE A REZIDUURILOR, PROVENITE DIN INCINERAREA DEŞEURILOR MENAJERE, PRIN SOLIDIFICARE - STABILIZARE ÎN ROCA DE CENUŞĂ
METHOD FOR TREATMENT OF MUNICIPAL SOLID WASTE INCINERATION RESIDUES BY STABILIZATION/SOLIDIFICATION INTO FLY ASH ROCK

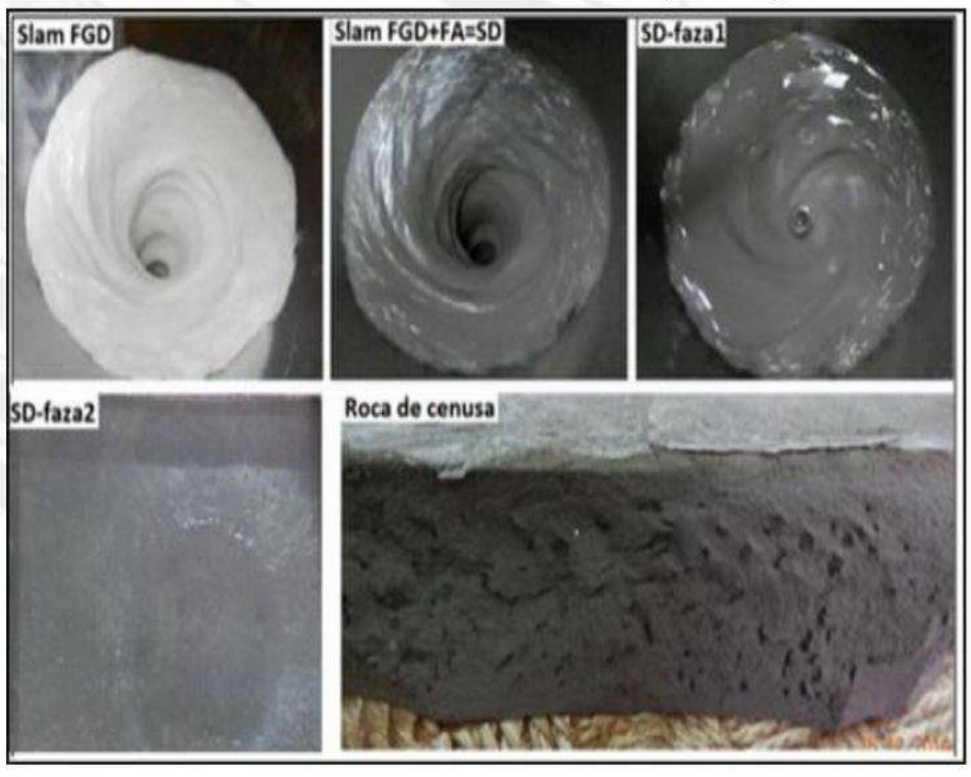
Nr.Brevet, Patent NB: RO131486A0

Autori/Authors:**Reinhold WÄCHTER*, Ioana IONEL, Adina NEGREA**

Invenția se referă la inertizarea reziduurilor toxice provenite din incinerarea deșeurilor municipal solide, prin stabilizare în matricea rocii de cenușă provenite din arderea cărbunelui în centralele energetice. Metoda presupune reţinerea prin absorpţie a compuşilor chimici poluanţi în matricea unui material liant, hidratare sau reacţii de precipitare. Scopul acestui procedeu este de a crea noi compuşi, într-o formă stabilă, care să reţina poluanţii, şi care să fie inerţi sau cu un pericol mai scăzut de poluare în raport cu substanţa initială (reziduul).

The pattent focuses on inertization of municipal solid waste incineration residues, trough stabilization into ash rock matrix resulted from coal power plants. The method is used to encapsulate harmful chemical compounds by absorption, hydration or precipitation reactions, using a binder matrix. The aim of the process is to create new compounds, in a stabilized form, which retain the harmful elements that are non-hazardous or less hazardous than the raw (initial) material.

Instalatia experimentala & Rezultate,
Experimental facility & Results



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Ministry of Education and Research

ELECTRICAL PERSONAL INDIVIDUAL CAR

Authors: ȚÎȚU Aurel Mihail, OPREAN Constantin, MĂRGINEAN Ion, ȚÎȚU Ștefan,
MOLDOVAN Alexandru Marcel, BOGORIN-PREDESCU Adrian

Patent request: A2015 00552

DESTINATION

In order to be an economical and environmentally friendly mean of transport in the city where there is a need to move only the person on its own, to replace the transport of a single person with a car equipped with five seats, but keeping a personal comfort similar to that provided by classic cars meant to transport five people.

PRINCIPLES USED

- the bodywork is compact, formed from the half of an ovoid;
-the carriage is elliptical and has four wheels arranged în the peaks of a rhombus with large diagonal of direction;
- lateral driving wheels, equipped with hub motor and front wheel and rear wheel can reverse synchronous axes and directions for achieving the direction of movement;
- the wheels are mounted in an identical manner independently, each one comprising fork and suspension springs, shock absorber and power-assisted steering;
- the reverse is removed by the 180 degrees rotation of the car and moving back, but with the look ahead to the new sense, then the car rotates 180 degrees, with returning to the initial direction;
- the classic steering wheel is missing and all the driving is done from a joystick that can be controlled with one hand, by changing the lever of the joystick ensuring both changing direction, and changing the speed and braking;
- from an ergonomic control panel disposed on the support of the left hand in order to rotate on the spot, turn signal and climate control.

TECHNICAL CHARACTERISTICS

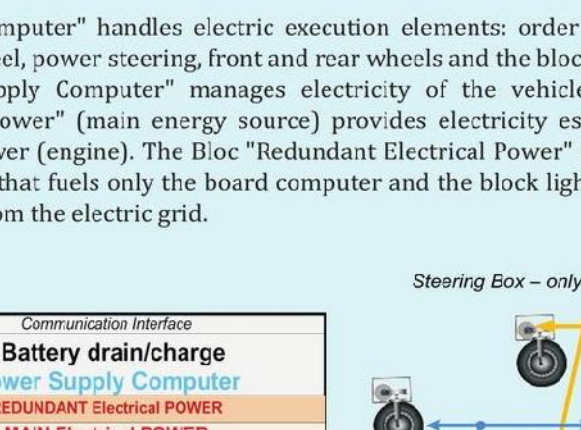
- weight: max. 250 Kg without batteries
- max. 400 Kg with batteries;
- payload: max. 150 Kg;
- maximum speed: 50 Km/h;
- length/width/height: 2.5/1.5/1.5 [m];
- autonomy: 60Km;
- battery charging time: max. 14 hours for lead batteries/min. 2 hours for lithium-ion batteries;
- electric motor power: 2 KW;
- battery voltage: 60 V;
- cost per 100 Km travelled: equivalent to 1 litre of gasoline.

ADVANTAGES

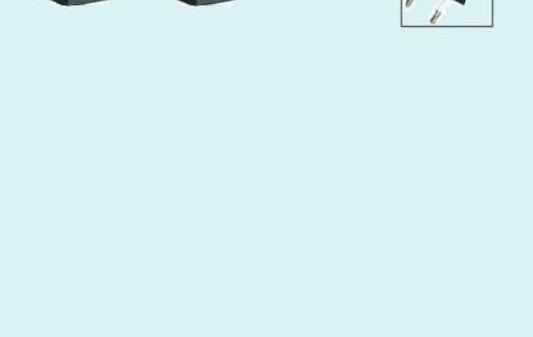
- advanced support while driving;
-additional safety systems;
- ease of parking;
- low cost price per kilometer; -environmentally friendly, zero emissions;
- quick start;
- noiseless;
- can be charget from home electrical socket.

APPLICATIONS

-commuting to work and back home in the city.

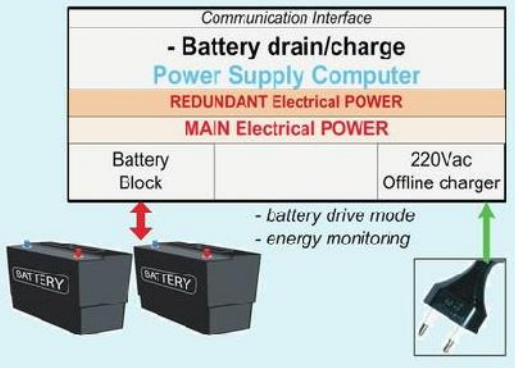


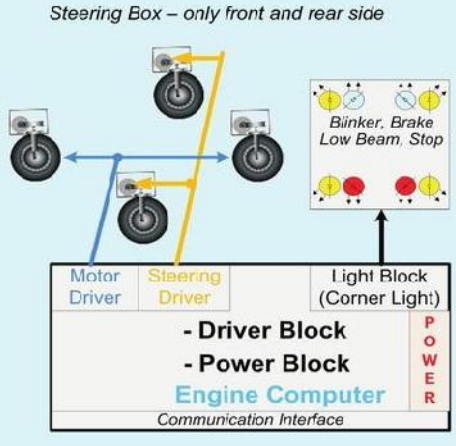
Block diagram of the electronic and execution system implements the technology "drive by wire". It replaces traditional mechanical systems with electronic control system using electromechanical actuators (power steering) and human- machine interfaces "Human Machine Interface" (holder, switchboard).



"Board Computer", the main computer, take commands from the user via the control panel and the holder and channeling them to the execution elements through communication interface "Communication Interface" and displays the information on the display.

"Engine Computer" handles electric execution elements: order of sideways placed driving wheel, power steering, front and rear wheels and the block light.
"Power Supply Computer" manages electricity of the vehicle. The block "Main Electrical Power" (main energy source) provides electricity especially in the high electric power (engine). The Bloc "Redundant Electrical Power" provides emergency power line that fuels only the board computer and the block light. It provide battery charging from the electric grid.





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DECONTAMINATION REACTOR OF AFLATOXIN M IN MILK

Ministry of Education and Research

Authors: Otto KETNEY, Mihai TATU

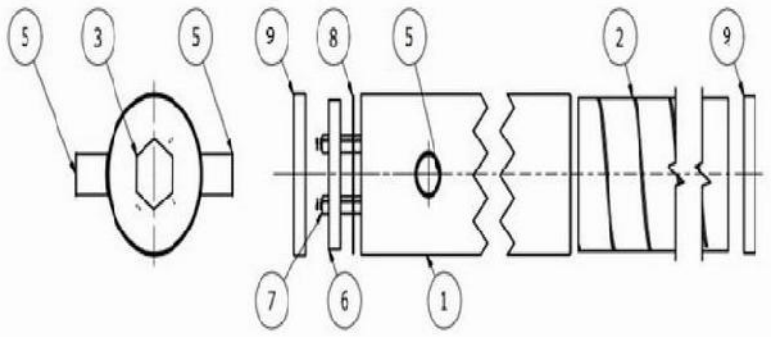
Patent number a 2015 00544

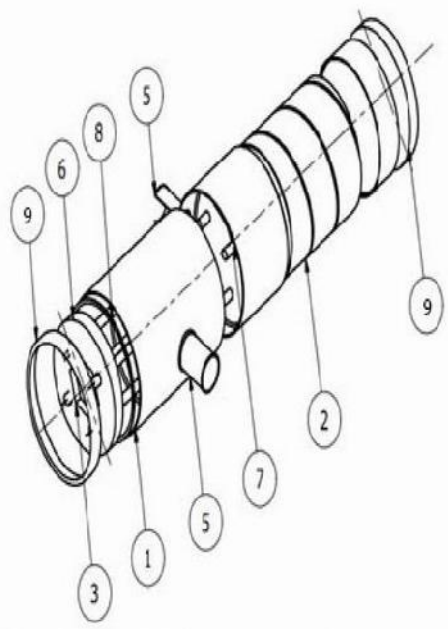
DESCRIPTION

The invention relates to a aflatoxin M decontamination reactor, characterized in that it is intended to decontaminate whole milk which has an acidity of between 16… 19 thorner degree and is contaminated with aflatoxin M1.

Aflatoxin M1 has been classified as risk group 1 (human carcinogen) by the International Agency for Cancer Research [1]. When aflatoxin B1 and aflatoxin B2 appear in contaminated feed and are ingested by lactating cows, a portion (about 1.5%) is metabolized and excreted in milk as aflatoxin M1 and aflatoxin M2, thus contamination with aflatoxin M1 occurs as a result of consumption. by animals of feed contaminated with aflatoxin B1.

The milk aflatoxin M decontamination reactor is characterized by the fact that the whole system consists mainly of two cylinders with spiral channels, the outer cylinder, between the two cylinders the milk circulates spirally, the functionality is characterized by the milk contaminated with aflatoxin M entering. in the reactor by means of the inlet connection and through the spiral surface between the two cylinders until the exit of the reactor, during this time it is subjected to UV radiation by means of UV lamps whose power can be variable.





Components of the milk aflatoxin M decontamination reactor (1- outer cylinder, 2- inner cylinder, 3- longitudinal channel, 5- inlet and outlet connection, 6-inner cylinder sealing cap, 7- UV lamp, 8- seal gasket, 9- outer cylinder seal lid)

ADVANTAGES

The invention is characterized in that it has the advantage of reducing aflatoxin M from milk in continuous flow to large volumes of milk, can be applied at industrial level and guarantees food safety.

1. Decontamination of aflatoxin M from milk by destroying the C8-9 double bond in the furan terminal cycle of aflatoxin M.
2. The toxicity of aflatoxins and their photodegradation products is significantly reduced or may even disappear without significant loss of quality and nutrients.
3. Large-scale UV radiation in the food industry can guarantee food safety and extend the shelf life.
4. sterilization of milk in a continuous flow without heat treatment

APPLICATIONS

The technical problem solved by the invention is characterized in that it can increase the degree of decontamination of the contaminated milk as aflatoxin M and ensure a uniform dose of photons in the flow of milk in the continuous reactor for large volumes. Geometric characteristics to address this invention is characterized in that the milk stream running through the spiral space between two concentric cylinders. Geometry of the parts can provide a large surface area to volume application of UV radiation

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MINISTRY OF EDUCATION AND RESEARCH

Device for PVC processing and fluidization

Students: Marin - Cristian BUICĂ, Dumitru BUNEA, George Adrian MARIN

Description:

The proposed research and innovation project refers to a device designed to transform plastic waste into granules of different sizes and then to melt them in order to create a "plastic filament" type material that is necessary for later use in specific printer technologies. 3D. The diameter of the "plastic filament" obtained can be variable, as desired, with the possibility of adjustment by changing some elements specific to the device. The device for processing and fluidizing the PVC was realized within ULBS, the Faculty of Engineering, the Laboratory "Device design" in order to use it in the form of a prototype, in order to be further refined. The plastic material obtained at the end can be used without high costs (recycling costs) in view of making various objects using 3D printers. It is worth mentioning that the presented device represents only a variant realized constructive and functional in order to achieve the proposed decision.

Advantages:

- Low plastic recycling costs;
- Obtaining plastic material as a raw material for 3D printers with minimal effort.
- Low cost of raw material for 3D printers;
- The possibility of finding solutions to reduce electricity consumption;
- The possibility of capturing the odor obtained as a result of the melting of the plastic.
- Recycling of plastic material
- Obtaining the raw material for 3D printers at a much lower price
- The creation of the filament from any type of

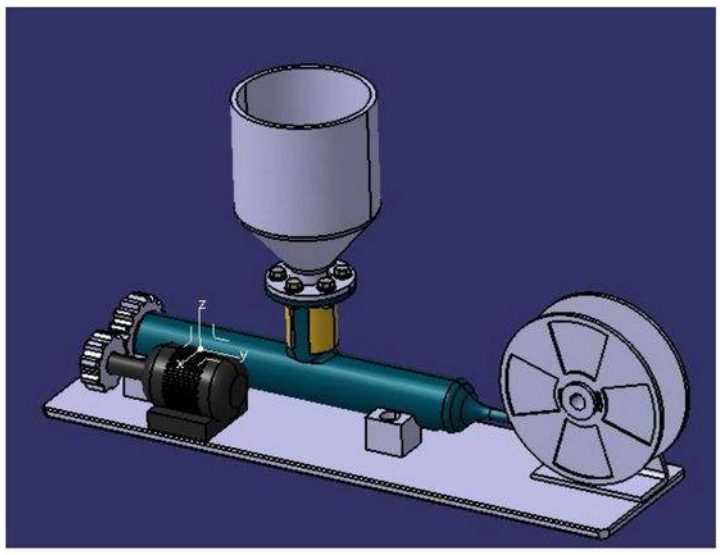

Fig.1 Device

Applications:

- Machine building technology;
- Plastic deformation technologies;
- 3D printers

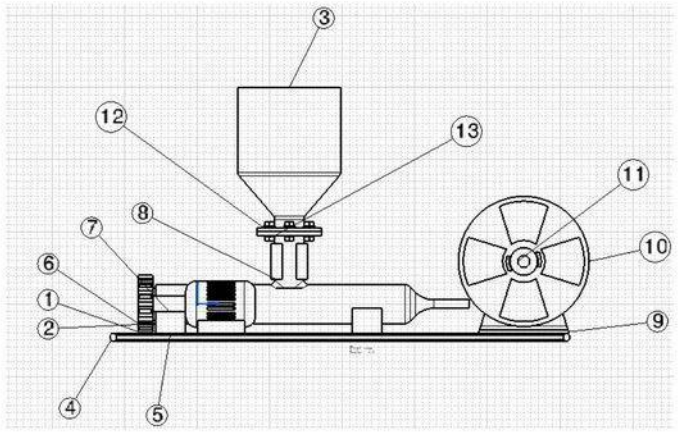

Fig.2 Device components

Bill of Material:
DISPOZITIV_ABS_ASM_14_ASM

Number	Quantity	Nomenclature
1	1	MELC_10
2	1	CARCASA_CLINDRICA_8
3	1	PALNIE_6
4	1	SUPORT_8
5	4	SUPORT_INJECTOR_6
6	1	ROATA_DINTATA_MOTOR_5
7	1	MOTOR_ELECTRIC_6
8	1	REZISTENTA_ELECTRICA_3
9	1	SUPORT_ROLA_3
10	1	ROLA_3
11	1	TIJA_ROLA_3
12	6	SDIN6921M8180 1255080016H_2
13	6	SISO4032M8013 270B0001H_2

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MINISTRY OF EDUCATION AND RESEARCH

Device for checking and interpreting the geometrical condition of radial stroke

Students: Marin - Cristian BUICĂ, George Adrian MARIN

Description:

The research and innovation project presented was carried out within ULBS, the engineering faculty, the laboratory "Assisted design of the processing and control devices". The research carried out is based on the constructive and functional design of a control device that measures the radial beat of some functional diameters (functional dimensions) for the reference "crankshaft" within a car. The actual design was realized using the NORELEM System and CATIA V5R21. The control device is made of a base plate with threaded holes, two short prisms, a side plate and a special support chosen to support the comparator clock. The rotation of the crankshaft oriented with the help of the two prisms and of a pin fixed in the side plate will be done manually. The materials used for the orientation elements are high alloy steels, being known that the modulated devices use very good quality metallic materials. The rotation of the "Crankshaft" can be realized and automated using a pneumatic installation or a hydraulic installation depending on the preference of the beneficiary. This device designed and realized practically in the laboratory is the result of some needs expressed by a company in the automotive field in the city of Sibiu.

Advantages:

-measuring the radial beat with a precision at the level of mime;
- the possibility of achieving an automation without considerable effort;
- low cost of implementation, use and implementation;
- can be used as needed, can be disassembled, this being a device with modulated elements;
- is part of the category of modern devices, having a high class in terms of measurement and control technologies.

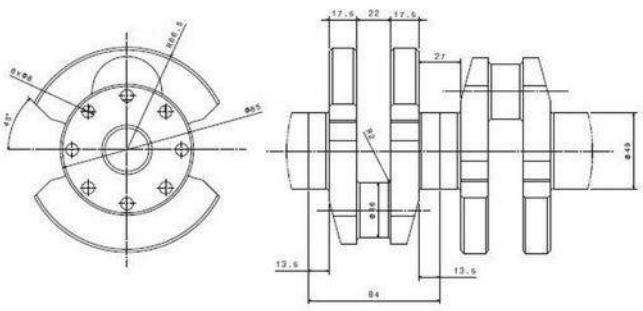

Fig.1 Crankshaft

Applications:

-Technology of car construction;
- the car domain;
- Can be used in any dimensional technical control laboratory

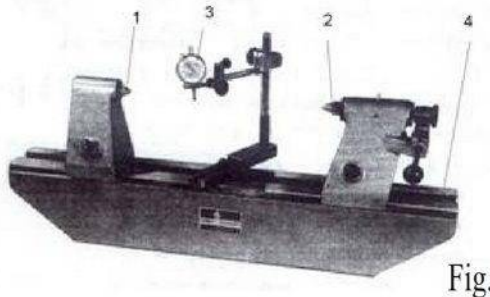

Fig. 2 Principle of radial beat measurement

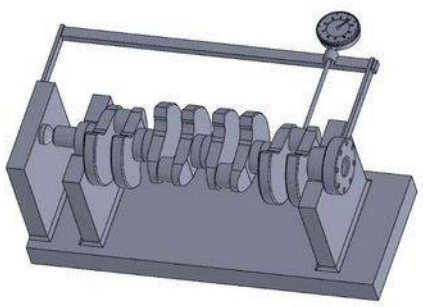

Fig. 3 Measuring device

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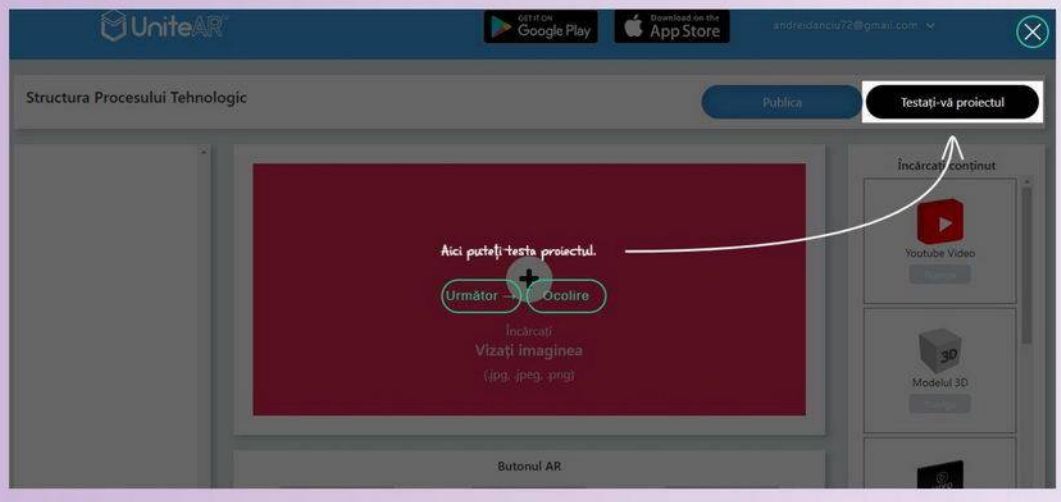
MINISTRY OF EDUCATION AND RESEARCH

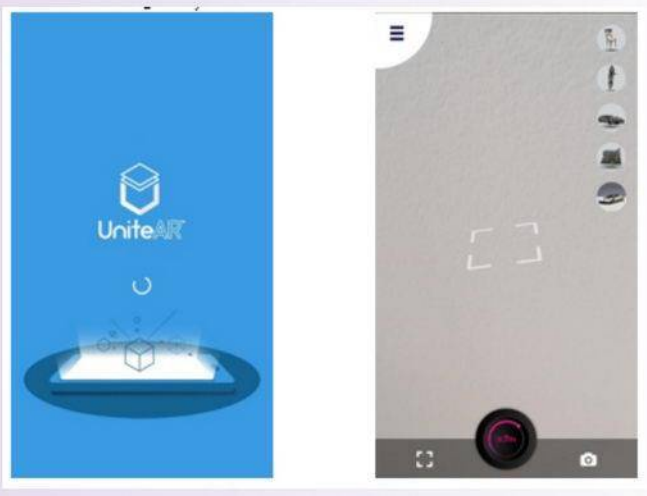
Contributions concerning the use of smartphone applications in higher engineer education

Student DANCIU Andrei

Description:

Through this research project I tried to highlight the importance of the evolution of smartphone technologies for higher education.
It aims to study the market of existing applications, analyze the possibilities of integrating some applications in higher education or creating an application that can better meet the needs of this type of education.
The research ended with the creation of an application that uses virtual reality so that students can better understand what a technological process means.



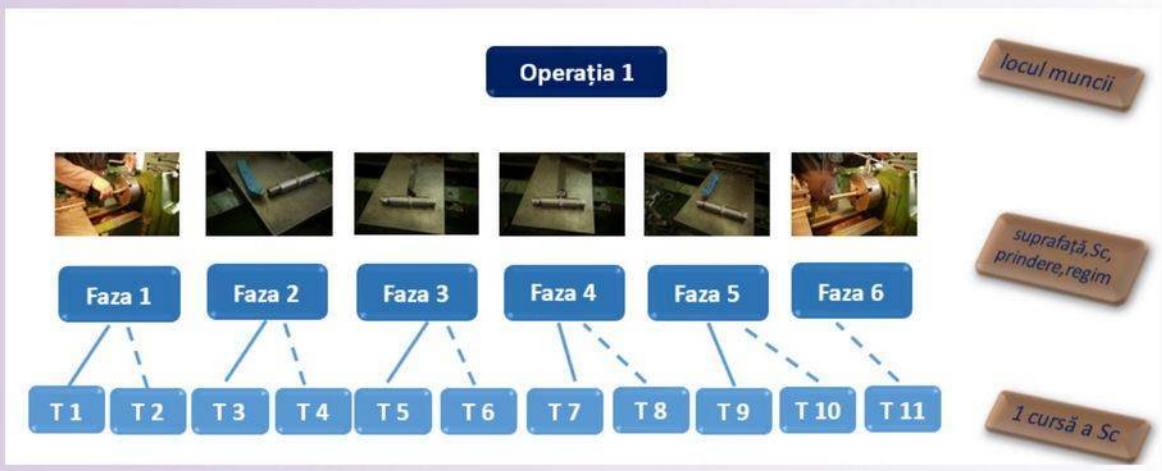


Benefits:

- Easy to use;
- The application brings the possibility to observe a process in a practical and repetitive way;
- This type of application can be used in various fields of activity.

Aplications:

- Education, advertising, automotive field.



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MINISTRY OF RESEARCH AND INNOVATION

Electrical erosion processing with massive electrode - method of unconventionalprocessing of metallic materials

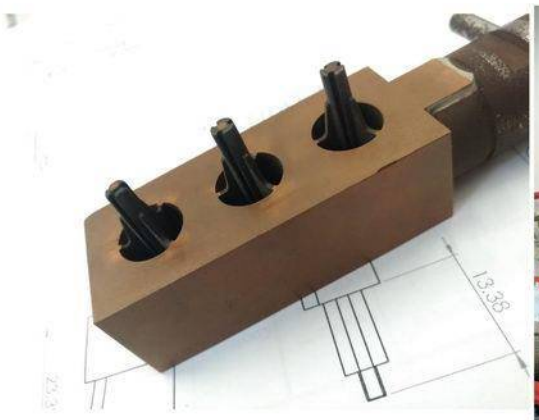
Author: URSACHI Bogdan-Gratian

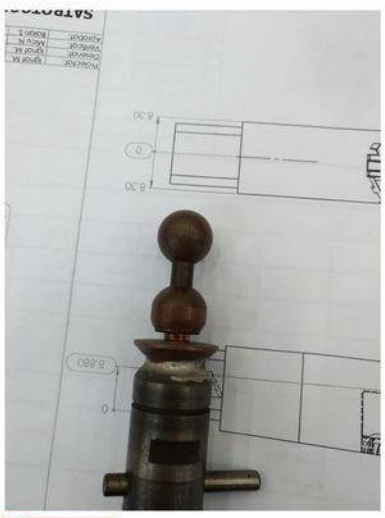
Student Scientific Research Project

DESCRIPTION

Electro-erosion is the process of electrically erosion processing of hard and very hard materials (HRC 52 ... 64) that can not be processed by classical splintering. The process is particularly useful when special configuration shapes and profiles are required. The project presents an up-to-date research on modeling of the process of electro-erosion processing with shape copying for various types of metallic materials. The research refers to the processing of different metallic materials (OL, OLC, etc.) in order to model and optimize two objective functions:
-volumetric wear and relative wear.

ADVANTAGES
-The possibility of processing complex shapes and profiles ;
-By simple adjustment, you can obtain different finishing degrees of the processed surfaces ;
-Possibility of processing a piece with technical claims;
-The possibility of processing hard and extra hard materials;
-The accuracy of the operation is up to microns;





APPLICATIONS
-Machinery industry;
-Stamp and mold;
-Unconventional technologies;
-Light industry;
-Nuclear industry;
-Automotive industry;
-Armament industry.

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MINISTRY OF EDUCATION AND RESEARCH

Method of automatic control of axial radial bearings

Students: Popa Constantin-Denis, Matusa Ionut Alexandru

Description:

The purpose of the research is to reduce the times in which the bearing control is performed on an automatic technological line. With the reduction of verification times, a reduction of the consumed resources is realized, therefore, the production cost is reduced.

In a first phase, a check of the efficiency of all the elements of the line will be carried out in order to establish the components that will be kept and the elements that will be replaced / optimized.

In the second phase, the cycle times will be recalculated, depending on the specifications of the new components and the times of the remaining components will be optimized.

Benefits:

- Decreased cycle times required for checking and controlling a bearing;
- Reduction of resources consumed following the process;
- Increasing the life of existing components, either by modifying them or by replacing them;
- Increasing the intervals in which the line is operated, either for carrying out the revisions or for the maintenance;
- Decreasing the surface occupied by the line by making more compact machines;
- Modifying the contact surfaces between the machines and the bearing itself (to reduce the risk of damage to the parts during the verification and control cycle);
- Reduction in the number of operators necessary for the smooth operation of the line;
- Reducing the number of parts rejected after the trial.

Scope of application:

- Any bearing manufacturer;
- Any company that uses bearings as part of its products that wants to achieve the quality control of bearings received from suppliers.

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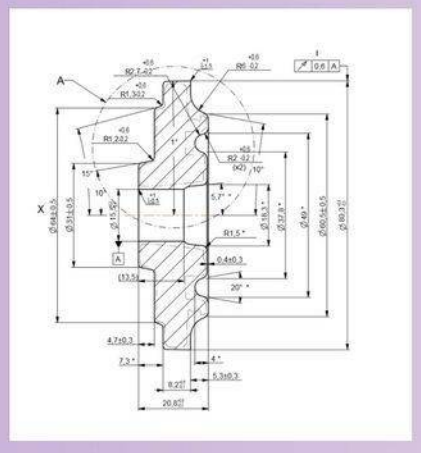
Ministry of Education and Research

Improving the quality of an industrial fabrication process

Student: Daniel Bunescu

Description

The research aimed for improving the quality of a technological process of manufacturing a flange that was recently launched in production at S.C. COMPA S.A. Sibiu, a company with a long tradition in the production and development of automotive components. The main purpose of the research was to reduce the internal scrap rate, which was realised by using statistical process control, calculation of process capability index and gage R&R analysis. The main defects and their source were identified using these quality management methods. The measures taken reduced the scrap rate in only three months with 16,32%.



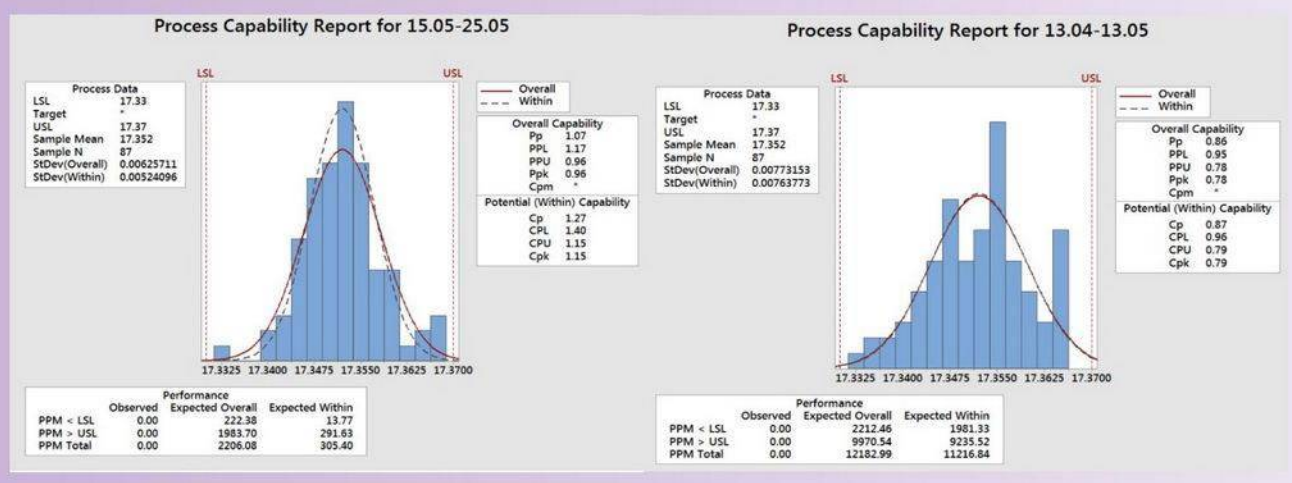
Advantages

-a decrease in the number of scrap rate

-a more efficient fabrication process overall

-the reduction of work time

Application and domain of usage: industrial engineering, workshop 630 at S.C. COMPA S.A.



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Ministry of Education and Research

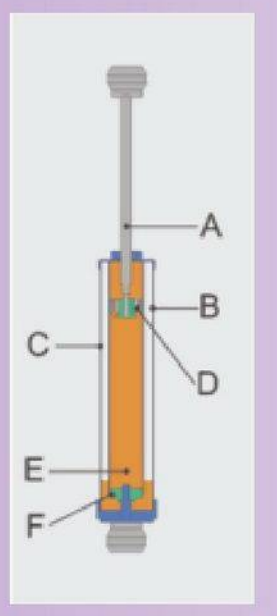
Design of a new type of hydraulic double-sided shock absorber

Student LIMBĂȘAN Vasile Laurențiu

Description:
The shock absorber is a device used to dampen a shock, noise or oscillation phenomenon in a technical system.

From the point of view of the interior construction, there are two-tube dampers and single-tube dampers.

The basic elements of the construction of the two-tube shock absorbers are two tubes (obviously), one in the other. The inner tube houses the main oil reservoir inside which a piston moves.



Advantages:
The constructive length smaller, than that of the monotubular system, at the same stroke.
Assembly of the elements outside the tube without affecting the inner surface of the working cylinder.
High variability of adjustments by the use of active pistons on compression.

Applications:
Domains of activity: Automotive, In car construction technologies, etc

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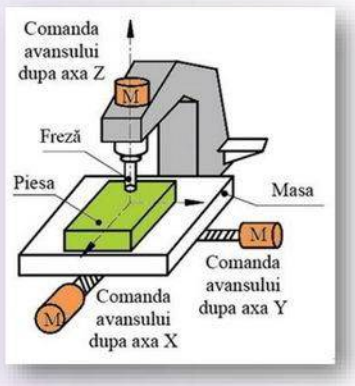
MINISTRY OF EDUCATION AND RESEARCH

Design of a laboratory stand used for drilling and milling operations for the processing of small-sized semi-finished materials from low hardness materials

Students: MATUSA Ionut Alexandru, POPA Constantin-Denis

Description:

The project consists in the creation of a laboratory stand with which we will be able to carry out the technological process of milling and drilling for the processing of small-sized semi-finished materials of medium or low hardness. All operating movements will be performed manually, the three movements translation related to the X, Y and Z axes will be realized by sliding the tables of the car with the help of the ball screws and the guide rails offering simultaneously high precision and high rigidity of the system. At the top of the stand will be found the electric motor that will be catch the fixing device that will be caught and driven by the main shaft of the motor. The motor together with the tool, the tool catching device and the rest of the component parts of this system will perform the translational movement on the Z axis and at the same time the rotational movement of the tool. will be made by the electric motor.



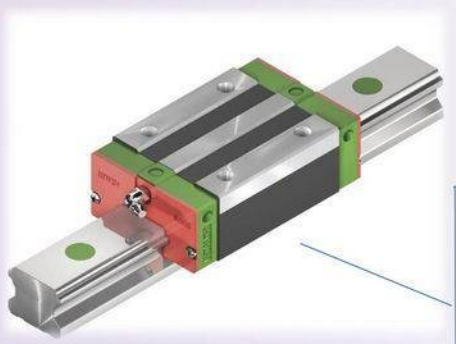
Images for informational purpose to form an image in relation to the appearance of the laboratory stand.

Benefits:

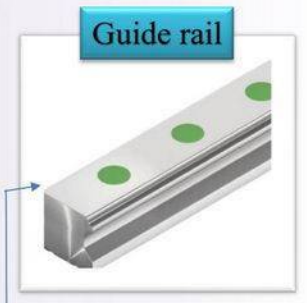
- Small investment compared to a similar product taken entirely from a certain producer.
- The possibility to "juggle" with different parameters such as design, size, shape, and other elements that on such a fully purchased equipment would be limited.
- High accuracy and rigidity of the system due to the components used.
-Maintenance with small costs and made on own account.

Nut

Screw



Guide rail



Bearing

Applications:

- Domains of activity: Industrial engineering.

In the stand presented we meet a clamping device for both the tool used and for the clamping and fixing of the semi-finished product

Tool clamping device

Clamping device

The bearings presented have in their component 2 rows of bearings, one row for each part.

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MINISTRY OF EDUCATION AND RESEARCH

3D PRINTING WITH BIODEGRADABLE MATERIALS

Student HICIU Sebastian-Traian

Description:

3D printing it is a training process of a solid three-dimensional object of any shape, made by an additive process, where successive layers of material are established in different forms. 3D printing it is, also, distinct from the traditional processing techniques, which is mainly based on removal of materials such as cutting or drilling. Main biodegradable materials used in 3D printing are: ABS, PLA, PET, PC, etc. These types of materials have different printing temperatures, each material has advantages and disadvantages. From the respective materials a variety of printed products can be obtained.

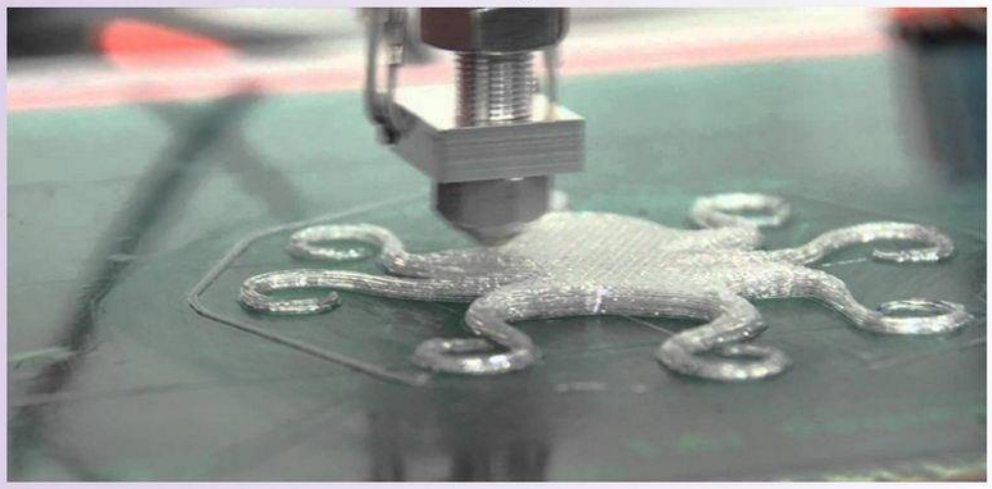
Main biodegradable materials:

1 - ABS – Acrylonitrile butadiene styrene;

2 - PLA – Polylactic acid;

3 - PET – Terehthalate polyethylene;

4 - PC – Polycarbonate.



Advantages:

-Low production costs
-Biodegradable materials
-Low printing temperature
-It is a precise technology
-It is a safe process

Applications:

- Domains of activity: Automotive, In car construction technologies, etc.

MakerBot Replicator+ 3D Printer

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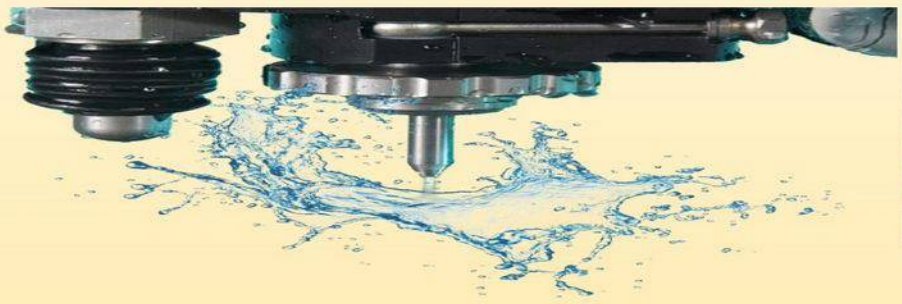
MINISTRY OF EDUCATION AND RESEARCH

WATERJET CUTTING

Student Mario–Ioan DAVID

Description:

Water jet cutting is an ideal alternative for milling or traditional cutting techniques. The most important parameters of the technology are the pressure and the quantity of water. They determine the energy of the water jet. The water jet is created in the cutting head, here the pressure energy is converted into kinetic energy.

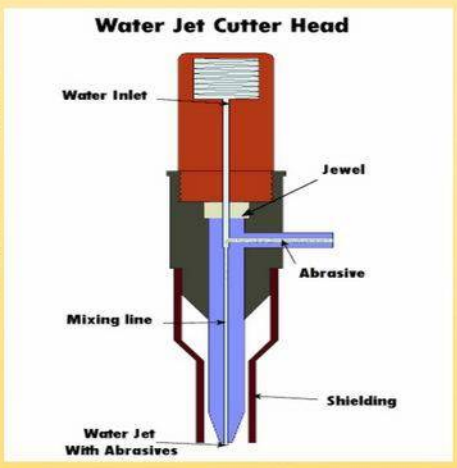


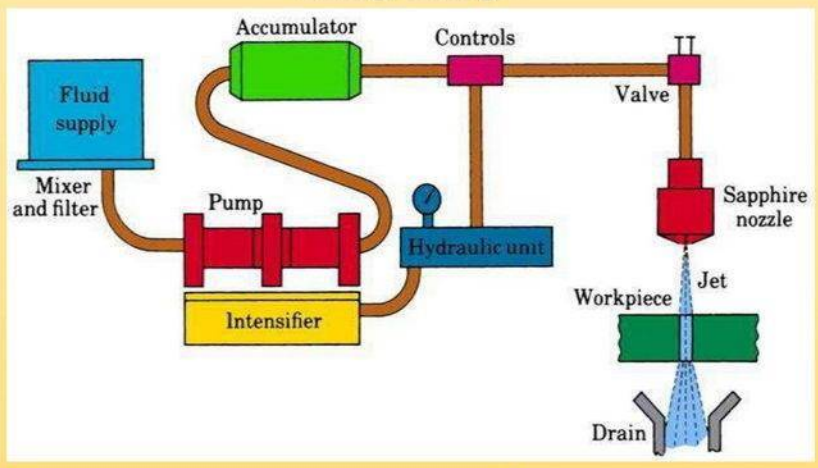
Applications:

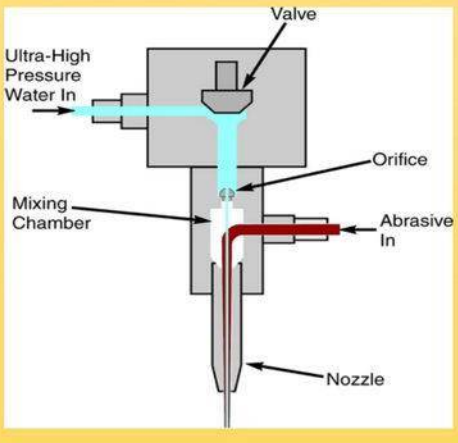
Industrial machines construction, automotive, civil constructions etc.

Advantages:

Flexible production, efficient production of unique parts.
There is no thermal load.
There are no thermal effects or voltages
It is a precise and productive technology
Even hard materials can be cutted
Environmental protection: the environment is not polluted during cutting







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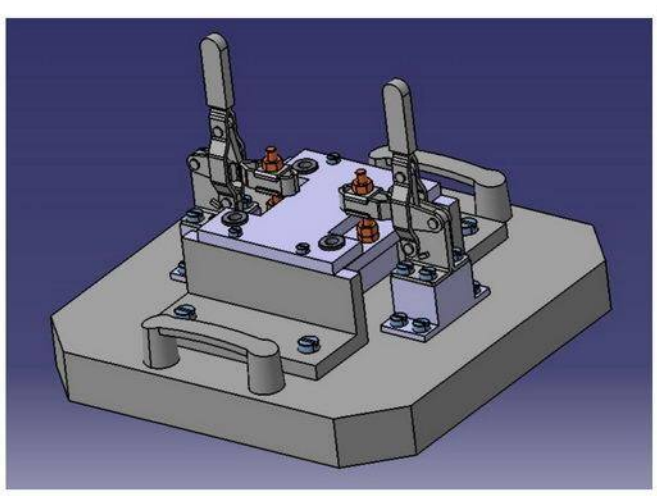
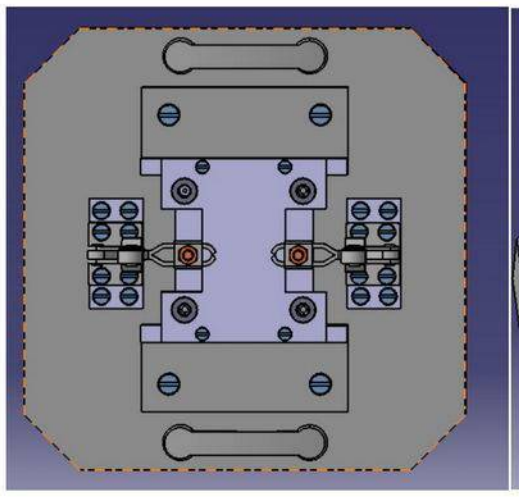
MINISTRY OF EDUCATION AND RESEARCH

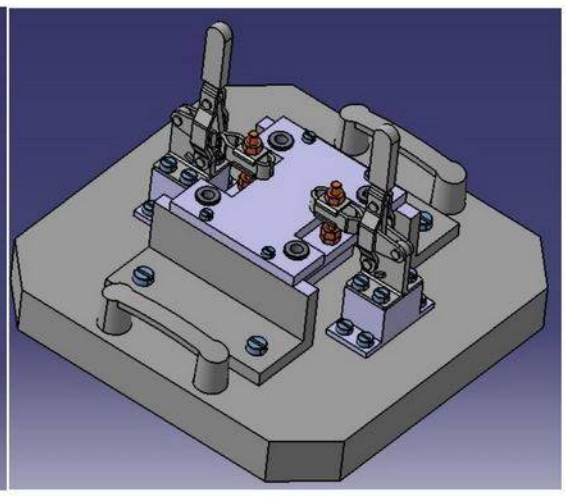
CLAMPING DEVICE FOR DRILLING

Mesaros Adriana / Dancu Florin Radu

The student research project presented refers to the clamping of component which have the C120 material, which is used in the automotive industry. The clamping device for drilling it must ensure well-determined position to the direction of certain movements, in the case of machining on drilling machine. This device is the constructive and functional technical system that must ensure the orientation and fixation of the semi-finished product.

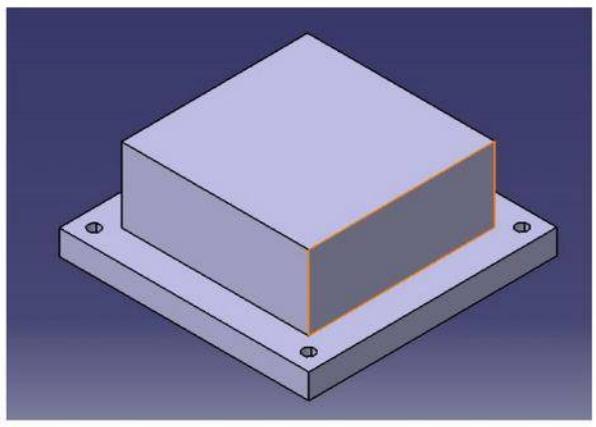






Benefits:

- Easy to use and handle without the necesity for professional training;
- Low production costs;
- Device made of interchangeable modular elements;
- Easy to repair.
- Easy to adapt for various component products.



Applications:

- It is used in parts that require processing of drilling.

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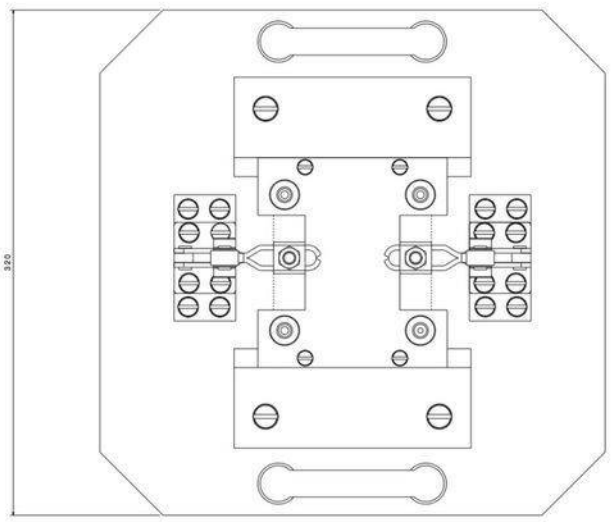
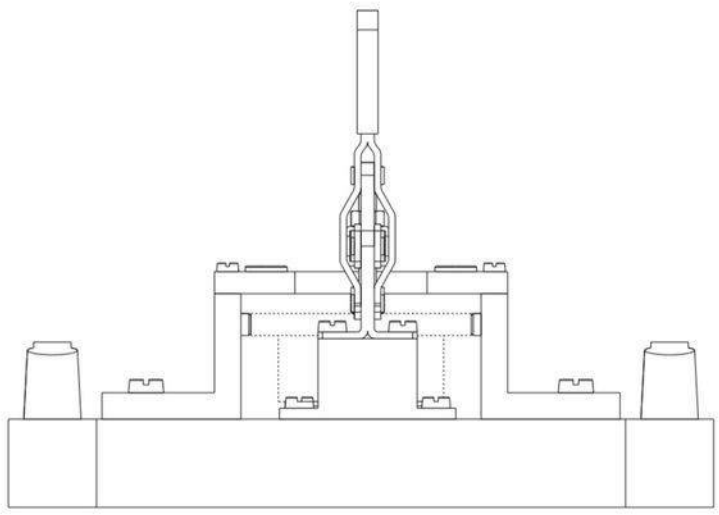




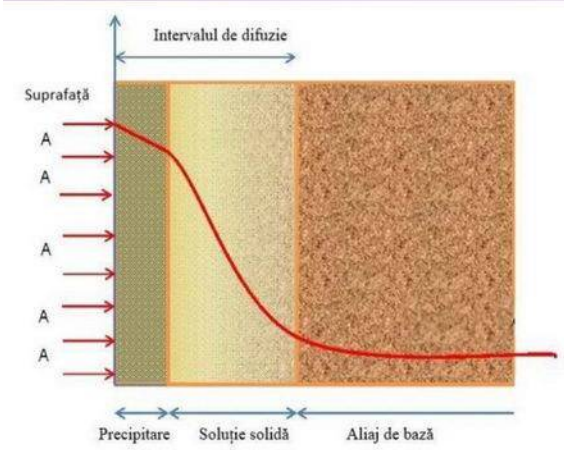
Ministry of Education and Research

Studies on the possibilities of replacing Tenifer type heat treatment

Authors: Luciana POPESCU
Sebastian MĂRĂSCU

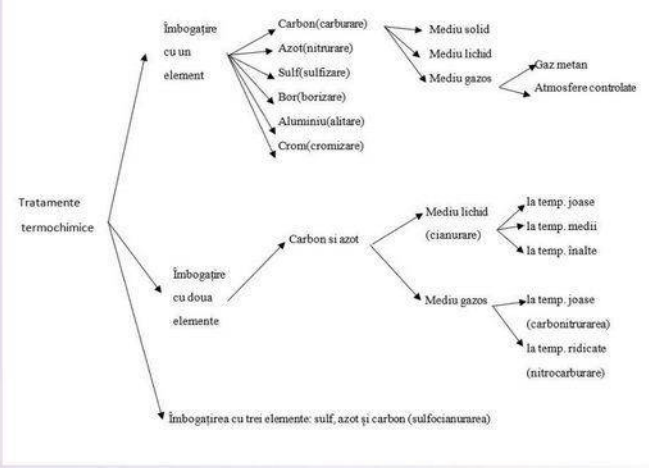
Description: The main purpose of thermochemical treatments is to enrich the surface layers of parts with a certain element. Historically, chemical treatment was limited to processed, forged and cast parts, with applications in cars, cars, tools and drilling. The process is carried out in the liquid, solid or gaseous environment with one or more active chemicals simultaneously. In contrast to thermophysical treatments, structural changes also result in changes in the chemical composition in superficial structures.

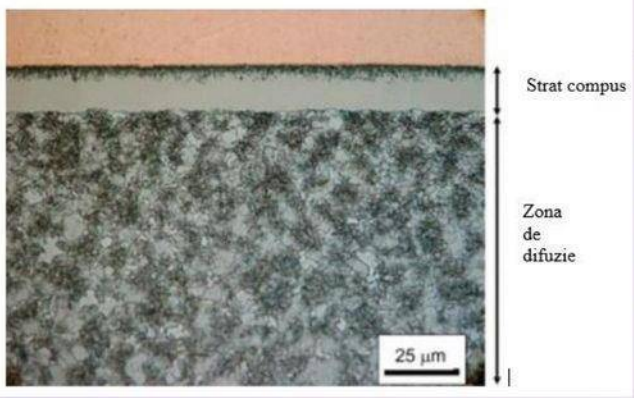
The Tenifer process was successfully marketed for the first time by a UK company called Imperial chemical Industries, but there were problems with cleaning the solution and not water-soluble. The German company Degussa initiated and developed a salt bath process called Tuffride or Tenifer at low temperatures, around 550°F (1.022°F). One of the oldest and most successful solutions to improve the properties of materials is to modify their surface by thermochemical treatments with salt bath, a process called tenifer.



The classification of the thermochemical treatments shall be carried out in particular by the element with which the superficial layer is enriched, according to the number and temperature at which the treatment takes place.

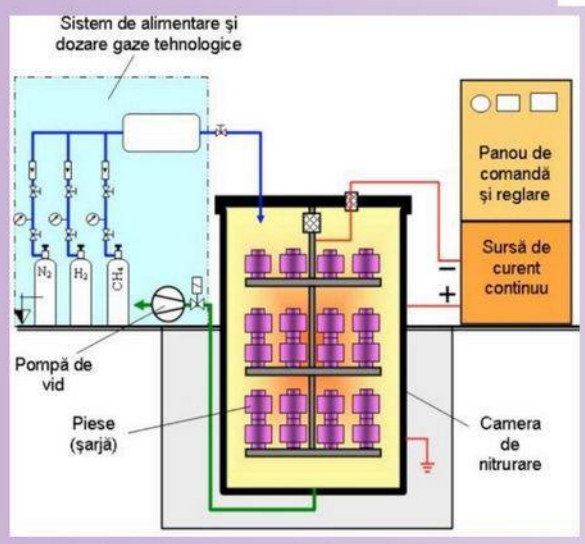
The thermochemical treatments technology consists three steps: dissociation, absorption and diffusion.
The most commonly used thermochemical treatments specific heating and cooling processes are as follows:
- Heating in ovens;
- Vacuum heating;





Advantages:

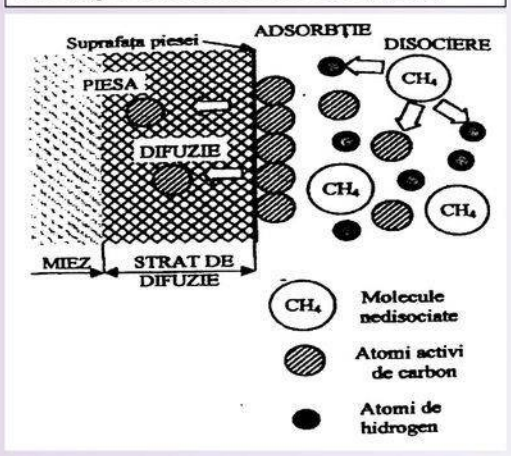
Steel thermal treatment is the process of heating mechanical properties of steel without changing associated with increasing steel resistance, but desired characteristics. The industrial use of important process with a number of unique can simply be a heat transfer medium or within the bath and the surface of the treated and cooling steel tools to change the physical and the original shape and size. Heat treatment is often can also improve product performance and provide other melted salt baths for the thermal treatment of metals is an advantages. Depending on the nature of the salt used, baths chemical processing at high temperatures, where reactions part lead to fundamental structural changes.



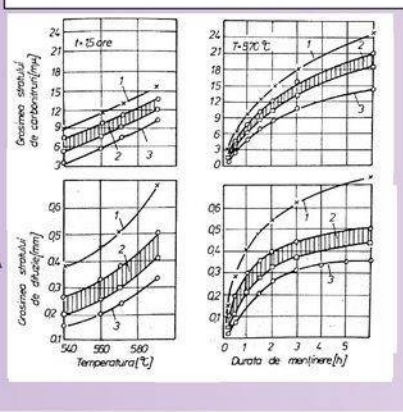
Applications: A part is inserted into the system's remember and is subjected to heat treatment, cleaning, degreasing and nitriding protection, between the parts ensuring large spaces. The devices with the nitrile parts are electrically insulated from the cover and the sides of the retort and are in close connection with the cathodes of the installation.

The Replacement Tenifer type chemical treatment for the piece presented it has been established because thermo-chemical treatments in cyanide baths are highly polluting, and so they need to be replaced.
The heat treatment proposed was a carbonitriding in a gaseous environment. Thus, the parts of steel are exposed to carbonation in a gaseous environment at low temperatures (500 – 580°C) to maintain their surface hardness, wear and binding resistance, fatigue resistance, etc.

The stages of thermochemical treatments



Temperature variation depending on the thickness of the layer



Among the most popular techniques, salt-bath treatment remains one of the most useful for surface and heat treatments of tools and components. This technique has been used for a long time in metallurgical processes; other technologies have been developed, such as the fluidized vacuum bed and the bathroom ovens with a protective atmosphere, which have undergone improvements in heating and cooling.

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Ministry of Education and Research

Plastic parts in the automotive industry

Students: Delia Aurelia Cristina ARION,
Elena Maria HAȘEGANU

Fig. 1 Armrest system

Fig, 2 VW TOUAREG 2001

Description:

Injection molding has been one of the most popular ways for fabricating plastic parts. This performance is due to notable qualities: they are anticorrosive, electro-insulating, good mechanical properties, low cost, pleasant external appearance, they can be processed both by traditional mechanical means and by injection technology, can be covered with paint or by galvanizing, which allows each executed product to achieve the desired look by the designer. The developed parts are used for the armrest system (Fig.1) for the first generation of VW-TOUAREG 2001 vehicles (Fig.2). The material chosen for the two benchmarks is POM - Polyacetal. Polyoxymethylene, because it has high mechanical strength, rigidity, high hardness, high shock resistance, wear and has a low coefficient of friction. The property that best characterizes this material is that of having thermal stability (operating temperature -40 ° ... 140 ° C).

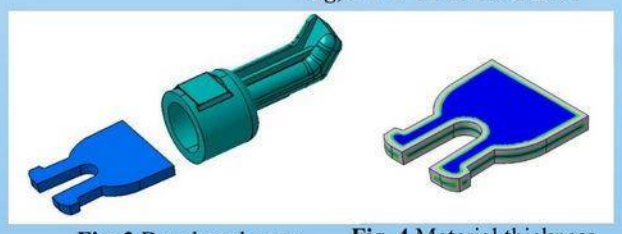

Fig. 3 Developed parts

Fig. 4 Material thickness analysis for the part "comb"

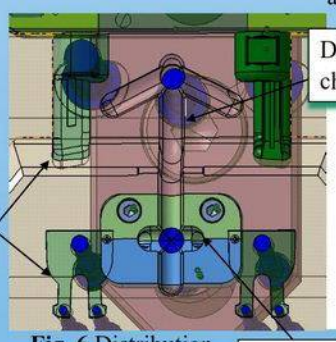

Fig. 6 Distribution channels

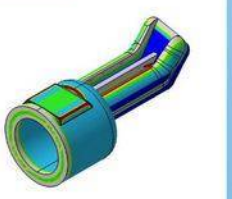

Fig. 5 Material thickness analysis for the part "hook"

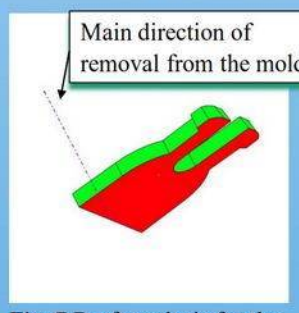

Fig. 7 Draft analysis for the part "comb"

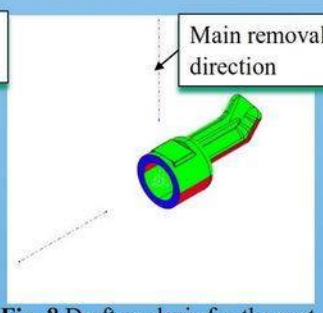

Fig. 8 Draft analysis for the part "hook" on main direction

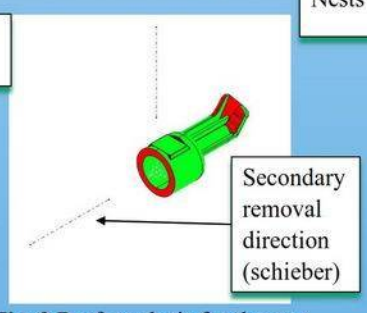

Fig. 9 Draft analysis for the part "hook" on secondary direction

Benefits :

- does not require further processing though the parts are quite complex
- threads can also be made
- they can be mechanically assembled using screws and nuts
- pleasant, smooth and glossy appearance
- they can easily engraved

Applications: Automotive industry

• **The filling time**: 4,262 [s]

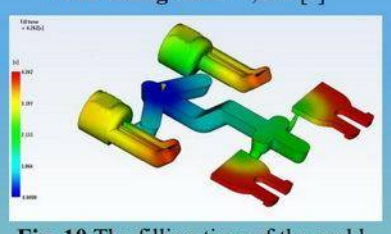

Fig. 10 The filling time of the mold

• **Quality prediction of the parts**

Fig. 11 Quality of the parts

• **Injection pressure :** 4.705 [MPa]

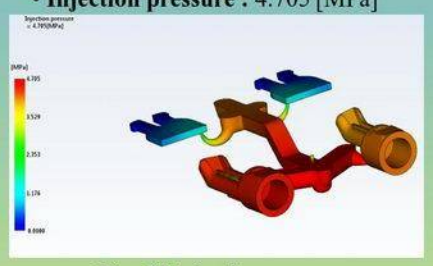

Fig. 12 Injection pressure

• **Prediction of goals in the net**

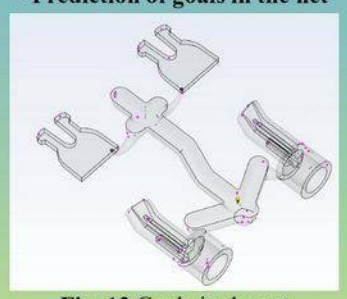

Fig. 13 Goals in the net

• **Flow temperature -** is between 131 and 220 °C

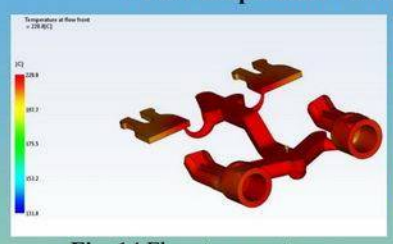

Fig. 14 Flow temperature

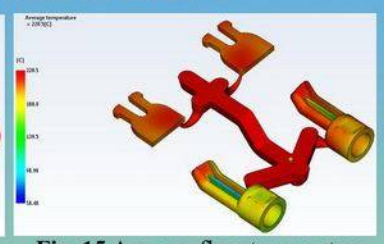

Fig. 15 Average flow temperature

• **Cooling time:** 72.64 [s]

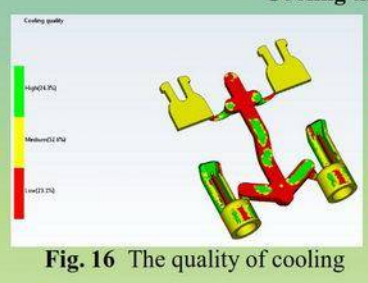

Fig. 16 The quality of cooling

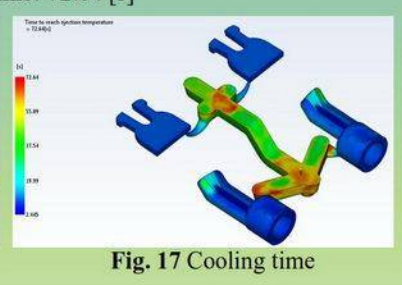

Fig. 17 Cooling time

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• **Surfaces on the part where the material can break**

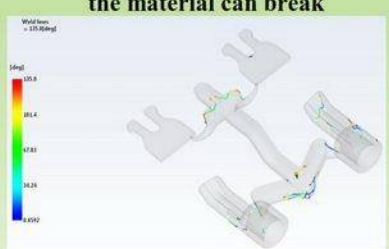


Fig. 18 Places where the breaking of the part may occur

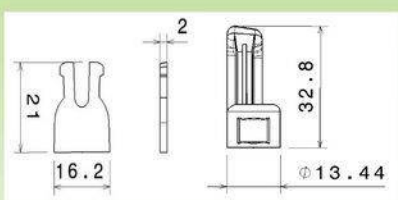


Fig. 19 Dimensions

Ministry of Education and Research

Statistical data processing from measuring

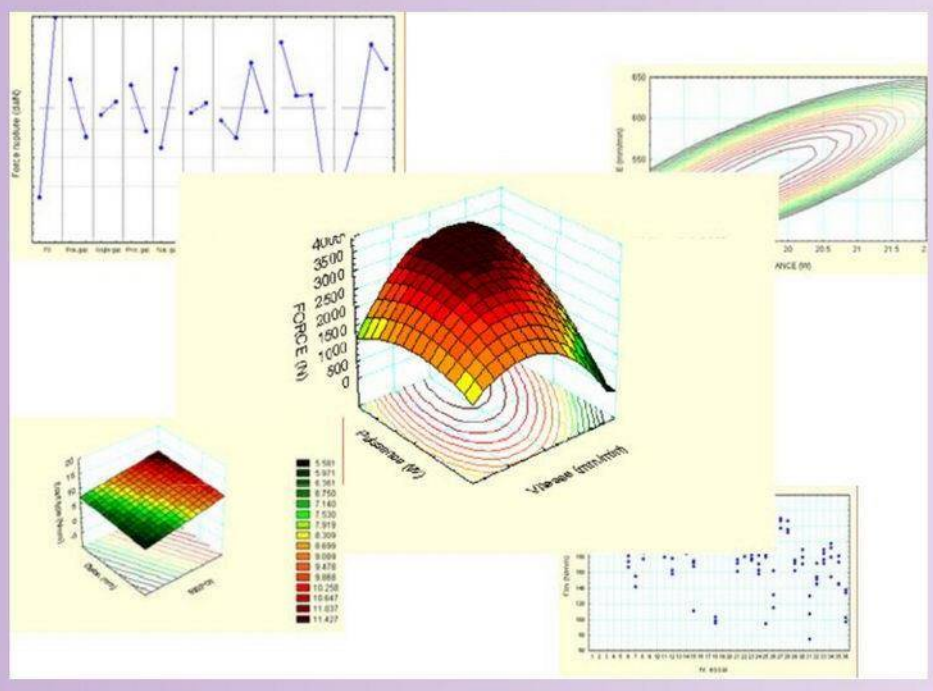
Students: COSTEIU Emilia-Ștefania, MITOI Roxana-Emanuela

Description:

Learning some notions about: first types of statistical processing performed on a sample of values from experimental measurings or from aqusition operations of datas, areas of applicability of the respective processing,algorithms and the ways of working.

Applying statistical tests presented in the study on a sample of values and draw conclusions.

In situations that follows value determination of a sample from a certain process when we want to eliminate or reducing effects caused by various types of errors, experimental values obtained are submitted on some tests that evaluates influential induced by error generators factors of measuring.



The veracity of the results from the natural sciences and engineering
⇒ **The existence of experimental results**

⇓

Experiment ⇒ Measuring process

⇓

Experimental theme
What needs to be done?

⇓

Experimental strategy
How to proceed?

⇓

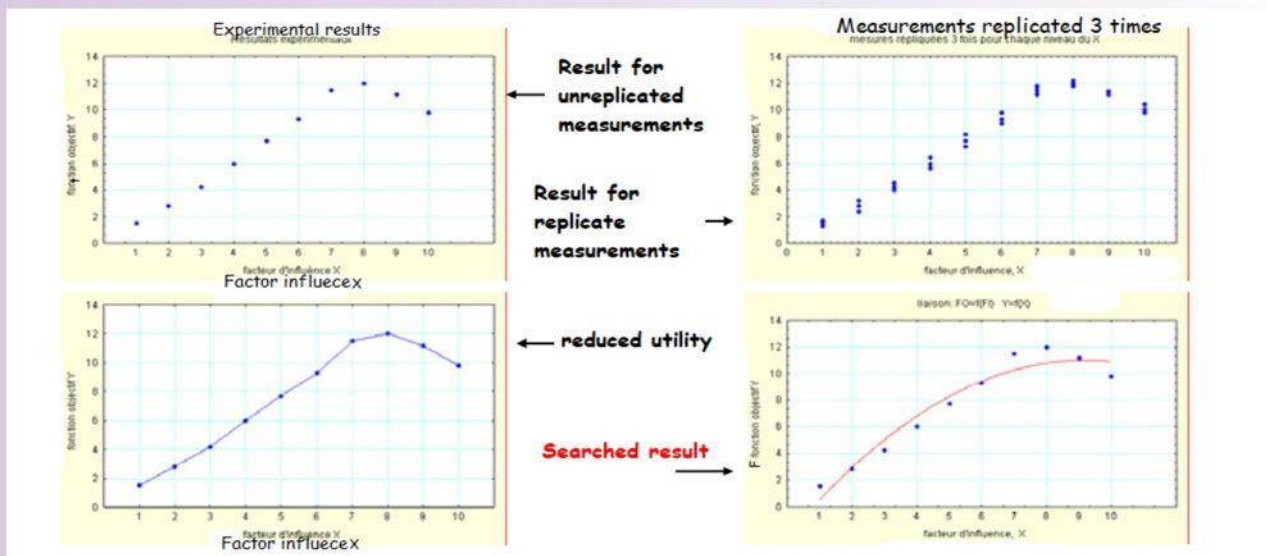
Processing the results , conclusions, taking decisions

Advantages:

- The elimination or reducing the effects caused by a multitude type of errors
- Establishing as accurate as possible the quality and parts precision
- Preventing the possible waste

Applications:

- Industrial engineering, machine construction technology



The particularity of the problem: due to the presence of experimental errors,the experimental points should not be united with the segments, but it should find the curve that redouces the experimental "noise".

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MINISTRY OF EDUCATION AND RESEARCH

Design and construction of a 4x4 truck

Student: Mihai-Ciprian LANGA

Description:

The research and innovation project aims at research and development of a 4x4 truck based on vehicles produced by Tatra, Volat, Oshkosh, LiaZ, MAN and Kamaz, being capable to carry a load up to 10 tons and reaching a speed of 110kmph. The truck will have a high mobility level and can travel on any type of terrain, including rough terrain. The first part refers to characteristics of existing trucks and a parametrized and simulated CAD model according to the aspects investigated, so the second part is the presentation of a model based on it, which fulfills all applications of model.

Fig. 1 Tatra Truck

Applications:

- agriculture
- mining industry
- defence industry
- firefightning
- utilities service

Advantages:

- development of new truck
- improvement of specific assemblies or components
- improved stability

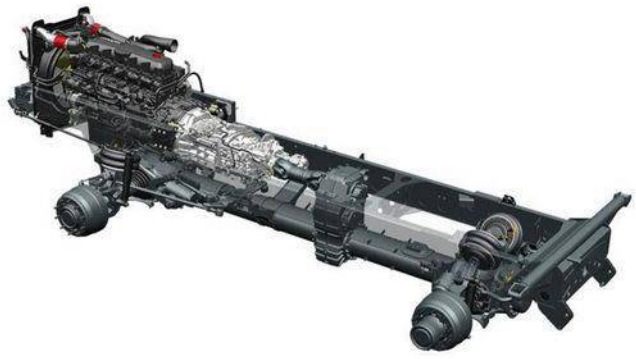

Fig. 2 4x4 Truck chassis

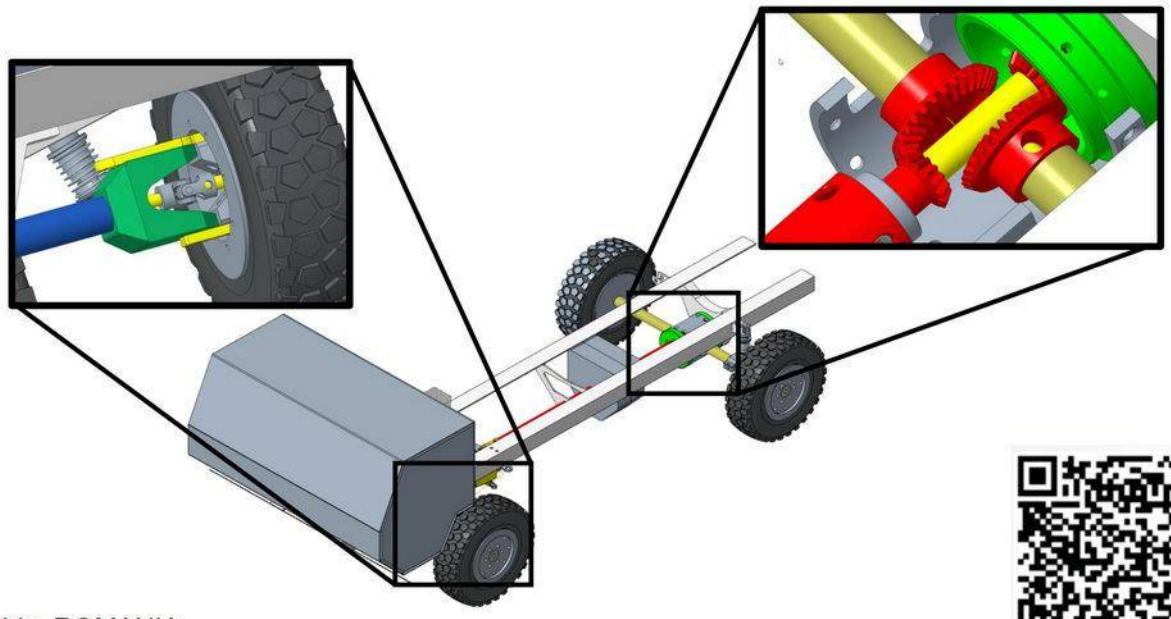

Fig. 3 3D model

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Ministry of Education and Research

The accuracy of the analysis of a measuring system within a tolerance laboratory and dimensional control

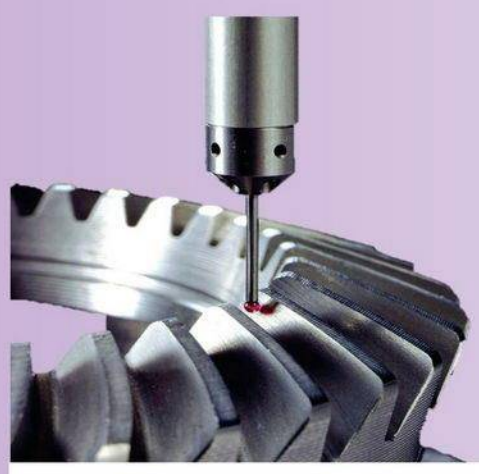
Students: MITOI Roxana-Emanuela, COSTEIU Emilia-Ștefania

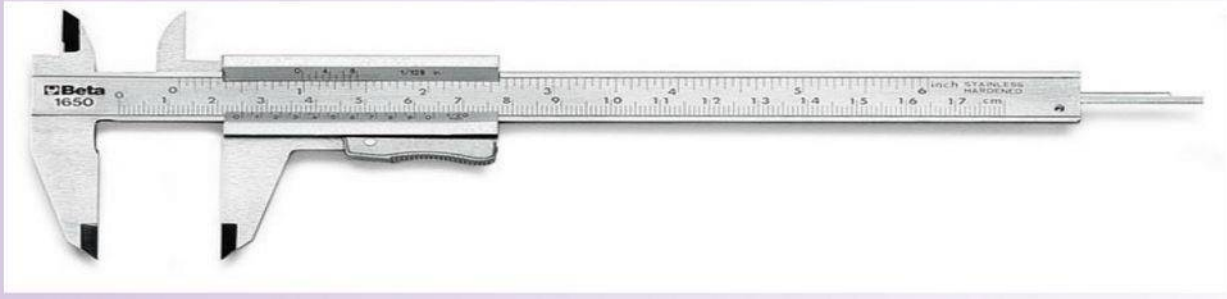
Description:

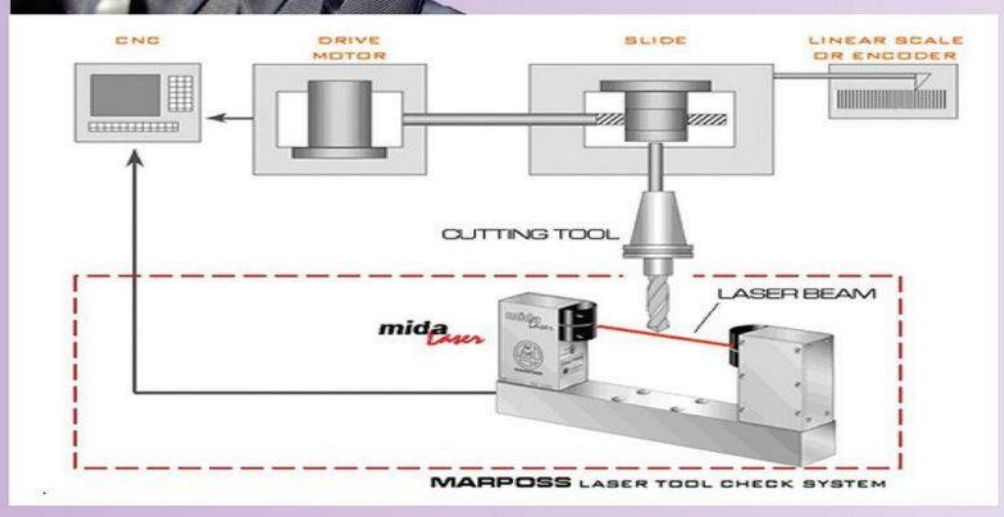
The quality of a produt will depend on a complex of sizes including geometrical parameters, liniars and angulars, are basic factors, which in machines constructions they are granted a particular attention both in technical design and in the technological one.

The execution of a sample to a exact rigurous size it is hard to obtain. On the other hand, the practice shows that a sample could fulfill its functional role in good conditions and if the dimension of this is executed in certain limits.

For example,if we cosider a sample with a reaming in wich should rotate a certain spindle, ensemble of the two samples works approximate as well for a closer scope of values for a reming.







Advantages:

- Monitoring and measuring of the products
-The control of the inconsistent product
-Corrective and preventive precision actions
-The improvement of processes and pieces

Applications:

- Industrial engineering, machine construction technology

Contact

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Ministry of Education and Research

Prototyping

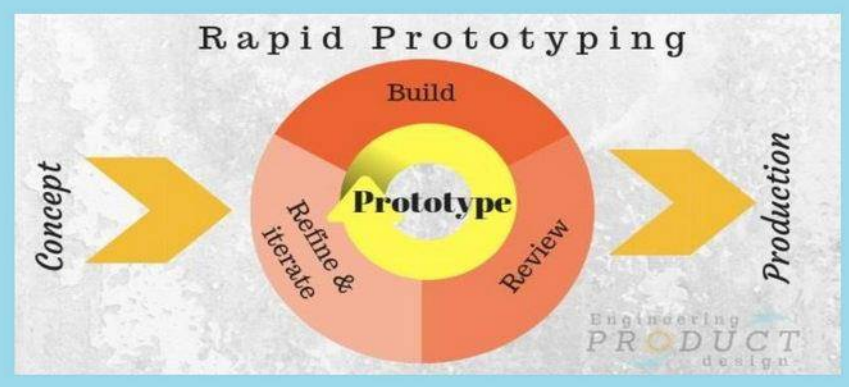
Student TUREAN Alexandru-Andrei

Description:

Prototyping is a process of building a model or a draft version of an idea. It is a method of product designing that is used in various applications in mechanical engineering development. It is also a stage where preliminary changes and product fixes occur before fabrication happens.

Engineers and prototype specialists try to understand the limitations of the prototypes to precisely simulate the proposed design features.

Designing the complete prototype is expensive and can take a long time, especially when repeated several times, there is a care that there are problems and can be solved, then a complete project can be built. Alternatively, rapid prototypes or quick-to-apply technical techniques are available for initial prototypes to implement some, but not all, of a complete project. This allows the necessary design and manufacturers to test faster and easier in the parts of the project care are most likely to have problems, to solve problems and then to completely design.



Advantages:

Users are actively involved in development

Errors can be detected much earlier

Feedback from users is available leading to a better solution

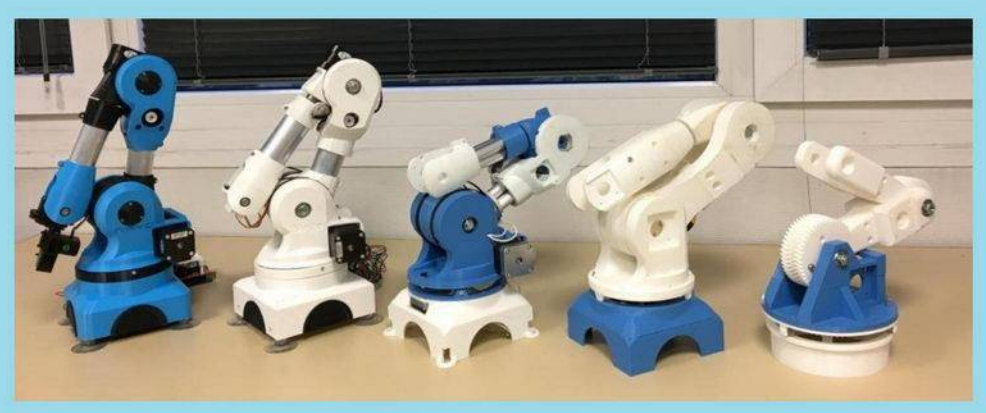
Missing functionality can be easily identified

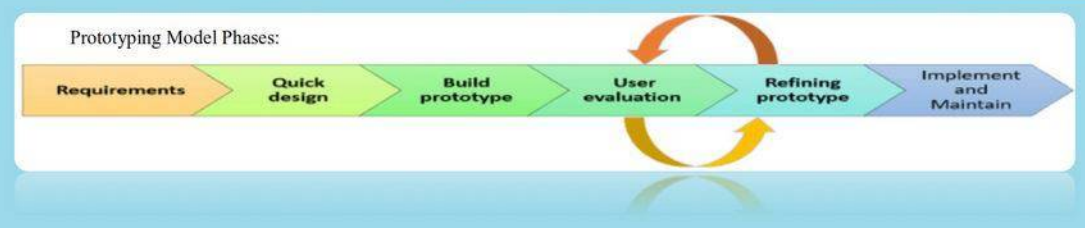
Applications:

Industrial Engineering

Robotics

Automotive Engineering





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Ministry of Education and Research

The research study of the design of a passive bitubular shock absorber used in the automotive industry in Bilstein Sibiu

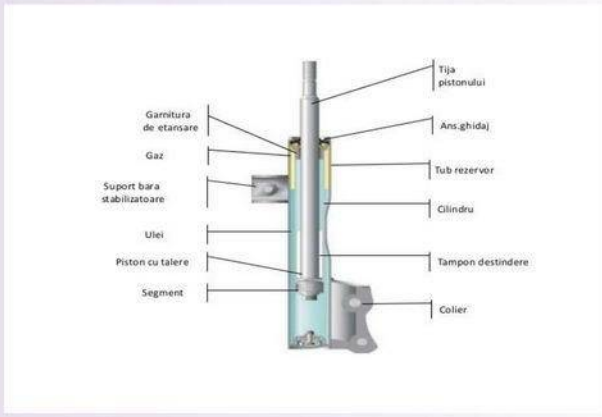
Students: SCHIOPU Eduard-Florin, HERCIU Andrei-Ioan

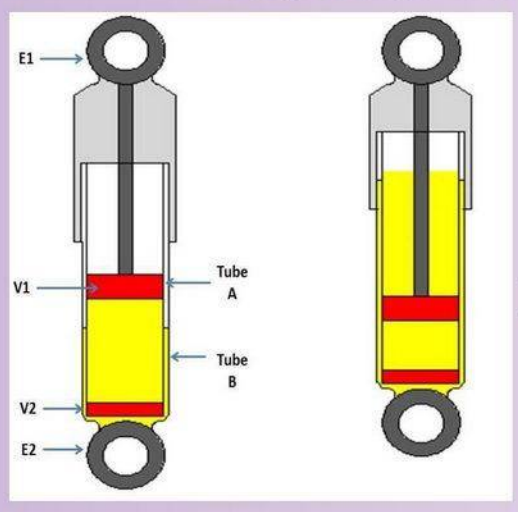
Description:

The special feature of the two-tube damper is the existing one of the tank, or as it is called: the clearing chamber. At the compression stroke, the rod is inserted into the working cylinder, thus displacing a volume of oil equal to the portion of the rod that enters the cylinder. This surplus is pushed through valves in the clearing chamber, the space between the inner cylinder and the reservoir tube. In the upper part of the compensation chamber is pressurized gas (approx. 6 bar), which is used to prevent the occurrence of oil circulation noises.

Benefits:

- Long service life
- Suitable for large diameter rods
- Reduced change in gas force depending on temperature
- Compression potential and active compression variability





Domeniul de aplicabilitate:

- Industrial engineering

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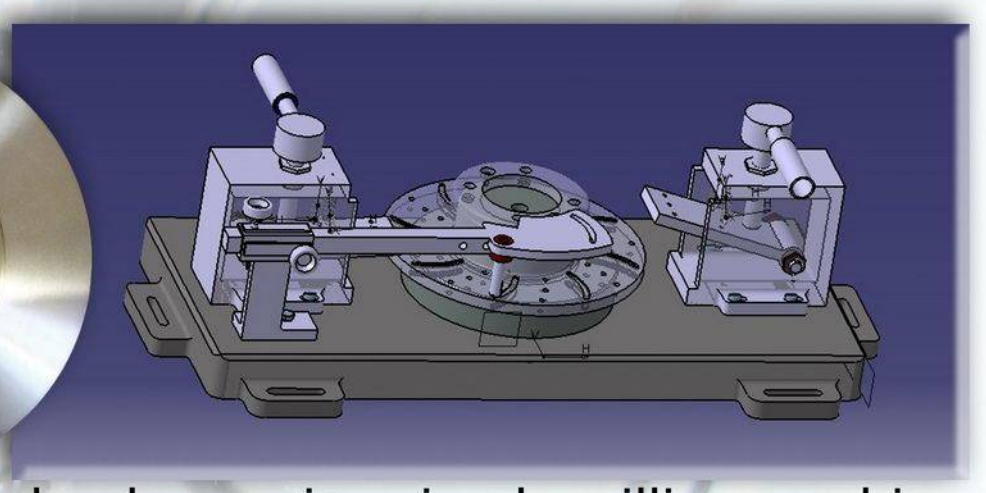
Ministry of Education and Research

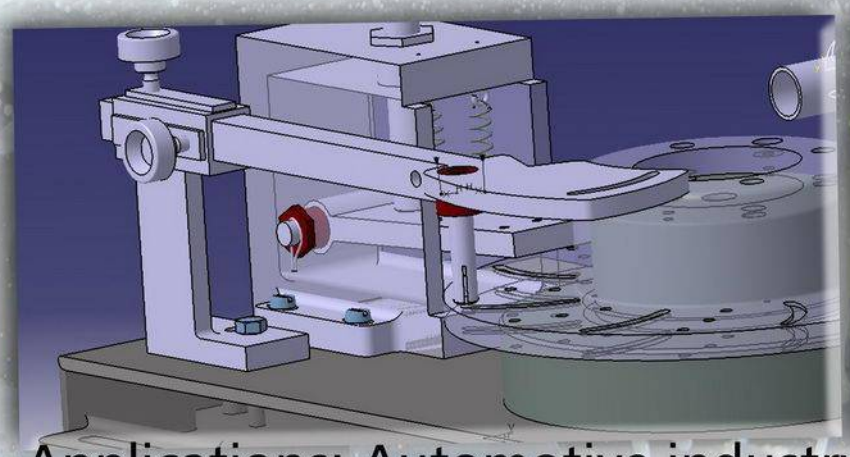
Clamping device for milling the water evacuation channels on brake discs

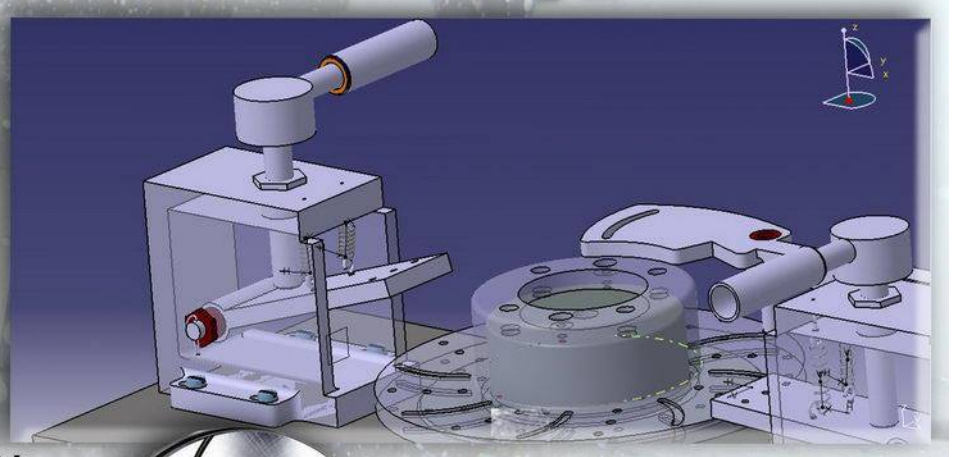
Student: BUICAN George

Description: Device used to clamp and orientate brake discs to aid milling of shallow channels on the active surfaces, channels used for eliminating water during difficult operation conditions.



Advantages: The machining can be done using simple milling machines. The placement and removing of products is made easy by the lever action clamping mechanism which pivots offering easy access, also the indexing system can be retracted from its working position, another plus is the telescopic actuation handle that can be retracted and secured via a built in magnet.





Applications: Automotive industry.

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MINISTRY OF EDUCATION AND RESEARCH

3D Printer

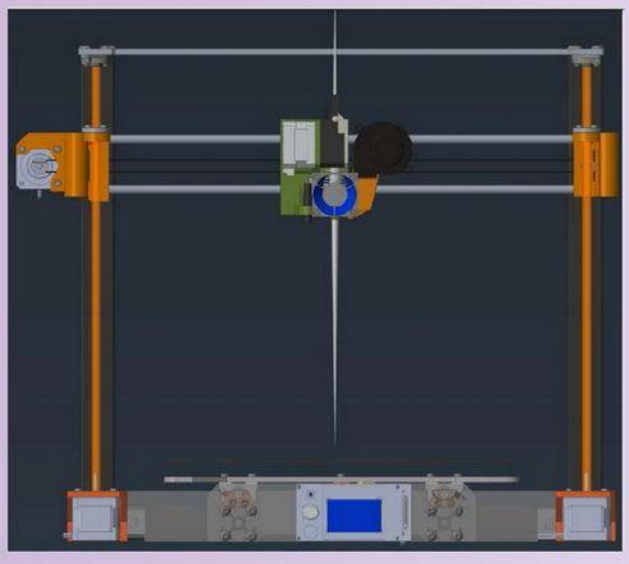
Student: BUNEA Dumitru

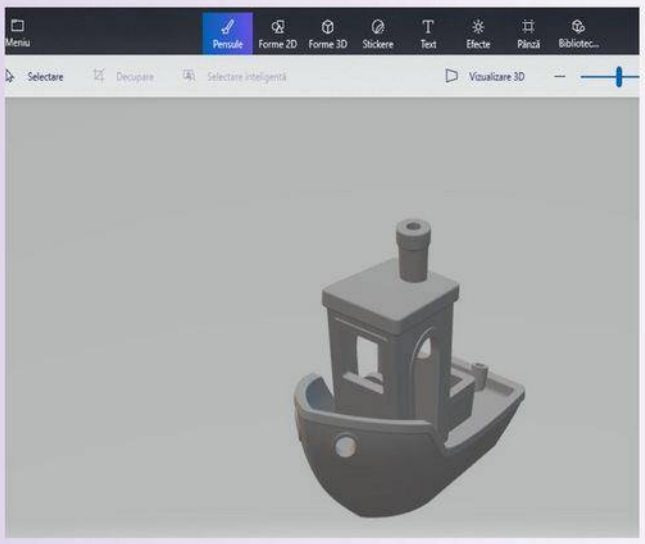
Description:

The invention (3D Printer) is intended to copy or create 3D prototypes of an extremely complex piece or toy of a plastic material such as PLA (Polylactic Acid), ABS (Styrene Butadiene Acrylonitrile) or newer photopolymerizing resin.

A 3D printer is a limited type of industrial robot, which is capable of creating 3D models of parts through an additive process in which successive layers of material are deposited in various forms under computer control.

The difference between the 3D printing technique and the traditional method of manufacturing objects is that instead of removing the excess material, the material is deposited in the desired shape from the beginning, without the need for further processing.





Benefits:

- Low production costs
- Unlimited 3D shapes can be created, the limit is only the imagination of the designer
- Low consumption of raw materials

Applications:

- Domains of activity: Automotive, In car construction technologies, etc

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PHONOABSORBANT STRUCTURE FROM POLYURETHANE WASTES

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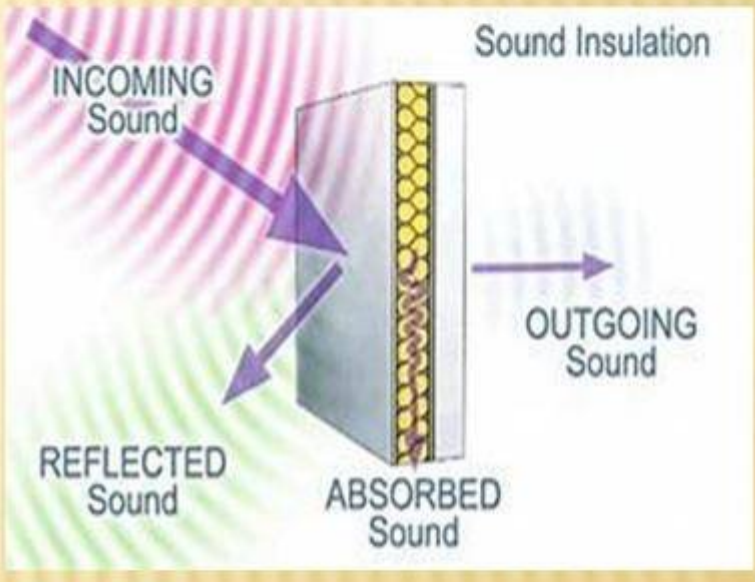
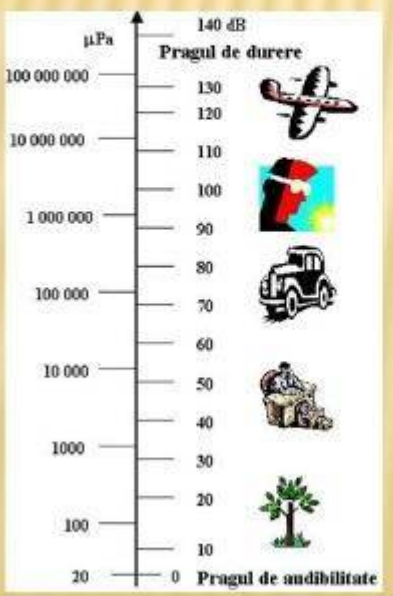
A 2020-00057/07.02.2020

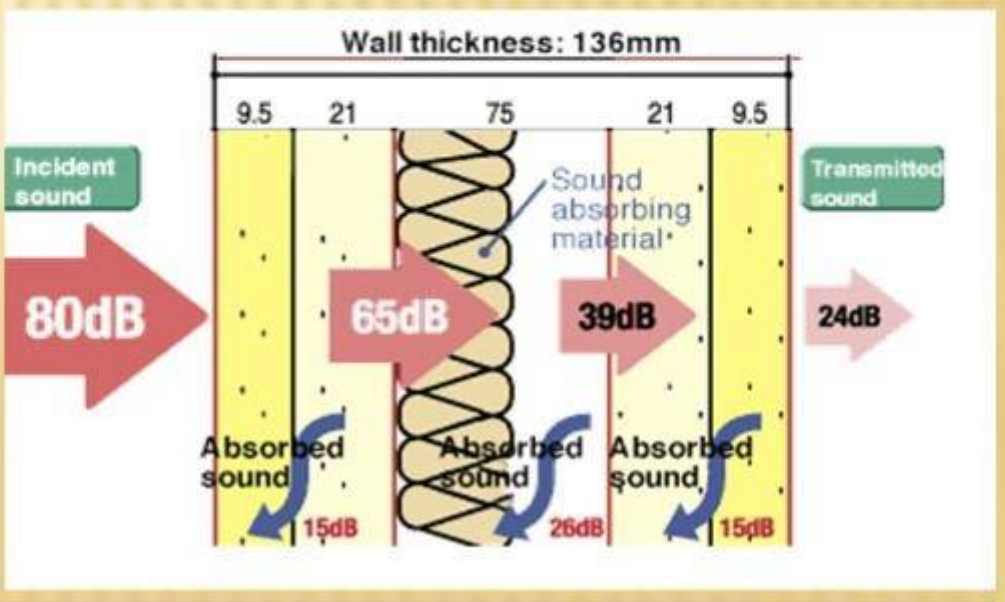
The invention relates to a stratified type structure and its process for obtaining it. According to the invention, the structure consists of gypsum panels between which an anti-breakage element such as fiberglass mesh bonded together with a polyurethane binder and a sound-absorbing layer made up of mills of polyurethane foam having the particle size of 7 ... 10 mm and polyurethane binder in 50:50 gravimetric proportion, used in civil or industrial constructions, Fig.1. The process of obtaining the sound-absorbing structure according to the invention consists in bonding the plates with fiberglass nets, preparing and depositing the mixture of polyurethane foam milling polymeric binder between the plates and drying the structure.

The advantages of the invention are:

- polyurethane waste resulting from industrial processing or dismantling of appliances containing polyurethane foams is used as raw material,
- the panels are not made of reinforced concrete
- the grinding is not embedded in the mass of the panel but a well-defined stratified structure is obtained, each layer having its unitary composition.
- A laminate is obtained which avoids obtaining an absolutely heterogeneous structure
- does not contain any metallic elements
- the anti-noise element is a solid structure, made up of polyurethane foam waste granules bonded with a polyurethane binder.
- the layered structure can be cut, adjusted to the shape required by the assembly conditions, easy machinability.
- easy installation
- easy and simple realization of the structure
- recycling of destructible materials
- material saving, low cost







Acknowledgements: *This work was supported by MEC-UEFISCDI, project: PN-III-P1-1.2-PCCDI-2017-0476/51PCCDI/2018, within PNCDI III.*

PROCESS FOR RECYCLING THE NON-METALLIC FRACTION OF WASTE PRINTED CIRCUIT BOARDS AND RECOVERED POLYPROPILENE AS IMPACT-STRENGTH COMPOSITES

Patent application: 0080/17.02.2020

Ramona Marina Grigorescu, Paul Niculae Ghioca, Lorena Iancu, Rodica-Mariana Ion, Nelu Ion, Madalina Elena David, Ramona Elena Andrei, Mircea Ioan Filipescu, Bogdan Norocel Spurcaciu

Corresponding author: rmgrigorescu@gmail.com

The invention describes a process for simultaneous recycling of non-metallic fraction of waste printed circuit boards and of recovered polypropylene as impact-strength composites. The recycling of these polymers is a stringent requirement both for the protection of the environment and for reducing the use of fossil materials, their extraction and processing being costly and polluting processes.

Polypropylene is one of the most used polymers and its industry was highly developed. It is known that most of polypropylene sorts have a low impact-strength, property that becomes even more deficient for the recovered polymer due to the degradation of the products during their exploitation. The process according to the invention removes this disadvantage by melt modifying the recovered polypropylene together with the non-metallic fraction of printed circuit boards and with a mixture of two styrene-butadiene block-copolymers.

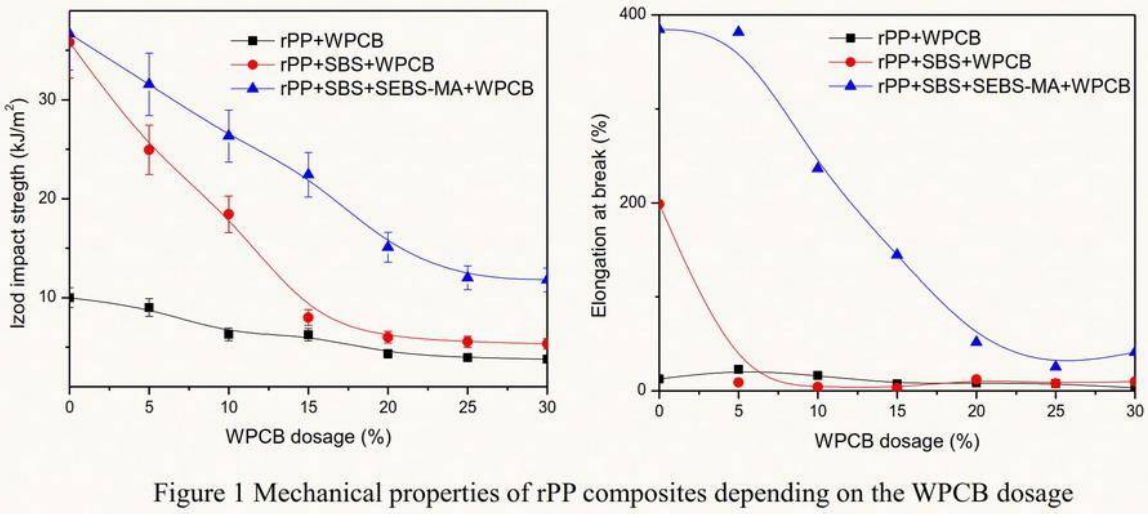


Figure 1 Mechanical properties of rPP composites depending on the WPCB dosage

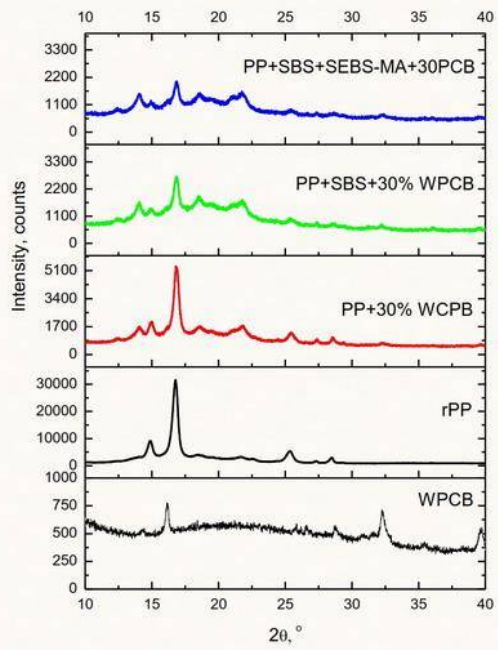


Figure 2 X-ray diffractograms recorded for rPP composites

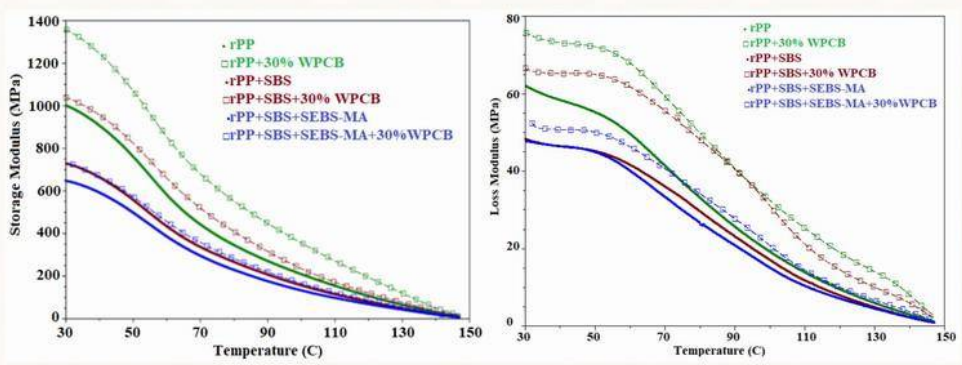


Figure 3 Dynamo-mechanical properties of rPP composites depending on the WPCB dosage

The invention has the following advantages:

- Uses the powder from waste printed circuit boards with a size of 0.2 ... 0.8 mm, whose less advanced milling is achieved with reduced energy consumption;
- It leads to waste polypropylene composites with high impact strength comparable with the assortments available on the market, but cheaper and obtained by an ecological method.

Application domain: technical items and packages.

Acknowledgements: This work was supported by a grant of the Romanian Ministery of Research and Innovation, PCCCDI – UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0652/84 PCCDI/2018, within PNCDI III.

Alginate microcapsules with encapsulated magnetite for photocatalytic degradation of anti-tumoral drugs

Rodica – Mariana Ion, Ana –Alexandra Sorescu, Alexandrina Nuţă, Nelu Ion

ICECHIM, Research Group "Evaluation and Conservation of Cultural Heritage", Bucharest Romania;
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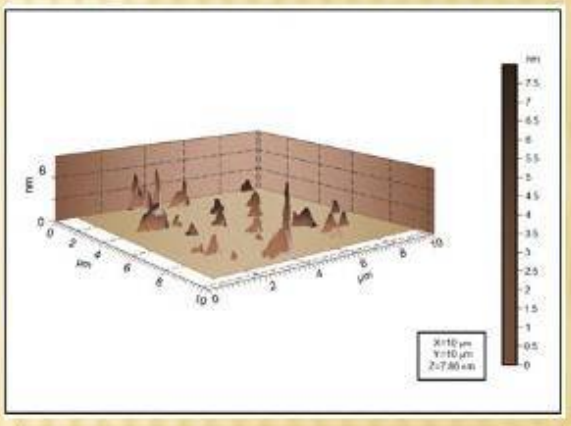
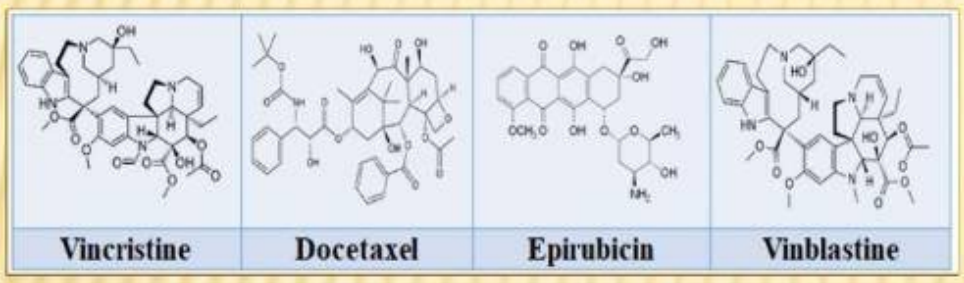
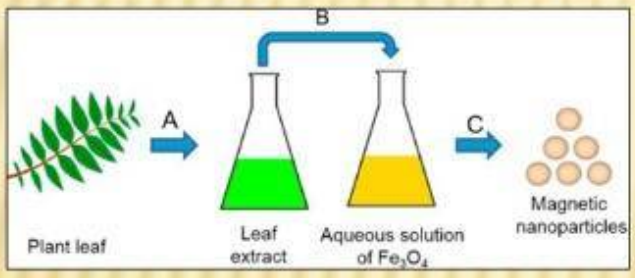
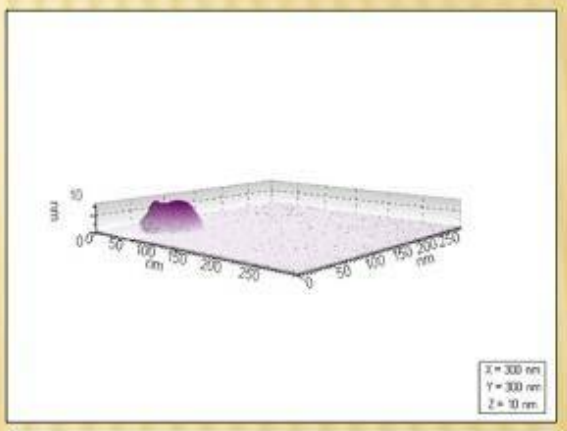
A2020-00029/23.01.2020

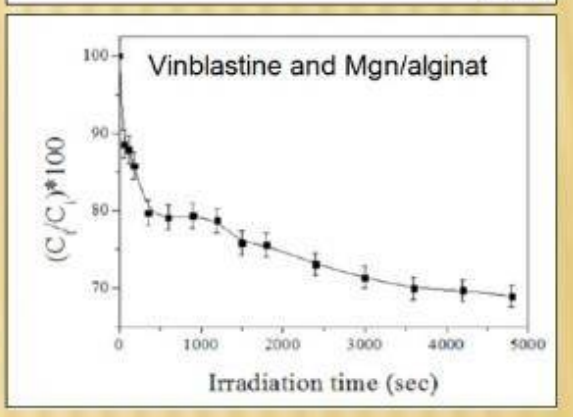
The present invention relates to a process for obtaining magnetite nanoparticles for use in the retention / destruction of antitumor drugs present in wastewater.
According to the invention, the process of obtaining involves two steps, as follows: the extraction of phytocomponents from vegetal-source as non-toxic resources, followed by the contact with the precursors of Fe^{3+} and Fe^{2+} at a pH appropriate to obtain the iron-ferric oxide, isolation and drying.

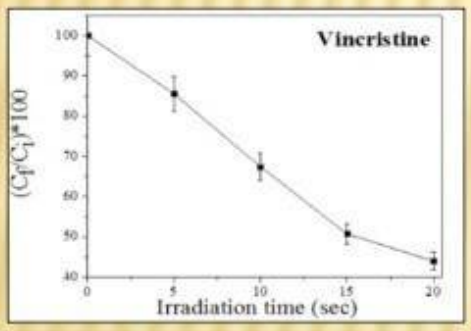


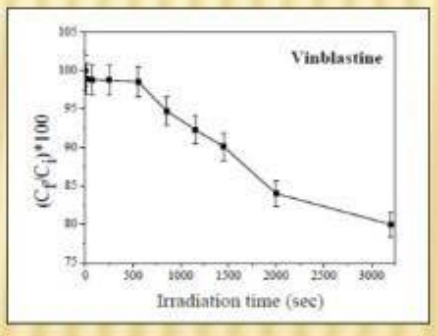


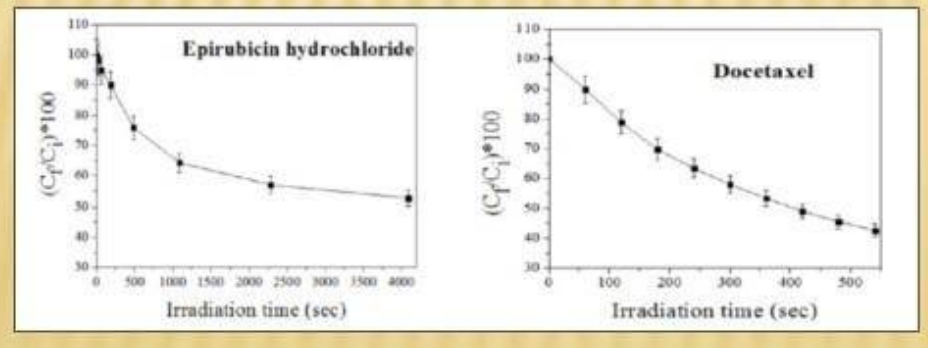












ADVANTAGES AND ORIGINALITY:

- The application of magnetite for the first time in the literature as nanostructured encapsulated catalysts
- are effective, economical in time and energy
- Is a green technology. ınsfer from phases which they separate.
- High selectivity and separation capability of the compounds termolabile from medicine, biology, pharmaceuticals and organic.

Acknowledgements: *This work was supported by MEC – UEFISCDI, projects 51PCCDI/2018 and PN 19.23.03.01.04.*

Elastomeric films for the degradation of anti-tumor drug wastes in photocatalytic reactors

Rodica Mariana Ion, Paul Niculae Ghioca, Ramona-Marina Grigorescu, Lorena Iancu, Madalina -Elena David, Nelu Ion

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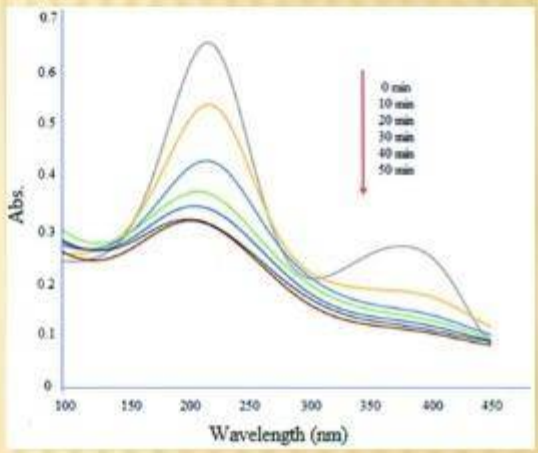
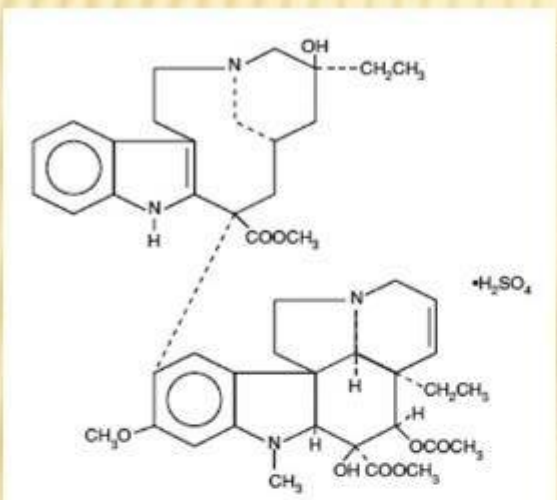
A2020-00030/23.01.2020

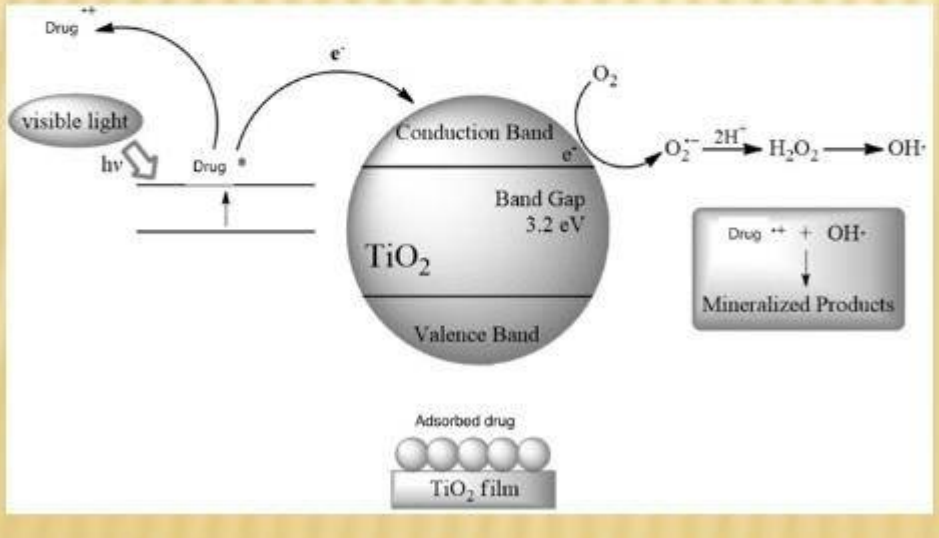
The invention provides an elastomeric film used for the degradation of anti-tumor drug waste in photocatalytic reactors (Fig.1) and the process for obtaining it. The elastomeric film according to the invention comprises particles up to 200nm of titanium dioxide 2-6% relative to the mass of the elastomer, which is dispersed in block styrene-butadiene copolymer with stellate structure and with 32% polystyrene and molecular weight of 196,000 g / mol - SBS, with a resistance to thermo-oxidative degradation of the styrene-butadiene block copolymer up to 60°C.

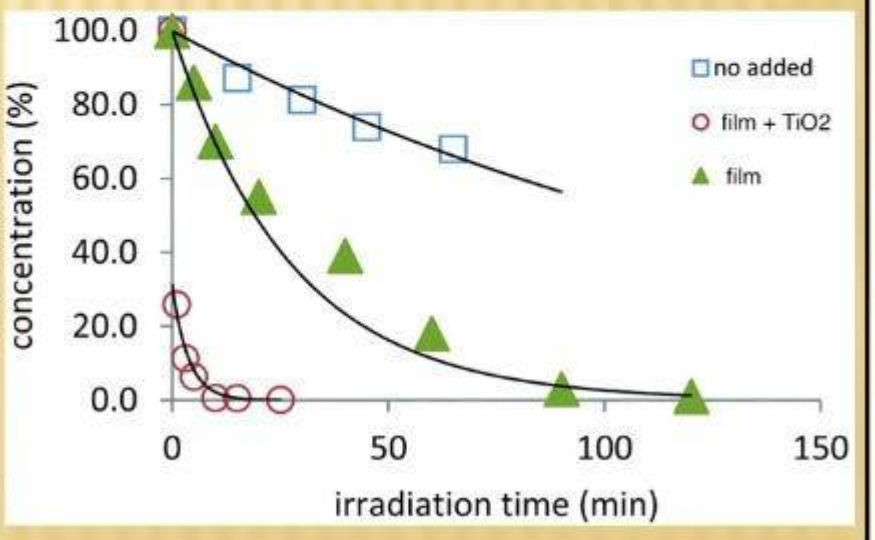




PHOTODEGRADATION

- Photodegradation is the process by which light-sensitive drugs or excipient molecules are chemically degraded by light, room light or sunlight.
- The variation of degradation depends on the wavelength of light, shorter wavelengths because more damage than longer wavelengths.
- Before a photodegradation reaction can occur, the energy from light radiation must be absorbed by the molecules.
- Photodegradation of the chloroquine and primaquine gives the various product through different pathways.





Acknowledgements: *This work was supported by MEC – UEFISCDI, projects: 51PCCDI/2018 and PN 19.23.03.01.04.*

2020

A00073/2020

Natural fungicidal composition for combating grapevine downy mildew and method of obtaining it

Irina Fierascu[1], Radu Claudiu Fierascu[1], Toma Fistos[1], Liliana Cristina Soare[2], Camelia Ungureanu[3], Diana Vizitiu[4]

[1] National Institute for Research & Development in Chemistry and Petrochemistry - ICECHIM, Emerging Nanotechnologies Group; [2] University of Pitesti; [3] University Politehnica of Bucharest; [4] Institute for Biotechnologies in Horticulture Stefanesti

The present invention relates to an ecological composition for combating pathogenic strains that affect grapevines (*Plasmopara viticola* (Berk. & MA Curtis) Berl. & De Toni, (1888), responsible for the grapevine downy mildew), based on phytosynthesized silver nanoparticles using alcoholic extracts of *Dryopteris filix-mas* (L.) Schott rhizomes.

This ecological composition to control pathogenic strains affecting grapevine crops has the property of direct application in culture without requirement of other chemicals as transport vectors.

BEFORE

AFTER

This ecological composition to control pathogenic strains affecting grapevine crops uses non-toxic solvents, has no adverse effects, is cheap, and has no negative effect on the environment and human health.

ICECHIM - Bucharest

University of Pitesti

Institute for Biotechnologies in Horticulture Stefanesti

University Politehnica Bucharest

This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0332, contract 6 PCCDI/2018, within PNCDI III.

2020

A00072/2020

Antimicrobial coating and with protective role for the natural stone surfaces with cultural value and method of obtaining it

Radu Claudiu Fierascu[1], Irina Fierascu[1], Roxana-Ioana Brazdis[1], Anda Maria Baroi[1], Alina Ortan[2]

[1] National Institute for Research & Development in Chemistry and Petrochemistry - ICECHIM, Emerging Nanotechnologies Group

[2] University of Agronomic Science and Veterinary Medicine, Bucharest

BEFORE TREATMENT

Staining test - granite

Staining test - marble

Staining test - travertine

The present invention relates to a coating material with antimicrobial and protective properties, for natural stone objects (limestone or magmatic rocks) with cultural value, and not only, based on an antimicrobial component (consisting of a hydroxyapatite derivative) in a solution of organosiloxane oligomers (at different concentrations).

AFTER TREATMENT (multiple samples)

Staining test – after 4 h

Staining test – after 48 h

Staining test – after cleaning

ADVANTAGES

The solution uses compounds whose synthesis is fast, economical, and without negative action on the environment and human health

The solution has an antimicrobial component easily to synthesize. In addition, the influence on the treated objects is insignificant from an aesthetic point of view.

This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0413, contract 50 PCCDI/2018, within PNCDI III.

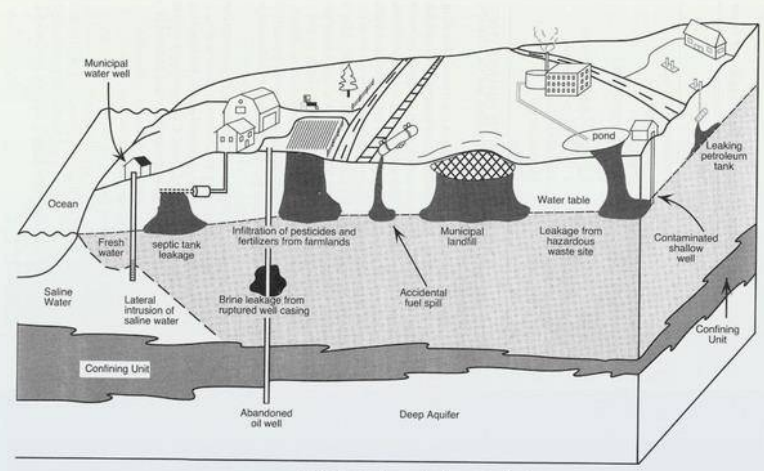
2020

A00380/2019

Adsorbent with magnetic properties based on apatitic material for treatment of impurified waters with organic and inorganic compounds and the method of obtaining it

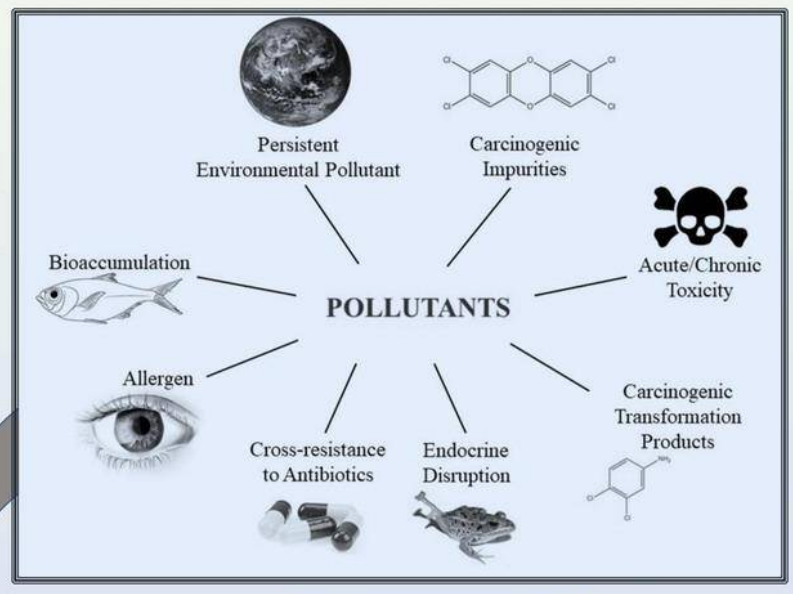
Radu Claudiu Fierascu, Irina Fierascu, Valentin Raditoiu

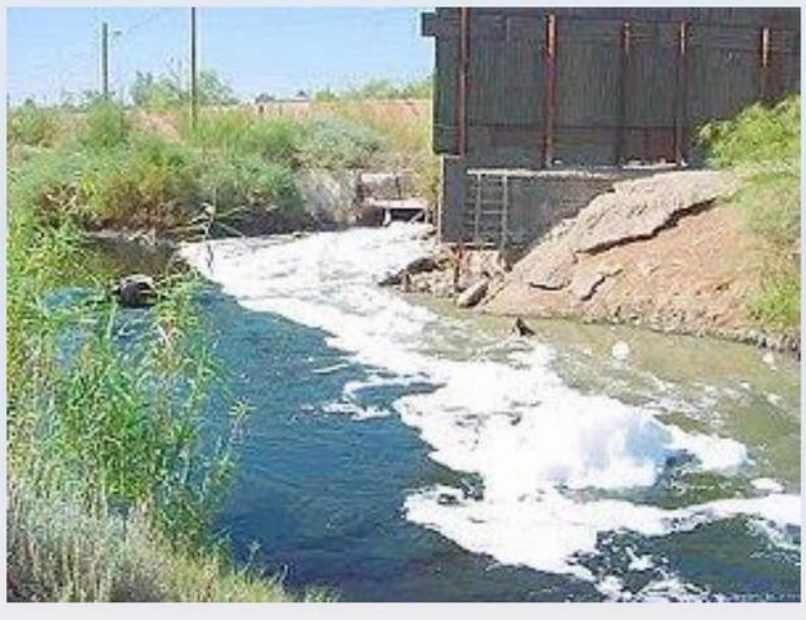
The present invention relates to an adsorbent material composed of an active phase (apatitic material) and a magnetic phase, for the adsorption of organic and inorganic pollutants present in aqueous media, at ambient temperature and atmospheric pressure.



Mechanisms of ground water contamination.

PROBLEM TO BE SOLVED:





Application of the present invention - polluted water sources

Adsorbent removal using an external magnetic field

Acknowledgements

This work was supported by Romanian Ministry of Research and Innovation - MCI through INCDCP-ICECHIM Bucharest 2019-2022 Core Program PN. 19.23 - Chem-Ergent, 2018 Project No.19.23.03.01.

2020

A00074/2020

Antimicrobial pulverisable solution for restoration / conservation of leather supports and method of obtaining it

Radu Claudiu Fierascu[1], Irina Fierascu[1], Roxana-Ioana Brazdis[1], Anda Maria Baroi[1], Alexandru Stirban[2], Ariana Codruta Leahu[2], Alina Ortan[3]
[1]National Institute for Research & Development in Chemistry and Petrochemistry - ICECHIM, Emerging Nanotechnologies Group
[2]National Museum of the Union, Alba Iulia
[3]University of Agronomic Science and Veterinary Medicine, Bucharest

LEATHER ARTEFACT

PARCHMENT

OLD LEATHER

NEW LEATHER

The present invention relates to an antimicrobial pulverisable solution based on a mixture of hydroxyapatite, calcium oxalate and zinc apatite (composed from a hydroxyapatite derivative in which calcium has been completely dissociated from zinc), used for conservation/ restoration of heritage objects on leather support.

AFTER TREATMENT

OLD LEATHER

NEW LEATHER

PARCHMENT

This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0413, contract 50 PCCDI/2018, within PNCDI III.

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RECOVERY OF THERMAL ENERGY RELEASED DURING THE BRAKING PROCESS OF A DRILLING RIG BELONGING TO A DRILLING PLANT FOR OIL AND NATURAL GAS WELLS

Patent Application No. A 2017 00869

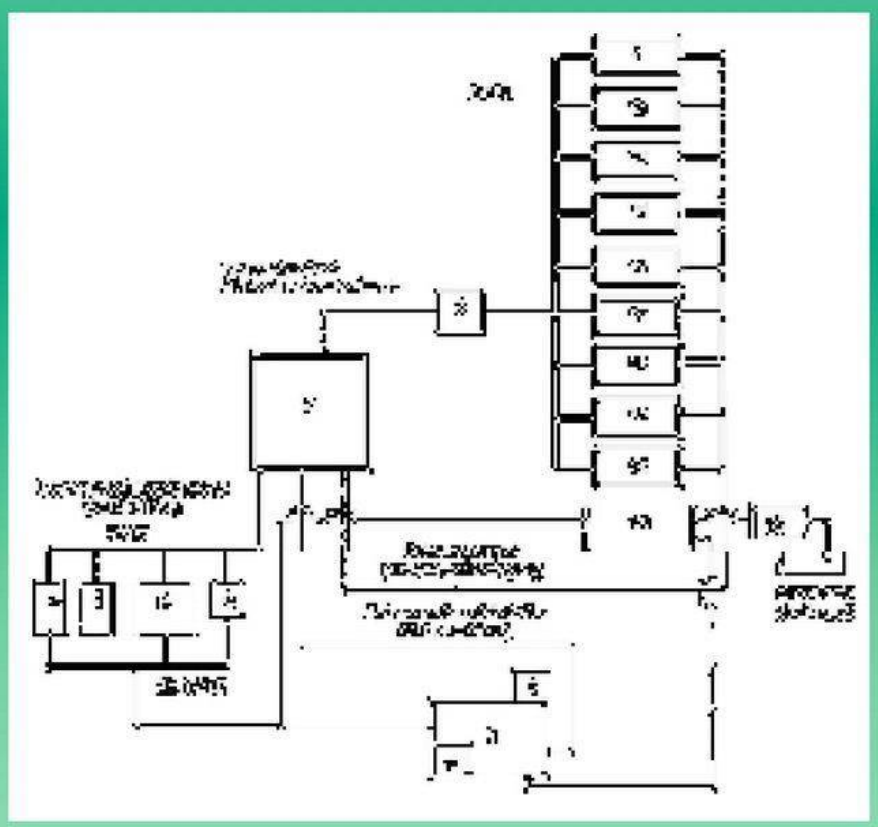
Authors: DOBRE ADRIAN, STOICA VICTOR, MARIN MARCEL DORIAN

Novelty / Description

•The invention relates to the recovery of the thermal energy released in the braking process of a drilling winch belonging to a drilling plant for oil and natural gas wells, with its use in auxiliary activities for example for heating the radiators in the barrels arranged according to the location plan, as well as ensuring the consumption of domestic hot water for the social group.

•The disadvantage of the classic solution is that the thermal energy absorbed by the cooling water is lost, by dissipation in the environment.

•The recovery of the thermal energy is carried out in three stages: in the first stage the hot thermal agent at 74 ° C enters the mantle of the heat exchanger ; in the second stage the cold thermal agent enters the pipe bundle belonging to the heat exchanger; in the third stage the heat agent at 50 ° C enters the radiators and the reservoir of the social group.



Claims: The recovery of the thermal energy released during the braking process of a drilling rig belonging to a drilling plant for oil and natural gas wells, according to the invention, removes the disadvantage mentioned by that, it is carried out by means of a heat exchanger with the mantle and the bundle of pipes, with a single passage in the mantle and several bundles, respectively in counter-current, as follows: a primary circuit is realized in which the water with the temperature of 74 ° C enters the mantle of the heat exchanger (7); another closed secondary circuit is made using the water pump (8), which carries water from the pipe network of the exchanger (7) with a temperature of 50 ° C, which reaches the shacks (9), (10), (11), (12), (13), (14), (15) and (16) and in the social group reservoir (17); a third circuit is made up of a cold water supply pipe at 20 ° C originating from the bead (reservoir) of the installation (1) which enters a larger separate reservoir (18) having water temperature of 30 - 35 ° C, due to the heat exchange with the smaller reservoir (17), which has water at 50 ° C from the pipe network of the heat exchanger (7) and the resulting water at 30 - 35 ° C feeds the showers (19) and then evacuates to the sewer.

Advantages:

▪The recovery of the thermal energy released in the braking process of a drilling winch belonging to a drilling plant for oil and natural gas wells, that would otherwise will be used just as a cooling agent for the asynchronous electric motors of the drilling plant.

Applications:

▪Heating the radiators of the shacks of the people that work at the drilling plant.

▪Ensuring the consumption of domestic hot water for the social group.

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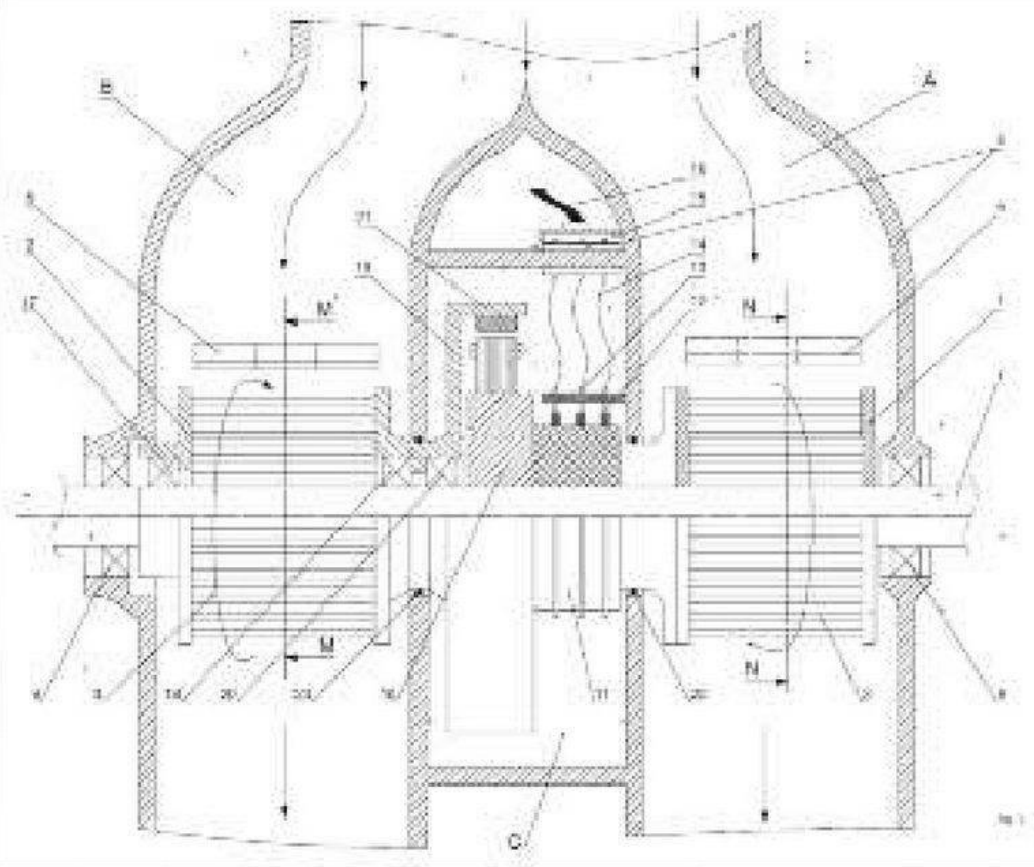
Small hydropower plant with two cross-flow counter rotating turbines

Patent Application No. A 2018 00615

Authors: Nicolaie S., Mihăiescu G. M., Bunea F., Popescu M., Chihaia R.A., Băbuțanu C. A., Dumitru C., Macamete E., Guțu M., Ilie C. I., Fuiorea I.

Novelty/ Description

The invention relates to a small hydropower plant with two cross-flow counter rotating turbines, equipped with two turbines, with transverse flow, with the rotor blades facing each other, located in separate, lateral chambers of the housing. The turbines are mounted with an oblique entry, on both sides towards the water inlet direction, that the hinged construction elements of the housing divide into the two chambers, causing the turbines to operate separately. Due to the reverse orientation the two chambers, the adjusting valves and the blades, the turbines rotate in opposite direction, respectively, counter-rotating.



Advantages:

- ❖ The relative rotational speed as a sum of the speeds of the two turbines gives an important increase in the efficiency of energy conversion compared to the classic solutions with a single turbine and a significant reduction of the mass and the size of the turbine-generator assembly;
- ❖ Possibility to use the energy of rivers with low head and variable water flow rates;
- ❖ Compact and robust construction with two counter-rotating turbines
- ❖ The induced electrical voltage and, finally, the converted power are higher for the same gauge, compared to the classic constructions of electric generators.

1, 2 – turbine with transverse flow, 3 – rotor blades, 4 – housing; 5, 6 – control valves, 7 – shaft. 8,9 – sealing elements, 10 – fitting, 11 – the hub of the collector rings, 12 – brushes, 13 – fixed brush holder, 14 – conductors, 15 – terminal box, 16 – output cable, 17, 18 – sealing elements, 19 – coupling, 20 - sealing element, 21 - inductor armature, 22, 23 – sealing elements.

Applications:

Small hydropower power plants that benefit from medium or low head, micro-hydroelectric power plants, without dam or reservoir.

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MAGNETOSTRICTIVE MOTOR

Patent Application No. A 2016 00324
Author: IGNAT Mircea,DALEA Mihai

Novelty/ Description

This motor is based upon the intrinsic magnetostrictive effect, which is defined as the elongation or contraction of a bar made of magnetostrictive material, following its spontaneous magnetization or as a direct consequence of the increase in the magnetic field acting upon the bar. Several types of magnetostrictive motors, like linear, rotational or stepper, found their own particular places as components of servo-systems. This motor offers a clear solution demanded by the position control in a plain area, using two directions (i.e. two degree of freedom or 2-DOF), with direct application in high precision machining. The ideal material used in magnetostrictive motors fabrication is known as Terfenol-D. This material has remarkable features, which brands it as the "optimum": is capable to deliver a magnetic stress of 1000-2000 ppm for a magnetic field of 50 – 200 kA/m in volumetric materials, operates properly for the largest temperature range and displays an acceptable compromise between high tension and high Curie temperature

. Rotary magnetostrictive motor

Advantages: This material has remarkable features, which brands it as the "optimum": is capable to deliver a magnetic stress of 1000-2000 ppm for a magnetic field of 50 – 200 kA/m in volumetric materials, operates properly for the largest temperature range and displays an acceptable compromise between high tension and high Curie temperature

Applications:

- . electro hydraulic servo valves , high pressure common rail injectors, rotary-linear motion, ultraprecise fabrication operations, active vibration control , etc. In some applications the power consumption may become a critical factor, due to drastic local limitations.

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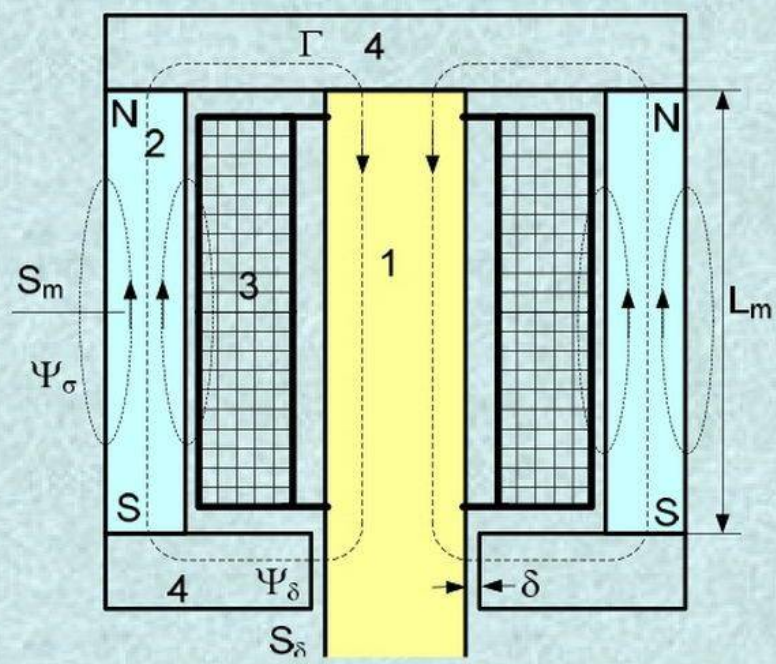
MAGNETOSTRICTIVE ACTUATOR

Patent Application No. A 2016 00324
Author: IGNAT Mircea

Novelty/ Description

This actuator is based upon the magnetostrictive effect, which is defined as the elongation or contraction of a bar made of magnetostrictive material, following its spontaneous magnetization or as a direct consequence of the increase in the magnetic field acting upon the bar. In figure 1, one can visualize the sketch of the actuator utilized in the construction of the magnetostrictive motor under test. The "Terfenol-D" made bar1 is part of the magnetic circuit, subjected to a resultant magnetic field. Two separate sources generate magnetic field. One source is represented by the permanent magnets 2, the other by the inductor 3, whose winding carries the current i_b. The magnetic circuit closes in through the lids 4. The permanent magnets 2 are shaped as a cylinder and deliver a magnetic field with a trace as depicted in figure 1. It is well known that the point of operation for a permanent magnet is placed on the "recoil" segment from the magnetizing characteristic [23]. Both, the magnetizing (i.e. along curve Γ) respectively the leakage flux Ψ_σ are indicated in the sketch.



. Linear magnetostrictive actuator.

Advantages: This material has remarkable features, which brands it as the "optimum": is capable to deliver a magnetic stress of 1000-2000 ppm for a magnetic field of 50 – 200 kA/m in volumetric materials, operates properly for the largest temperature range and displays an acceptable compromise between high tension and high Curie temperature. Very good precision of the linear movement.

Applications:

- .Linear electromechanical drives, electro hydraulic servo valves , high pressure common rail injectors, ultraprecise fabrication operations, active vibration control , etc.

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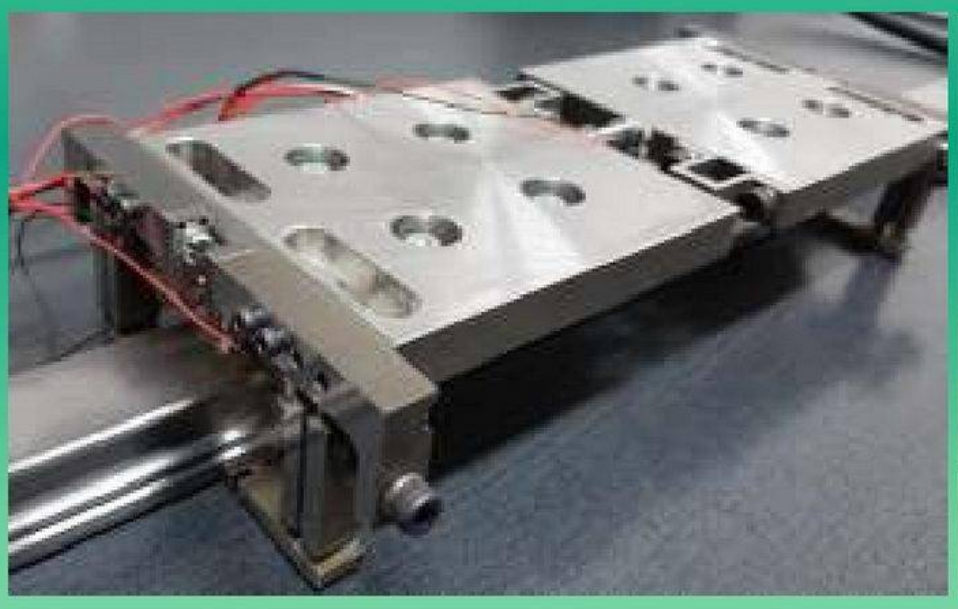
Incremental displacement positioning system by means of two position securing/releasing piezoelectric systems with parallelogram mechanism

Patent Application No. A/01066/2017

Authors: Ovezea Dragoș, Tănase Nicolae, Chiriță Ionel, Ilie Cristinel Ioan, Popa Marius, Lipcinski Daniel, Nedelcu Adrian

Novelty / Description

The positioning system is of "inchworm" type with an advance/retraction system and two clamping devices, driven by low voltage piezoelectric actuators. The clamping devices have compliant parallelogram mechanisms that allow for securing/releasing the current position. In order to compensate for the large mechanical play which is inherent to long travel guideways the compliant mechanisms also behave as mechanical displacement amplifiers. The advance system voltage can be varied in order to adjust the size of the step.
The drive can be used as an ultra precise positioning system (less than 1 micrometer) when a long travel (hundreds of millimeters or more) is also required.



Positioning system

High voltage power supply

Advantages:

- Easy to build using conventional manufacturing systems,
- Controllable step size,
- Sub-micrometer positioning precision,
- Compensation of large mechanical play,
- Supply voltage under 500V,
- Can be scaled with ease for various sizes of industrial guideways,
- Readily available piezoelectric components

Applications:

- Precise positioning for industrial equipment,
- Ultraprecise positioning for laboratory applications,
- Positioning of large optical devices.

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EUROINVENT 2020
EUROINVENT 10th European Exhibition of Creativity and Innovation
Iasi, Romania, 16-18 May 2020

Obtaining procedure and description of the concerned multiferroic material

Jana Pintea, Alina Dumitru, Georgeta Velciu
INCDIE ICPE-CA Bucharest, Splaiul Unirii nr 13, sector 3

Abstract

Mutiferroics are a novel class of next generation multifunctional materials, which display simultaneous magnetic spin, electric dipole, and ferroelastic ordering, and have drawn increasing interest due to their multi-functionality for a variety of device applications. Magnetoelectric (ME) multiferroics are materials in which ferromagnetism and ferroelectricity occur simultaneously and coupling between the two is enabled. Coupling between magnetic and electric orders makes it possible to design promising devices, such as high-speed memories with magnetically and electrically addressable states, magnetically tunable tunnel-junctions, sensors, filters, transducers, etc. In this presentation, we present a multiferroic material based on $BaTiO_3$-$BiFeO_3$ as well as the process of obtaining it.

Keyword: multiferroic materials, physics of multiferroic materials, $BaTiO_3$, $BiFeO_3$.

Procedure for obtaining multiferroic materials and characterisations

The compositions investigated belong to the system (1-x) $BiFeO_3$ - $xBaTiO_3$, where x = 0.3, 0.4 and 0.5. All three compositions were synthesized by solid state reactions. For this experiment, Bi_2O_3, Fe_2O_3, $BaCO_3$ and TiO_2 with a purity greater than 99% were used. The stoichiometric quantities were weighed and ground in a humid environment for 8 hours, used mills and agate balls. The wet environment he used was water. After drying, the blended powders were calcined at 900°C for 5 hours and then in the wet medium for 8 hours to obtain a high homogeneity and increase the grain fragmentation.

Table 1. Structural parameters of the solid solutions (1-x)$BiFeO_3$ – $xBaTiO_3$ (x= 0.3, 0.4, 0.5) ceramics sintered at 1050°C temperature.

Compositions	Associated Structure	Spatial Group	Cell Parameters [Å]		size of crystallites [Å]	V³(Å)	Density (g/cm³)
			a=b	c			
0.7$BiFeO_3$ - 0.3$BaTiO_3$ 1050°C -2h	rhombohedral	R3c (161)	5.643	13.828	90.1	381.44	8.171
0.6$BiFeO_3$ - 04$BaTiO_3$ 1050°C -2h	rhombohedral	R3c (161)	5.648	13.837	88.6	382.33	8.152
0.5$BiFeO_3$ - 0.5$BaTiO_3$ 1050°C - 2h	cubic	P3mP	3.995	3.995	89.7	63.78	6.072

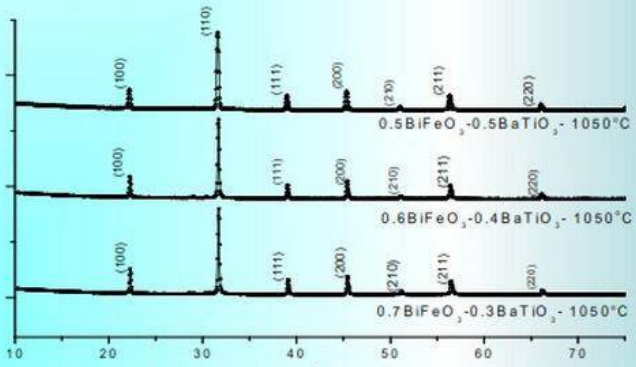


Fig. 1. The XRDdiffraction patterns of the solid solutions (1-x)$BiFeO_3$ – $xBaTiO_3$ (x= 0.3, 0.4, 0.5) ceramics sintered at 1050°C temperature.

The dry mixtures were granulated with 4% polyvinyl alcohol 5% concentration by weight of the material. The mixtures were pressed uniaxial in discs with a diameter of 12 mm and a thickness of 2.15 mm at a pressure of 1200daN / cm².

The disks were sintered at 1050°C for 2 hours in a Carbollite type electric oven. To determine the electrical properties, the discs were electrodes made of silver paste were applied. The crystalline structure of solid solutions (1-x) $BiFeO_3$-$xBaTiO_3$ was examined by X-ray diffraction (fig. 1 and table 1).

The shape and size of the grains were examined by SEM analysis using the Auriga scanning electron microscope from Workstation, produced by Carl Zeiss, Germany (fig. 2). Electrical properties were measured using an impedance analyzer (Agilent 4294A) at ambient temperature in the 40Hz - 30MHz frequency range (fig. 3). Magnetic properties were measured using VSM 7300 Lake Shore for solid samples (fig. 4).

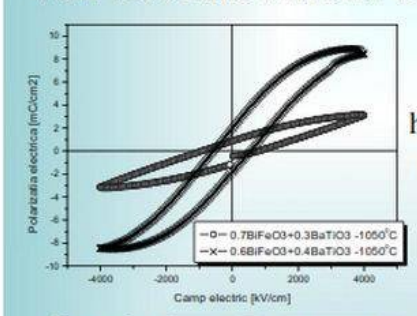
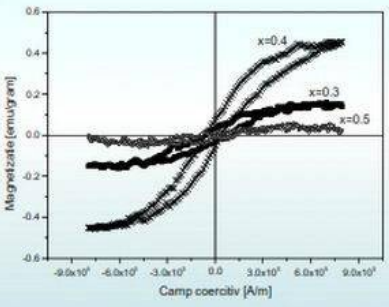


Fig. 3. Electrical hysteresis curves of the probe with x=0.3 and a.4 respectiveles.



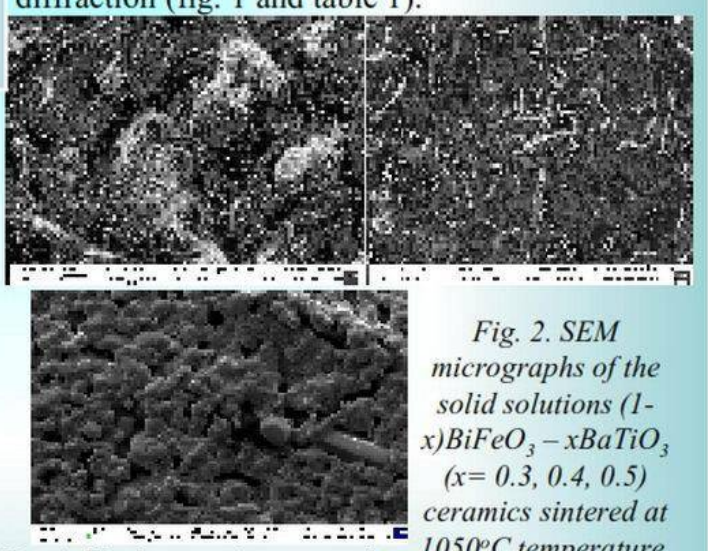


Fig. 2. SEM micrographs of the solid solutions (1-x)$BiFeO_3$ – $xBaTiO_3$ (x= 0.3, 0.4, 0.5) ceramics sintered at 1050°C temperature.

Fig. 4. The hysteresis curves of the probes with x=0.3, 0.4 and 0.5 respectively.

Conclusions The perovskit ceramics (1-x)$BiFeO_3$-$xBaTiO_3$ has been prepared through the solid state reaction method.. The ferroelectrical and ferromagnetic properties of the (1-x)$BiFeO_3$-$xBaTiO_3$ system have been highly changed by the introduction of the $BaTiO_3$. It has also been observed that these properties grow as the $BaTiO_3$ quantity increases.

Acknowledgement : The authors acknowledge the financial support of the Romanian Ministry of Research and Innovation (MCI) through the support of Romanian National Research Program (NUCLEU) nr. 14N/2016, project PN 16110207- "Researches on ferrous / multiferrous materials for the development of new applications"

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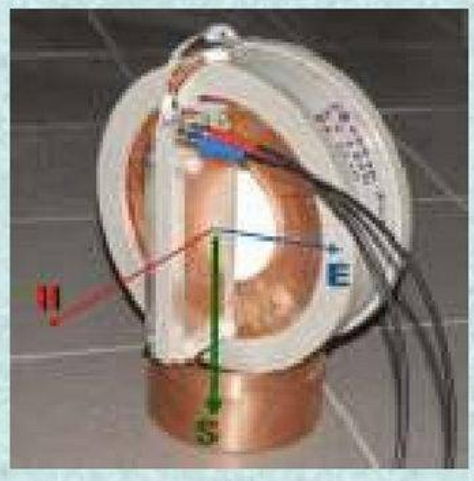
Isotropic sensor for determining the low frequency electromagnetic pollution

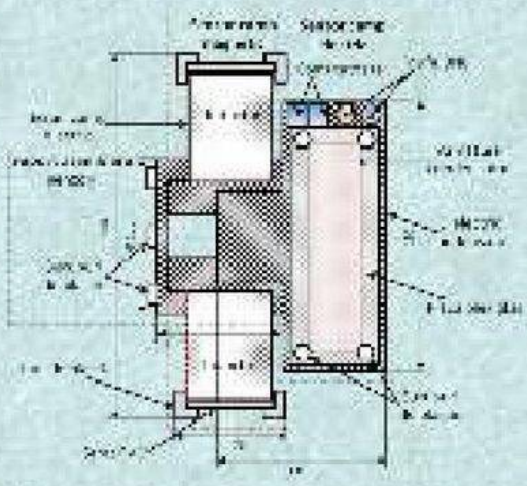
Patent Application No. A/00995/2017
Author: Mihai Bădic, Cristian Morari

Novelty/ Description

•This invention refers to an isotropic sensor for determining electromagnetic pollution at low frequency by measuring the electrical (E) and magnetic (H) components of electromagnetic radiation related to electric energy transmission lines (50/60 Hz).

•The isotropic sensor is based on constructive solutions with inductor as magnetic (H) field sensor and capacitor as electric (E) field sensor correctly arranged in order to measure perpendicular $\bar{E}$ and $\bar{H}$ pairs, according to theory, without the need of integrating amplifiers (which makes it easier to calibrate). It is able to measure the electrical and magnetic components of electromagnetic radiation (the six vector characteristic to electromagnetic radiation in Rayleigh/Fresnel area) in the frequency range 10 Hz – 10 kHz (preferentially at 50/60 Hz, which corresponds to areas affected by transmission and distribution of electricity) with a sensibility better than 5 nT for magnetic field and of 1 V/m for electrical field, with the possibility of identifying the radiation sources due to the dependence of quantities – including the phase difference between E and H – on *r* (the distance from the perturbation source) shown by the equations of elementary electric dipole superimposed on the elementary magnetic dipole (elementary loop antenna).





Experimental model of Isotropic sensor for measuring the low frequency electromagnetic pollution

Advantages:

- High sensitivity for the magnetic field, the main polluting factor;
- Missing of electronic amplification of the signal given by the sensor, which facilitates precision and calibration;
- The perspective of developing passive ultrasensitive devices for the detection of low frequency magnetic fields

Applications:

- Environmental surveillance for professional and civil exposure near high voltage power stations and lines;
- Test laboratories;
- The physics of the low frequency electromagnetic field

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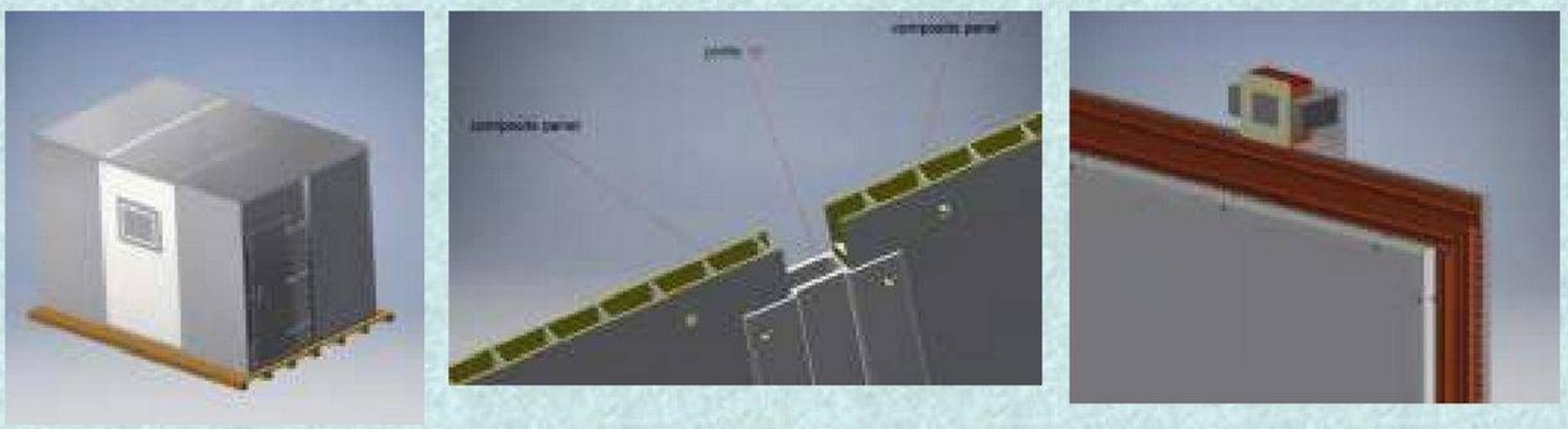
System for electromagnetic shielding of built enclosures in 100 kHz - 18 GHz frequency range

Patent Application No. A/00145/2018
Author: Mihai Bădic, Cristian Morari, Aristofan A. Teişanu

Novelty/ Description

The invention refers to a system for electromagnetic shielding in the 100 kHz - 18 GHz frequency range of already built enclosures, with applications in the industrial, medical, communications, information security and research-development fields. The electromagnetic shielding system in the 100 kHz - 18 GHz range of built enclosures uses a very lightweight modular structure (specific mass of 5.7 kg/m2 for a structure with aluminum foil with 200 μm in thickness), easy to mount, resistant to moisture, with panels covered on both sides with metal foil, which allows the use almost entirely of the space of the enclosure where it is applied, without the need to modify the installations for supplying electricity, water or gas, ventilation systems, communication, or other installations, and without penetrating the wall of the shielded room for mounting filters; it ensures the shielding of the windows so as to benefit from the natural light, it ensures an electromagnetic shielding effectiveness (SE_{dB}) between 60 and 120 dB in the frequency range 100 kHz to 18 GHz.



In order from left to right : Shieded Chamber & bottom full assembly ; constructive detail panels; access door detail

Advantages:

- It can be applied to the enclosures already built, without modifying the existing routes of power and data cables, respectively of windows and access doors;
- Saving time and labor;
- Lightweight and modular construction

Applications:

- Electromagnetic shielding of the enclosures already built in the frequency range 100 kHz – 18 GHz;
- Laboratories of electromagnetic compatibility;
- The possibility of extending the frequency range by adding materials with high magnetic permeability

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OBTAINING METHOD OF CARBON NANOPARTICLES DESIGNED FOR CARBENDAZIM DETECTION

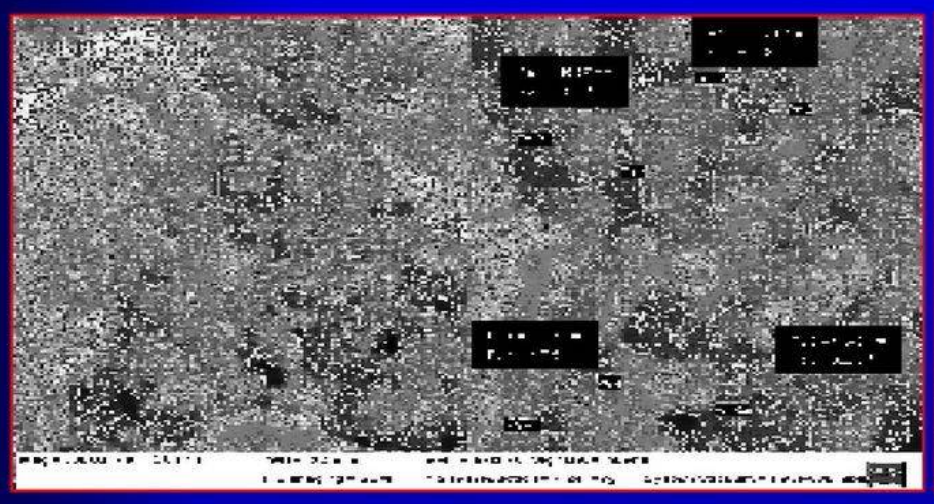
Patent Application No. A/00560/2017
Author: HRISTEA Gabriela

Novelty/ Description:

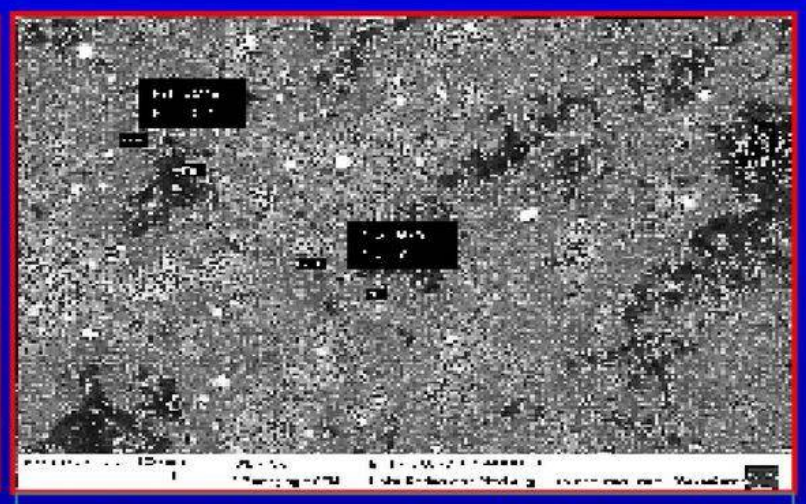
Concern about the presence of ***pesticide residues*** in water, soil and food has led to the identification of new alternative methods capable of detecting trace levels of these compounds in a simple way. Progress in dimensional control of nanoparticles, reactive surfaces and nanoparticle assembly mechanism will open real opportunities for the development of new detection solutions (sensors) as portable instrumentation of detection.

Most applied processes used to obtain carbon nanoparticles used in detection systems consist in: electric arc discharge, laser ablation, plasma methods, chemical vapor deposition (CVD), super-growth CVD, sol-gel methods followed by pyrolytic treatments.

The technical novelty of this invention consists in development of a ***new chemical route*** for obtaining ***carbon xerogel nanoparticles designed for pesticide detection***, with controlable dimensional size within 10-20nm. Dimensional uniformity of obtained nanoparticles as well as their physico-chemical and morphological characteristics allow the rapid and direct detection of carbendazim pesticide in real samples (fruits and vegetables).



Electronic Microscopy of Carbon Xerogel Nanoparticles



Electronic Microscopy of Doped Carbon Xerogel Nanoparticles with Platinum

Method Advantages:

- does not require expensive equipment (as in the case of physical methods)
- the number of processing steps is reduced;
- the synthesis conditions do not involve high temperatures or pressures, no special installations are required, but only usual laboratory equipment;
- the size of the nanoparticles is controllable by controlling the parameters of the synthesis conditions;
- the size of obtained nanoparticles: 10-20nm;
- homogeneous dispersions;
- carbon nanoparticles electrical conductivity : 0.1-1Ω;
- increased sensitivity of nanoparticles in detection of carbendazim by functionalisation (detection : up to 10 nM, 001ppm);
- the use of these particles allows the design of a sensitive interfaces so that the analyte of interest can optimum interact with the sensitive surface (based on these nanoparticles);
- efficient translation of the recognition process;
- development of electroactive labels adapted for electrochemical striping techniques to generate an electrochemical signal.

Applications:

- ❑ **Trace Recognition of Pesticides based Carbendazim** in Real Samples (fruits/vegetables)
- ❑ **Agriculture**
- ❑ **Food Industry**
- ❑ **Food Chain Security**

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PROCESS FOR OBTAINING AN INSULATING MATERIAL FOR ELECTRICAL MACHINES

Patent Application No. 00559/2017

Authors: TELIPAN Gabriela, ZAHARESCU Traian, IGNAT Mircea, VARATICEANU Bogdan, CHEFNEUX Mihaela

Novelty/ Description

The invention relates to a process for obtaining an improved slot insulating material for electrical machine, the insulating material class F insulation 155 consists of a sheet with a thickness of 0.20 mm, of polyethylene terephthalate. The initial insulating material is impregnated by immersion for 24 hours in a mixture of impregnating varnish alkyd-epoxy-melamine + phenolic antioxidant pentaeritritol tetrakis (3-(3,5-dithert-butyl-4-hydroxyphenyl) propionate 0.5% + SiO2 nanoparticles 5%. The tests were performed on 2 electric machines-Figure 1, M1 with untreated insulation and M2 with treated insulation. The tests were performed as follows: the electrical capacity between the windings was measured at the frequency of 1 kHz, the insulation resistance was measured at 1 minute and 10 minutes at an applied voltage of 500 Vcc the results were presented In Table 1. The thermo-oxidative resistance of treated insulation was studied by chemiluminescence method after thermal aging- Figure 2 and γ irradiation –Figure 3.

Table 1

Electrical rotating machine	Electrical capacity, pF	Insulation resistance, GΩ	
		At 1 minute	At 10 minutes
M1	913	252	491
M2	1018	309	600

Figure 1. Image of electrical rotating machine
Characteristics:
Electrical machine type: synchronous;
Nd-Fe-B high energy magnets - 6 magnets
Voltage: 325 VDC; Rated power: 380 W;
Resistance: 3.3 Ω; Inductance: 9.2 mH;
Inertia:0.68 kg cm² Rated speed: 4000 rpm;
Mass: 2.9 Kg.

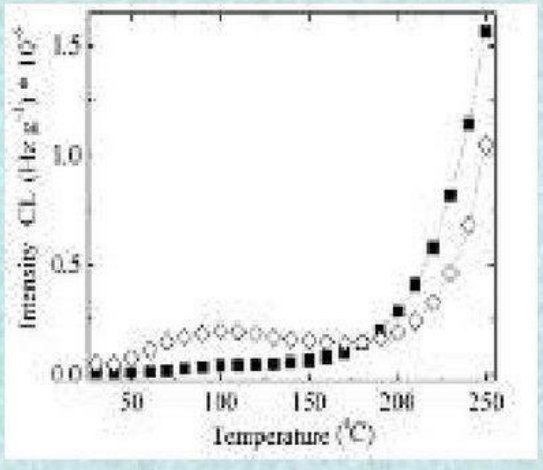

Figure 2. Non-isothermal chemiluminescence spectra recorded on thermally aged samples at 180°C for 240 hours;
(■) unchanged proof;
(◊) sample immersed in the lake + antioxidant + SiO_2 nanoparticles.

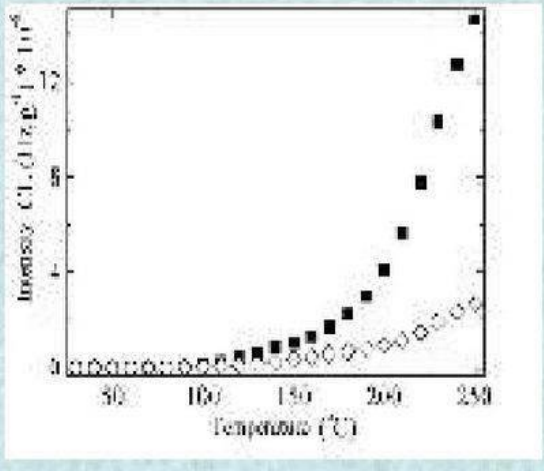

Figure 3. Non-isothermal chemiluminescence spectra
recorded on immersion-modified samples after
irradiation γ at 100 kGy:
(■) unchanged proof,
(◊) sample immersed in the lake + antioxidant + SiO_2 nanoparticles.

Advantages:

The treatment applied to the initial slot insulation with impregnation varnish, phenolic antioxidant and SiO2 nanoparticles leads to:

- The improvement of electrical properties: increasing of insulation resistance and electrical capacity;
- Good thermo-oxidative resistance;
- Increasing of insulation life time.

Applications:

•The invention is applied to the polymeric slot insulation based on terephthalate polyethylene class F 155°C, used in rotary electric machines for improvement of electrical properties and life time.

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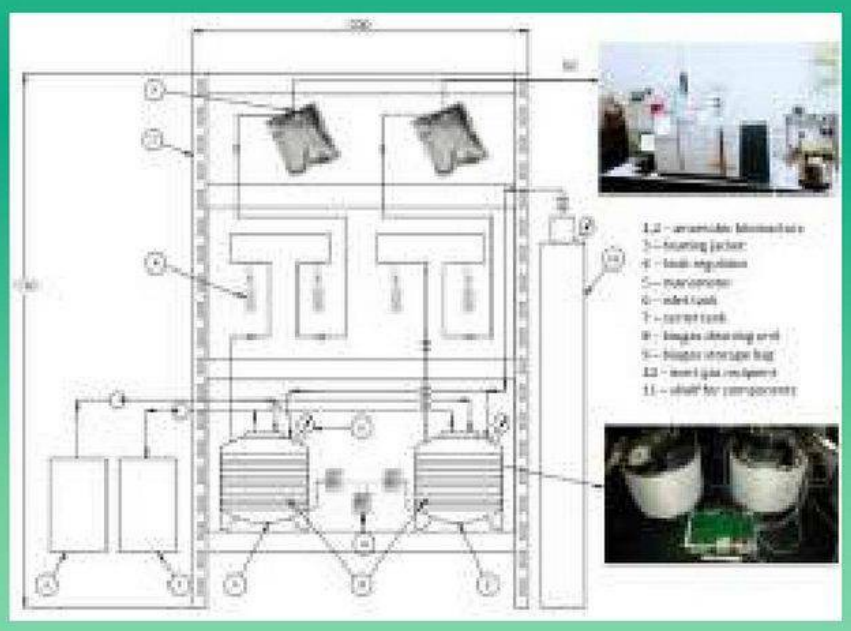
EXPERIMENTAL MODEL FOR TESTING THE BIOMETHANE POTENTIAL OF BIOMASS

Patent Application No. A 2018 00053
Authors: MATEESCU CARMEN, LIPCINSKI DANIEL, LUNGULESCU EDUARD MARIUS, TĂNASE NICOLAE, TÖRÖK LILIANA PARASCHIVA

Novelty / Description

This invention relates to a demonstration experimental laboratory model for testing the biomethane potential of biomass (e.g. agriculture waste, algal biomass, organic fraction of municipal waste, industrial organic waste and wastewaters, catering waste etc.), which integrates into a unitary system two anaerobic fermentation bioreactors operating in parallel in a mesophilic temperature regime, also adaptable for thermophilic regime. Each bioreactor is equipped with an electric heating jacket, a biogas purification line and a purified biogas harvesting recipient, while allowing biogas production to be quantified by volumetric, manometric and chromatographic methods. Moreover, the experimental model allows both manual and automatic sampling of raw and purified biogas samples for laboratory instrumental analysis.



Advantages:

- Designed for simultaneously testing two samples of the same or different types;
- Allows adjustable temperature regime;
- Allows biogas cleaning and regeneration of materials;
- Includes components readily available on the market at an affordable cost;
- Easy to set-up in any research or didactic laboratory.

Applications:

- Determining the biogas potential of various organic materials;
- Identification of new local bioresources with energy potential (e.g. algal biomass);
- Laboratory-scale experimental research prior to the development of waste-to-biogas projects;
- Practical demonstration activities for students.

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WIND TURBINE BLADES WITH GEOMETRY INSPIRED BY THE BIOENGINEERING MODEL OF THE THISTLE SEED

Authors: GEORGE POTERAȘ, Ph.D Eng.; Eng. DEÁK GYÖRGY Ph.D Habil.; IONEL NEACȘU, Eng.

Introduction

The invention relates to a wind turbine equipped with blades based on a bioengineered model inspired by nature, namely the thistle seed (Carduus nutans). According to the invention, the wind turbine, is provided with 8 blades arranged radially on 3 levels (1). The blades are fixed on a vertical axis and can be both intubated in a cylindrical turbine provided with slots and deflectors (2) or arranged radially and embedded in a sphere, with vertical or horizontal axis (3), the number of blades being variable in this case, from 8 to 16 blades, depending on the diameter of the sphere [1]. The blades obtained by applying the bioengineering solution, imprint to the turbine axis an improved rotational motion compared to other blade geometries, regardless of the air flow speed. The highest increase (+ 88%) was achieved at low air flow speeds.

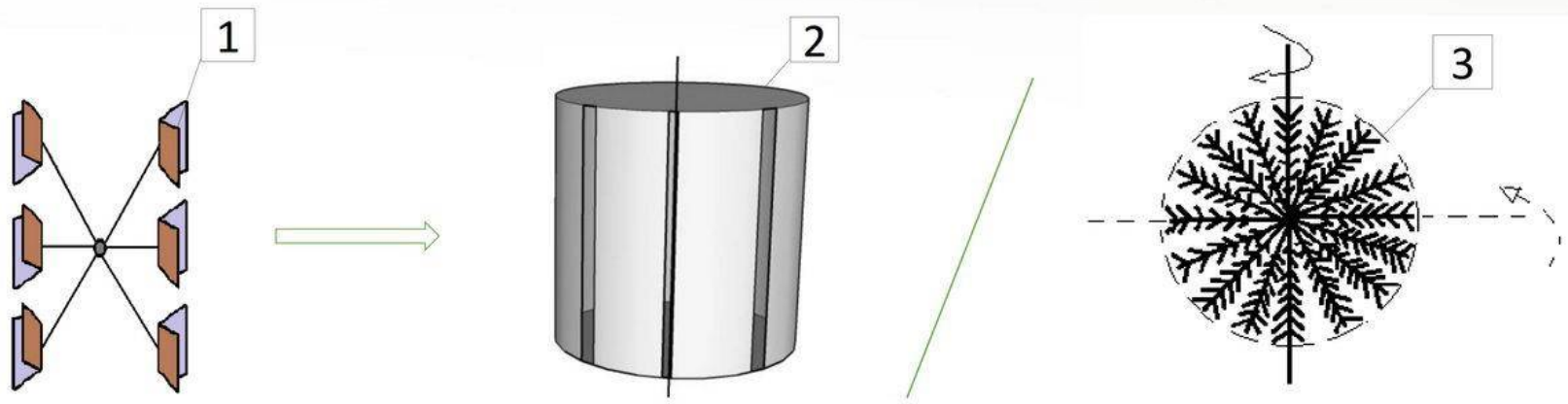

Figure 1: Types of blades with geometry inspired by a bioengineering model

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 research aimed to increase their efficiency through various laboratory tests.

Following these tests it was observed that the turbines provided with blades having the shape adapted to the pattern of the thistle seed present higher efficiency compared to the solutions proposed by the above mentioned patent applications.

The blades which are arranged on the central axis are placed vertically on three levels, in perpendicular planes. Vertical slots for the concentration of air flow are provided on the cylinder's generator, being inclined towards the inner walls of the cylinder. The opening of the slots is variable and the height is proportional to the height of the cylinder.

The opening of the slots can be adjust by a set of deflectors, which are attached to the cylinder through a mobile system, directing the air currents to the blades inside. The purpose of the slot-deflector assembly is to increase the air current velocity that enter in the module, having high effective power for conversion into renewable energy, at small wind velocity [2].

Results and conclusion

The convenience and necessity of the present invention results from the fact that, compared to other types of blade geometries, the laboratory tests indicated that the blades executed according to the bioengineering model of the thistle seed showed superior characteristics, taking on a better yield of air movement. In this sense the potential that our country has in terms of wind energy will be more advantageous exploited. Even though the trapezoidal blades had the lowest rotational speeds, their efficiency can be increased by varying the number and inclination angle of the slots.

Figure 2: Vertical axis laboratory model with geometry inspired by the bioengineering model of the thistle seed

Scenarios	v_x [m/s]	Rotational speed of blades [rot/s]		
		Trapezoidal	Ailanthus altissima	Carduus nutans
S1	1.5	1.20	2.10	2.22
S2	1.8	1.87	2.46	3.17
S3	2.4	2.57	3.60	3.55

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 wind 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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[2] G. Poteras, G. Deák, A.F. Nicolae, I Neacsu, N. S. Raischi, patent no. 131456, Floating installation for the production of electricity from multiple renewable sources, 2018.

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IN-SITE EXPERIMENTAL STAND FOR PHYSICAL MODELLING FOR THE DETERMINATION OF THE HYDRODYNAMIC AND HYDROMORPHOLOGICAL PARAMETERS OF A RIVER / WATER COURSE

Patent application no. A/00130/2020

Invention authors:
DEÁK György,PhD habil.eng.,PhD Eng., , PhD Eng., RAISCHI Constantin Marius, PhD Eng., MATEI Monica, LUMANAROIU Lucian, Eng., CORNĂŢEANU Gabriel, Eng., SILION Madalin, Eng., Petrache Ionut., Eng., BOBOC Madalina, Eng., OLTEANU Marius Viorel, Eng., BADEA Gabriel, Eng., CRISTEA Alexandru,Eng.,

Introduction

The invention entitled „In-Site Experimental Stand for Physical Modelling for the Determination of the Hydrodynamic and Hydromorphological Parameters of a River / Water Course" relates to an innovative method which involves the development of a large-scale in-situ physical model / experimental stand for determining the hydrodynamic and hydromorphological parameters of river / water course, based on natural flow conditions, river bed structure type and climate conditions. In the figures below are presented the in-situ physical model experiments for the Danube section Izvoarele - Vadu Oii..

Figure 1 - Physical model

Methods

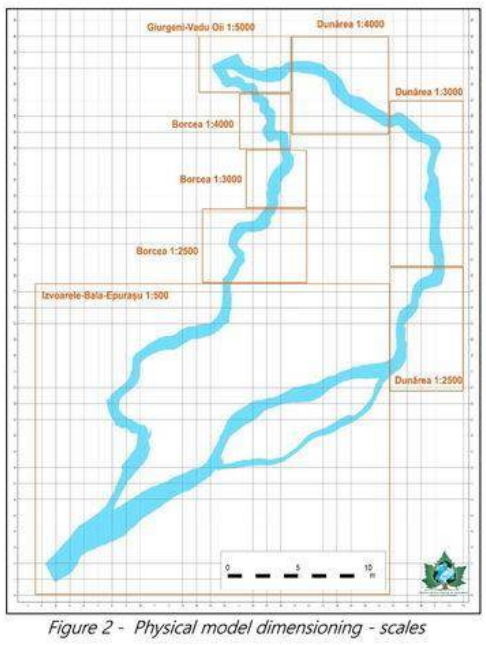

Figure 2 - Physical model dimensioning - scales

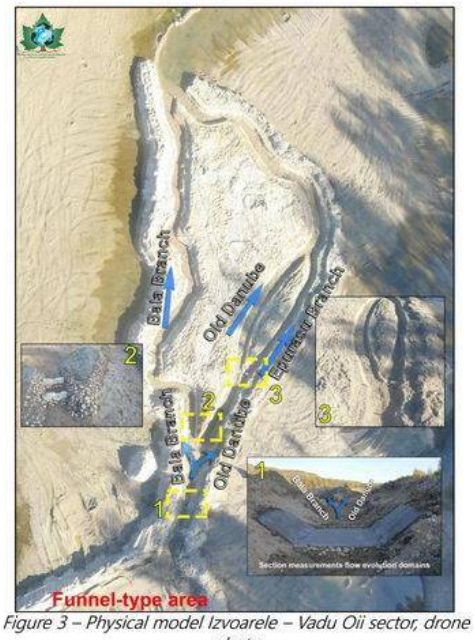

Figure 3 – Physical model Izvoarele – Vadu Oii sector, drone photo

Although modern technology allows the use of numerical simulation methods to assess the initial state, respectively the forecast of the evolution of hydrodynamic and hydromorphological phenomena on different sections of rivers /water courses and implicitly the assessment of the impact on the environment, the results obtained by numerical simulations can be significantly influenced by the lack of information in certain sensitive points which influences in time the general phenomenon on the course of a river / water course. These aspects are not quantifiable by numerical simulations, and in this context it is necessary in addition to their use, determination of the overall evolution by physical models, and determination of the parameters that describe the phenomena of bank erosion and sediment deposition, must be determined the local conditions that improve the level of confidence o the numerical simulations (combining the advantages of numerical models with in-site physical models).

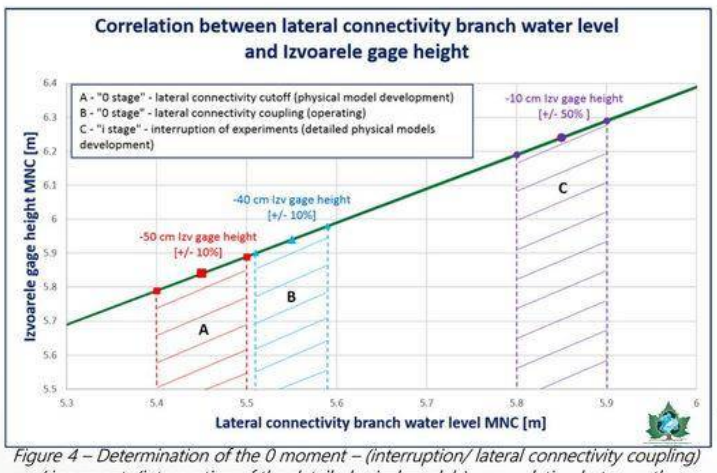

Figure 4 – Determination of the 0 moment – (interruption/ lateral connectivity coupling) / i moment (interruption of the detail physical models) - correlation between the hydrometric rod level and the level of the branch with lateral connectivity

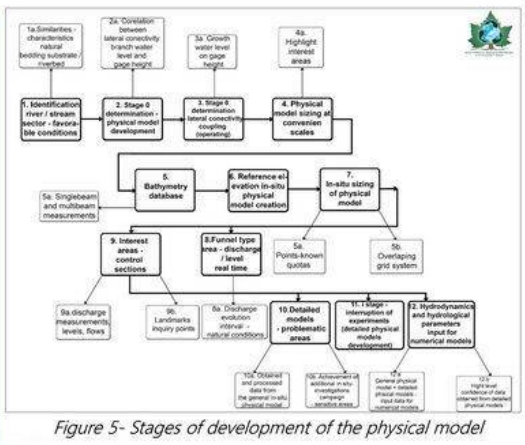

Figure 5- Stages of development of the physical model

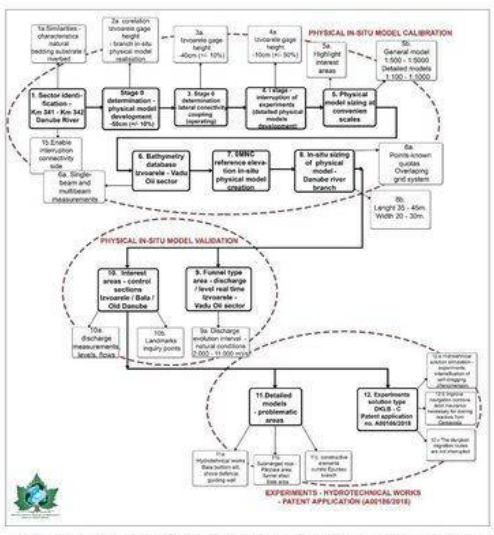

Figure 6 - Stages of development of the in-site physical model for the Izvoarele – Vadu Oii sector

Results and conclusion

The parameters obtained from data processing on both the general in-site model and the detail models are to be introduced in numerical simulation models. They increase the confidence level of the results obtained by granting the necessary intervention time for the elaboration of preventive solutions in terms of reducing the impact on the environment while ensuring in conditions of sustainable development the development of "win-win" solutions for both the environment and air efficiency without endangering the aquatic biodiversity.

Acknowledgments

This work was supported by a grant of the Romanian Ministry of Education and Research, within the RESCMANS NUCLEU Programme (39N/2019), unde the Project *„Monitoring of hydrodynamic and hydromorphological conditions on the Danube river – sector Izvoarele-Vadul Oii, in order to elaborate measures to ensure the friendly navigability with the environment"* (PN 19 43 03 01).

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Spongy composite material covered with Zinc oxide with photocatalytic activity in the UV and VISIBLE spectrum for environmental protection applications Patent Application no. A/00386/27.06.2019

Authors: Eng. Burlacu Iasmina; Eng. Deák György, PhD Habil.; Eng. Marcu Ecaterina; Biol. Cimpoieru Cristina; Eng. Panait Ana– Maria PhD

Introduction

The invention refers to a spongy support material covered with zinc oxide (MS/ZnO) and the process of obtaining it. The spongy support material is based on glass waste from fluorescent tubes, egg shells, Epsom salt fertilizer and it is coated with a layer of zinc oxide (ZnO) which gives it the photocatalytic properties. The obtained material has applicability in the environmental protection field, having a high photocatalytic degradation capacity of the organic compounds from wastewater.

Methods

The process of obtaining the spongy material covered with zinc oxide catalytic functionalized integrates two stages as it follows :

Stage I. Synthesis of the spongy support material (MS)

For the synthesis of MS, a mixture consisting of glass waste from fluorescent tubes, eggshells as foaming agent and anhydrous Epsom Salt as binder, was added in proportions corresponding to the support material recipe. The mixture is ground to a fineness that ensures the total passage of the powder through the sieve of 63 μm. The resulting powder was subsequently cold pressed, applying a pressing pressure of up to 25 tons. The obtained samples were dried at a temperature between 100- 150 ° C for up to 24 hours and then sintered at 750 ° C for about 1- 3 h.

Stage II. ZnO coating of the obtained spongy support material (MS/ZnO)

For coating on the MS surface of the ZnO layer, the oxide was dispersed in ultrapure water, in a mass ratio of 1/1000 - 5/1000. The MS capsule was immersed in the solution obtained and kept for 1 - 2 hours, under continuous stirring. For fixing the zinc oxide layer on the surface of MS, after stirring the MS/ZnO composite material was autoclaved at a temperature of about 110- 150° C, for up to 1h, and subsequently dried, at a temperature between 90- 150° C, for up to 1- 2 h. The obtained material is presented in Figure no. 1.

Both, the final synthesized composite material and the process of obtaining it were developed based on two principles converging to good practices in the field of environmental protection:

- involves the use of waste to obtain the spongy support material (MS), thus contributing to reducing the environmental impact generated by the volume of improperly deposited waste.
- the process does not generate secondary components;

Figure 1: Spongy composite material covered with zinc oxide (MS/ZnO), *Patent application no. A/00386/27.06.2019*

Results and conclusion

The MS/ZnO spongy material was microstructurally characterized using scanning electron microscopy (SEM) and tested in the laboratory to evaluate the degradation efficiency of organic compounds in the UV and VISIBLE spectrum. Figure no. 2 shows the porous structure of the MS/ZnO composite material at the microscopic level using SEM equipment.

According to the preliminary initial experimental results performed in the laboratory on a small scale, the MS/ZnO composite material has potential for applicability in the field of environmental protection, having photocatalytic degradation capacity of the studied pollutant, a pharmaceutical compund from wastewater in the UV spectrum (efficiency over 97 %) and in the VISIBLE spectrum (efficiency of over 43 %), Figure no. 3.

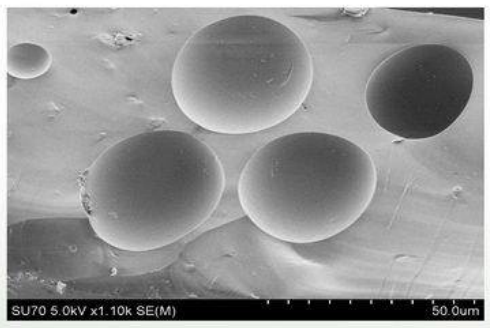

Figure 2: SEM micrograph of MS/ZnO material

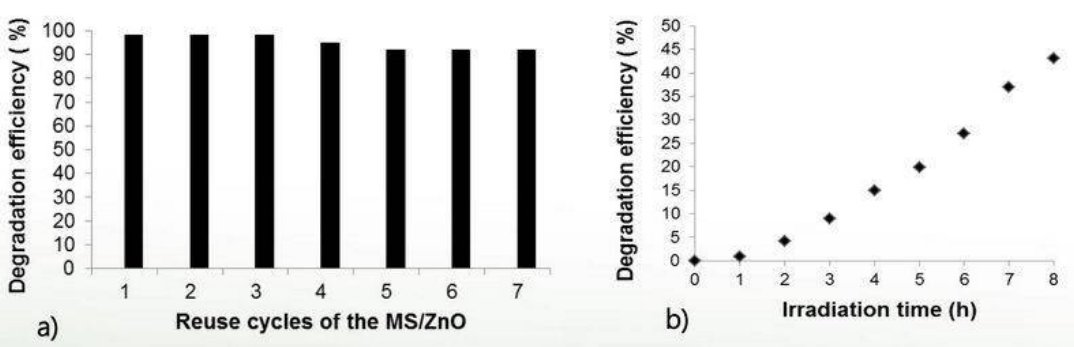

Figure 3: Efficiency of MS/ZnO for degradation of Clofibric Acid (5mg /L) concentration in 200 mL of ultrapure water: a) in the UV spectrum, after different cycles of reuse; b) in the VISIBLE spectrum

Acknowledgments

A part of the research activities that underlie the work has been performed in a project which is part of Research Programme NUCLEU - contract 43N/2018 (PN 18 26 02 03), financed by the Ministry of Education and Research.

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INTEGRATED SYSTEM FOR THE PRODUCTION OF RENEWABLE ENERGY IN COASTAL AND MARITIME AREAS (Patent No. a 2019 00656)

Authors: *PhD Eng. APOSTOL Valentin Gheorghe, PhD Eng. POTERAȘ George, PhD Eng. POP Horațiu, PhD habil Eng. György Déak,; PhD Eng. DOBRE Cătălina Georgiana; PhD SÎRBU Cristina, PhD Eng. TĂNASE Elena-Beatrice, Eng. Natalia Raischi;*

Introduction

The invention relates to a platform that integrates technologies for the production of electric and thermal energy by exploiting several renewable sources: hydraulic, wind and solar. The platform have three modules as in the figure 1. The solar hot water preparation module (1) consists of a right longitudinal solar collector (1.1), a transverse solar collector (1.3), a left longitudinal solar collector (1.2) and a technological space (1.4). The cylindrical aerial module (2) captures both the energy of the wind and Sun, and is constituted by a wind turbine (2.1) with a central vertical axis with eight rows of blades. On the generators of the aerial module (2) are provided vertical slots (2.2) for the concentration of airflow, adjustable by the system (2.3) which also have the supporting role for the photovoltaic cells used to capture the solar energy. The aerial module (2) has also a photovoltaic solar panel with a conical shape (2.4). The cylindrical submersed module (3) captures the hydraulic energy, at the intersection of the central vertical axis of the aerial module (2) with a horizontal axis (3.1) of the module (3) which is provided with a coupling for multiplying and transmitting the rotational speed. The partially submersed module (3) has the same diameter as the aerial module (2). On the horizontal axis (3.1) there are provided 16 rectangular paddles, eight by each sides of the coupling. All the equipment are bounded by a floating platform (4).

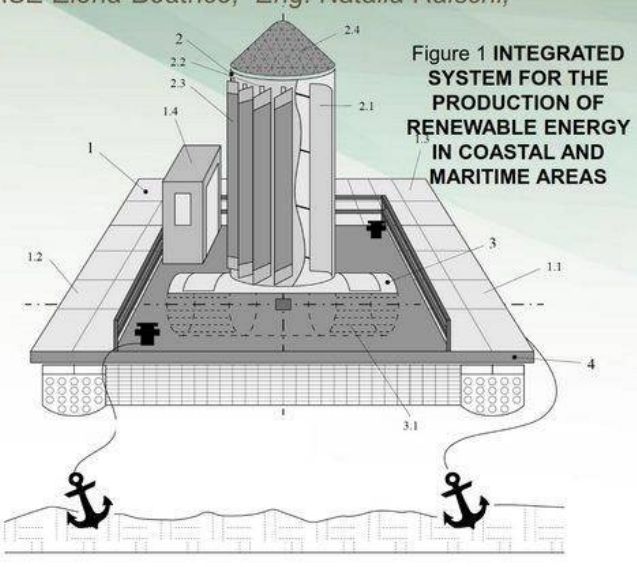

Figure 1 **INTEGRATED SYSTEM FOR THE PRODUCTION OF RENEWABLE ENERGY IN COASTAL AND MARITIME AREAS**

Methods

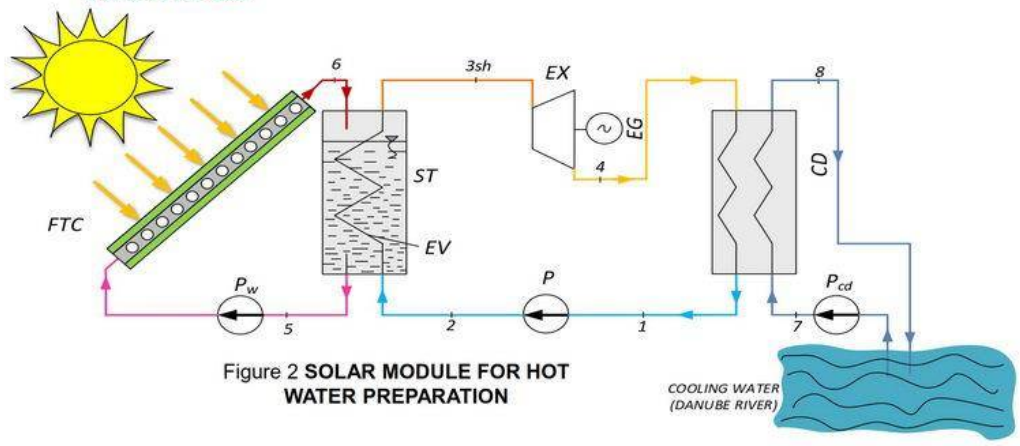

Figure 2 **SOLAR MODULE FOR HOT WATER PREPARATION**

Figure 3 shows the thermodynamic operating cycle of the module in the t-s diagram for dry working fluids. When the starting condition is reached, the working fluid will be vaporized in the Vaporizer (process 2-3), then will be expand from the vaporization pressure to the condensing pressure, producing mechanical work (process 3-4) and electricity through the generator EG, then converted into liquid into the Condenser (process 4-1). Returning then to the Vaporizer at the corresponding vapor pressure, with the help of the pump (process 1-2). The cooling water will be from the river, that will become warmer as it passes through the condenser (process 7-8). The operation of the module depends on the water temperature at the outlet of the tank (ST). When the values of this temperature reach 70 ^{o}C, the module starts operating. Due to this heat absorbed by the FTC from the Sun, the water temperature changes continuously in the storage tank during a day. When this temperature reaches a value of less than 45 ^{o}C, the module will no longer works. At the same time, the operation of the module is strongly influenced by the water temperature of the river.

Results and conclusion

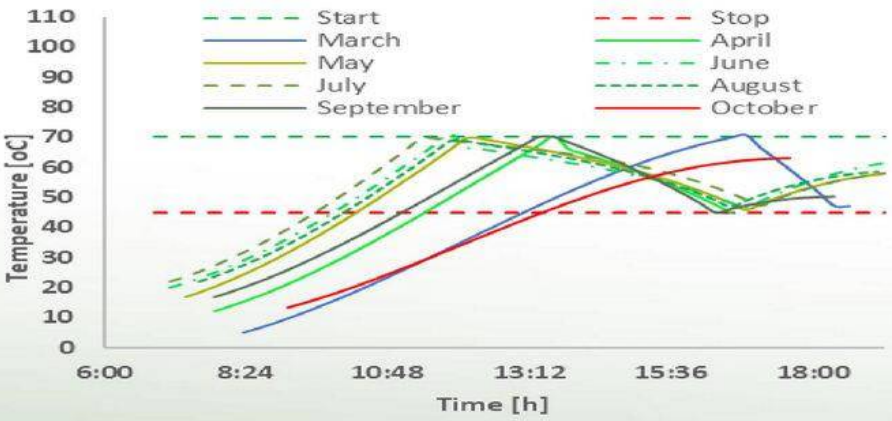

Figure 4 **TEMPERATURE VARIATION AT THE EXIT OF THE STORAGE TANK**

Figure 4 shows the temperature variation of the water at the exit of the storage tank, during a day, from April to September, under specific conditions of the Danube river. In the simulation, the module has reached the starting condition only in presented period, that means a water temperature value of 70 ° C . It can be observed that as the analyzed period approaches the summer time, the starting point of the module approaches the sunrise, which means a longer operating time and thus a higher energy production.

The novelty in to the state of the art refers to the Solar module for hot water preparation (Figure 1 - (1)) through the solar collectors (Figure 1 - (1.1), (1.2), (1.3)), which are integrated parts of the SYSTEM FOR THE PRODUCTION OF RENEWABLE ENERGY. The other technologies that use wind and sun energy are not discussed in this paper, although they were presented as part of the platform. The hot water solar module (Figure 2) is composed of a closed circuit consisting of a flat plate thermal collector (FTC) and a storage tank (ST) in which the water is circulated by the pump (Pw) through the main components of the module: evaporator (Ev), expander (Ex), condenser (Cd) and working fluid pump (P). As the Sun rises, the FTC receives more solar incrising the water temperature inside the ST. When the temperature of the water from ST reaches a set value, the module will begin to produce electricity through the generator (EG). The condenser of the module (Cd) is cooled with water from the river, using the PCd pump, the module will stop working when the water temperature in the ST reaches a set value.

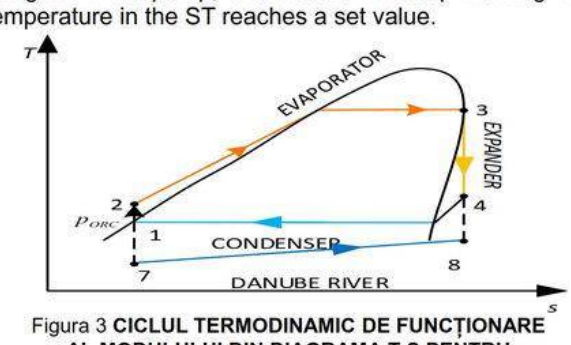

Figura 3 **CICLUL TERMODINAMIC DE FUNCȚIONARE AL MODULULUI DIN DIAGRAMA T-S PENTRU FLUIDELE DE LUCRU USCATE**

The energy production of the solar module also depends on the working fluid used. Figure 5 presents the results of the simulation of the energy production for specific conditions of the Danube river, with the working fluids: R1234yf, R1233zd (E), HFE7100 and R29. The highest energy output of 254.19 kWh was achieved when the solar module operates with the working fluid R1233zd (E). The value of energy production can be considered not very high. However, it could partially cover some of the energy consumption needed for the operation of the platform. The results show that the solar module can be used and integrated in a complex system for the production of renewable energy from natural sources located on rivers / in Romania.

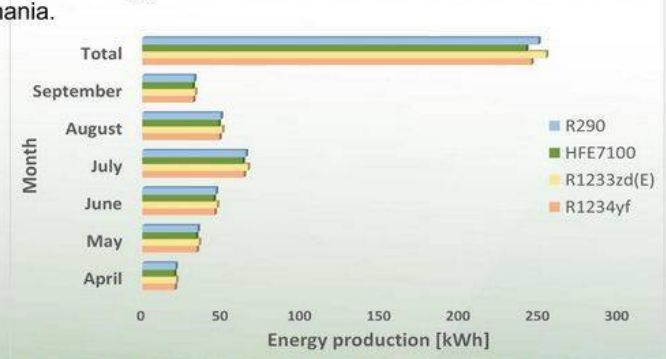

Figure 5 **ENERGY PRODUCTION OF THE SOLAR MODULE FOR SPECIFIC CONDITIONS OF THE DANUBE RIVER (WORKING FLUIDS: : R1234YF, R1233ZD (E), HFE7100 ȘI R290)**

Aknoledgments - The research activities that underlie the work has been performed in a project which is part of Research Program *PN-III-P1-1.2-PCCDI-2017-0406* TEACHERS – contract **81PCCDI** /2018, financed by the Romanian Ministry of Education and Research

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UNCONVENTIONAL RECOVERY PROCESS OF NON-FERROUS METALS FROM SLAGS

Felicia COSMULESCU[1], Florin DRAGOESCU[1], Daniela DUMITRESCU[2], Marian BURADA[2]
[1)]S.C. COSFEL ACTUAL S.R.L.; [2)]National R&D Institute for Non-ferrous and Rare Metals – IMNR

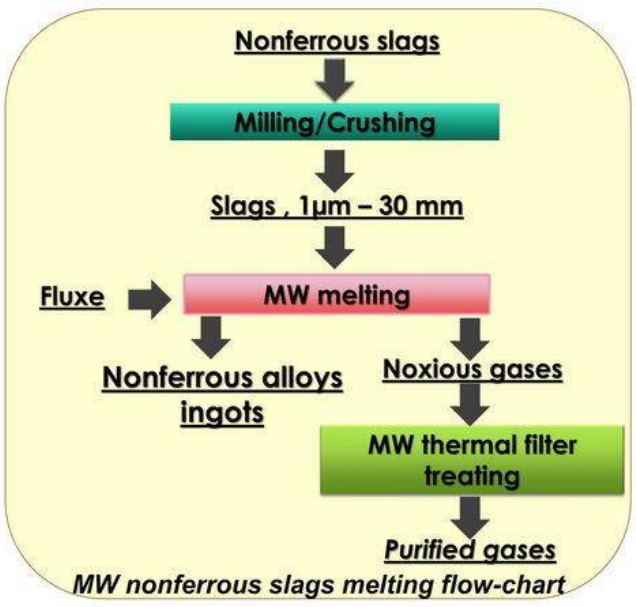
PATENT APPLICATION NO. A/00697/2019 (CLASS NO. 6, 1)

The invention refers to a process of non-ferrous metals recovery from slags using direct microwave (MW) heating in the field of frequencies of 2000-3000 MHz and applied microwave power density of 15-3500 W/kg, in the presence of a reduction agent. The slags are used in the milled form, 1 µm-30 mm, correlated with the depth of microwave penetration as well as the slag composition. The process involves using a microwave melting furnace in which a crucible made of microwave refractory ceramics is placed. By this process, nonferrous metals and alloys (Cu, Al, Zn and their alloys) were recovered with 30-60% efficiency, by melting slags mixed with salt fluxes.

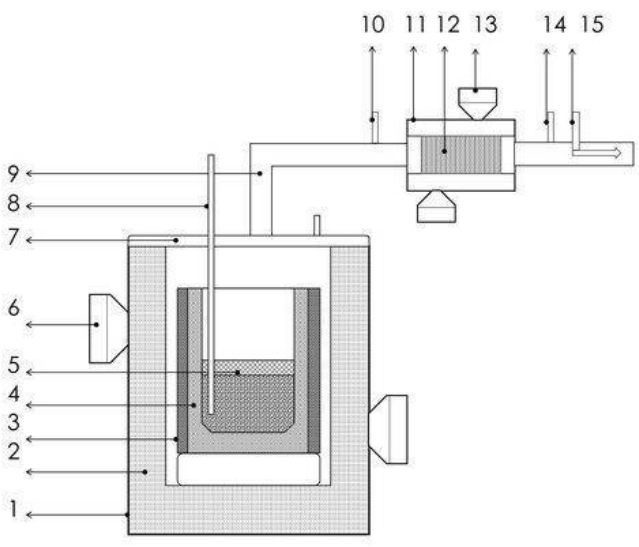
EXPERIMENTAL

Example 1: ***Copper alloys slags***, chemical composition (*wt. %)*
30 – 32.5% Cu, 3 – 5.5% Al, 11.5 – 14.7% Fe, 0.04 – 0.12% Ni, 6.8 – 10.7% Si, 2.7 – 4.5% Zn, 0.3 – 0.5% Sn
Example 2: ***Aluminium alloys slags***: 48-65% Al, 0.3-0.4% Ca, 1-2.5% Fe, 0.5-7.3% Mg, 4.5-7 Si, 0.1-0.2% Zn, 0.1-0.5% Cu, 0.2-1.2% Mn, 0.1-0.3% Ni.
Example 3: ***Zn-Al alloys slags:*** 60-65% Zn, 3.7 - 5% Al, 0.5-1% Cu, 0.1-0.2% Fe, 0.5-1% Mg, 0.7-1% Si.

Slags	Melting flux, composition , [wt. %]
Cu alloys	Na2CO3 (50%) – Borax (dried) (50%)
Al alloys	NaCl (40%) – KCl (40%) – Na3AlF6 (20%)
Zn-Al alloys	Coke (dried)



MW nonferrous slags melting flow-chart



Experimental set – up installation
1.Furnace body (steel); 2.Thermal insulating material; 3.MW susceptor material (SiC); 4.Melting graphite crucible; 5.Charge (slag + flux); 6.Furnace MW magnetrons; 7.Furnace cover (steel); 8.Thermocouple (K-type); 9.Flexible exhaust tube (steel); 10,14.Gas sampling sockets; 11.Melting gases thermal filter treating; 12.MW susceptor material (SiC balls); 13.Thermal filter MW magnetrons; 15.Venturi tube.

RESULTS AND CONCLUSION

Slags	Cu alloys	Al alloys	Zn-Al alloys
Recovery efficiency [%]	35-45	50-60	55-60

- **The recovery of nonferrous metals by direct MW heating of nonferrous slags is a feasible process.**
- **The recovery efficiency depends on the particles dimension of slags (MW penetration depth) as well as melting fluxes composition.**

Acknowledgement: *This paper has been achieved with the financial support of the National Authority for Scientific Research and Innovation and of the Ministry for European Funds, through the project POC-A.1-A1.2.3-G-2015 / ID: P_40_397, Contract 17/01.09.2016, SMIS 2014 +: 105532.*

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HIGH ENTROPY ALLOY FOR HIGH TEMPERATURE APPLICATIONS AND PROCESS THEREOF

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Patent application no. A/00590/24.09.2019

OBJECTIVE

The operating efficiency of the jet engines depends widely on the working temperature and the density of the materials used in their manufacture. These temperatures exceed by far the maximum service temperatures of titanium alloys (600°C) and high alloy steels (450 °C). Ni and Co based superalloys are presently used in practice but at operation temperatures bellow 1000 °C

The invention relates to an alloy with high entropy, resistant to high temperatures and a process for obtaining it. The new alloy is intended for the manufacture of parts that work under extreme conditions, at high temperatures. The thermal annealing treatment ensures the structural stability of the material.

DESCRIPTION

The elaboration process

- elaboration of the high entropy alloy, in an induction furnace with inert atmosphere
- casting in a mould, with controlled atmosphere cooling at room temperature
- mechanical processing to obtain the shape of the engine blade
- thermal annealing treatment
- final processing of the blade

ADVANTAGES

- superior mechanical properties at high temperatures and high resistance to oxidation;
- phase γ ”specific to aeronautical alloys is more stabilized than in conventional alloys;
- processing does not require complex thermo-mechanical treatments to obtain structures with maximum resistance to high temperatures;
- high operating temperatures with higher combustion yields;
- reduces maintenance and replacement costs of engine blades;
- reduces fuel consumption due to the high content of low density elements (Al, Zr).

***Acknowledgement**: This work was supported by research grants of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number COFUND-M-ERA.NET II-HEAMODELL (1)*

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CONCENTRATED COMPLEX ALLOY, OF LOW DENSITY, FOR EXPLOSION PROTECTION DEVICES

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Patent application no. A/00815/28.11.2019

OBJECTIVE

In the past, a large number of concepts designed to prevent or minimize explosions in fuel tanks have been studied. Due to the high complexity and instability, gas-fired systems are less used in practice. Systems based on solid materials have a high applicability and can be installed on various types of vehicles.
The invention relates to a complex concentrated alloy, with low density and its obtaining thereof. The alloy has a high ability to develop high mechanical properties, resistance to high temperatures and corrosion, that go beyond the classical materials. Thereby, the new alloy is designed to manufacture the explosion protection devices for fuel tanks.

DESCRIPTION

The alloy and the process of obtaining according to the invention consists of: elaboration of the complex alloy, in an induction furnace with a protective atmosphere (argon); pouring into the preheated mould, with cooling in a controlled atmosphere at room temperature; mechanical processing to obtain material bars with a diameter of 1-2 cm, fast melt-spinning solidification at 1500 rpm and final processing of the obtained strips. The fast solidification process ensures a geometric configuration specific to the protective devices and a high structural stability of the material.

ADVANTAGES

- the elements used to obtain the alloy are often used in practice
- the high structural stability of the complex concentrated alloy confers superior mechanical properties at high temperatures and high corrosion resistance;
- the intermetallic phases evenly distributed in the material helps to obtain a high hardness without exhibiting fragility;
- the production of small ribbons is achieved through a relatively simple process

***Acknowledgement**: This work was supported by research grants of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number 20PCCDI/2018, within PNCDI III.*

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HIGH ENTROPY ALLOYS WITH PREDICTABLE MECHANICAL PROPERTIES BY COMPUTATIONAL MODELLING – HEAMODELL

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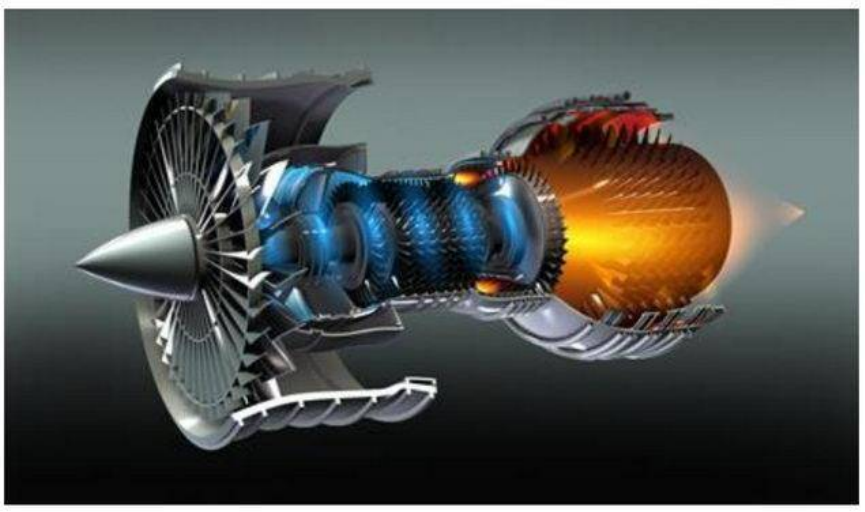
1.National R&D Institute for Nonferrous and Rare Metals – IMNR, Romania;
2.Technical University Delft, Netherlands; 3.Institute of Metals and Technology, Slovenia

PROJECT GOAL

The project goal is the development of multi-scale computational tools for the design of high entropy alloys (HEA) with predictable properties for application in jet turbine engines. The project encompasses an integrated computational approach to deliver a rational path towards composition, structure and properties for HEAs. The project will develop software to select best available alloy compositions for specific applications and will lead to a shortened time-to-market for materials with advanced properties.

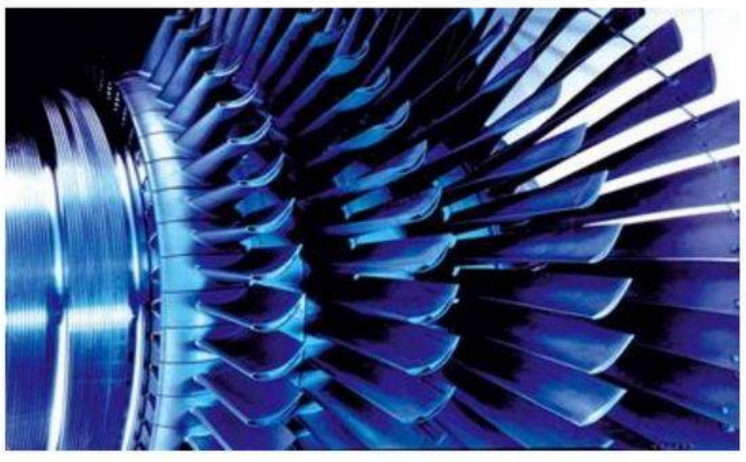


OBJECTIVES

- ★ Establishing of thermodynamic and kinetic criteria for HEA with required properties;
- ★ Creation of multi-scale models for the selection of HEAs compositions;
- ★ Validation of the developed models at laboratory scale;
- ★ Model simulation at pilot scale;
- ★ Intellectual property rights protection.

MAIN RESULTS

- ☑ New multi-scale software by connecting, through python toolkits, best in-kind modelling tools for design of HEAs with targeted properties;
- ☑ HEA formulations for use in jet engine turbines;
- ☑ Technical and scientific data base for new HEAs;
- ☑ High impact journal articles and patent applications in HEAs and software development.



APPLICATIONS

The new software developed in the project will provide solutions for replacement of conventional superalloys in jet engine turbines, thus addressing main issues such as: maximize the efficiency by increasing operating temperature, lower the polluting emissions and lower the fabrication costs of future jet engines.

***Acknowledgement**: This work was supported by research grants of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number COFUND-M-ERA.NET II-HEAMODELL (1)*

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INDIVIDUAL AND COLLECTIVE PROTECTION SYSTEMS FOR THE MILITARY FIELD BASED ON HIGH ENTROPY ALLOYS – HEAPROTECT

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1) National R&D Institute for Non-ferrous and Rare Metals – IMNR, Romania; 2) Politehnica University of Bucharest, Romania; 3) Military Technical Academy, Romania; 4) "Dunarea de Jos" University of Galați, Romania; 5) University of Craiova, Romania

OBJECTIVE

The HEAPROTECT project aims to increase the research and technology transfer performance of R & D organisations in the field of obtaining of performing equipment from new and advanced materials, for the protection of military systems. The project addresses a key national security issue: modern and performing infrastructure. The consortium of the project consists of 4 universities (UPB, ATM, UDJG and UCV) and a research institute (IMNR) with high rebound potential.

DESCRIPTION

The agenda comprises four sub-projects

- Project 1 aims to develop high explosion-proof protection systems for fuel tanks, based on light high entropy alloys.
- Project 2 aims to develop collective protection systems based on high entropy alloys from the AlCrFeMnNi system, microalloyed with Ti, Zr, Hf, Y.
- Project 3 aims to develop modern technologies for non-demountable assembly of components of individual or collective protection systems based on high entropy alloys.
- Project 4 aims to achieve high kinetic energy penetrators based on high entropy alloys, from high density chemical elements.

Each project involves complex and multidisciplinary research activities and benefits from the significant contribution of human expertise and infrastructure on specific areas: the elaboration and processing of high entropy alloys, material weldability and complex systems construction.

MAIN RESULTS

- ☑ Innovative technologies for obtaining fuel tank protection systems, collective protection structures, non-removable assemblies and high energy penetrators;
- ☑ Special and unique tests
- ☑ Patent applications
- ☑ Articles in ISI rated journals, conferences, workshops
  New jobs in R &D sector

***Acknowledgement**: This work was supported by research grants of the Romanian National Authority for Scientific Research and Innovation, CNCS/CCCDI – UEFISCDI, project number 20PCCDI/2018, within PNCDI III.*

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Cu-DOPED BST THIN FILMS DEPOSITION PROCESS BY RF-SPUTTERING METHOD

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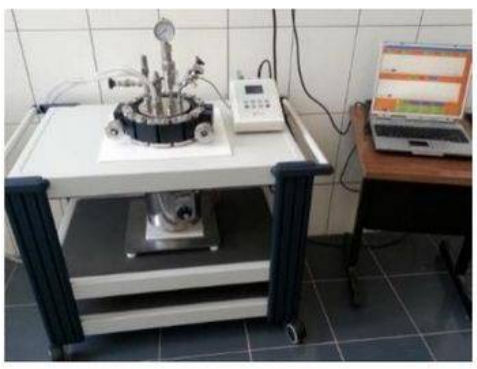
Patent no. 131119/30.07.2019
(developed in project no. 198/2012 – SENSGAS, financed by UEFISCDI)

Abstract

The invention relates to a process for obtaining Cu-doped BST nanocrystalline thin films on substrates used in the field of toxic gas sensors. The process uses sintered targets from doped BST powders, and the films are deposited by RF - Sputtering.

Powder Synthesis

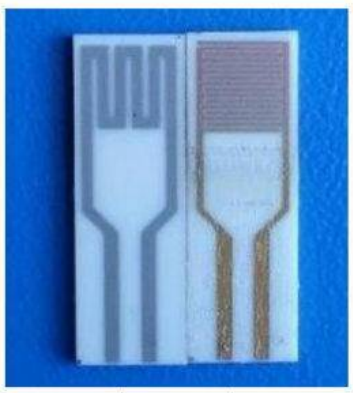


Spray Drying

Pressing and heat treatment

RF-Sputtering deposition process

Deposited sensor



H_2S detector characteristics:

- Operating temp. 230 °C
- Detection limits: 0-100 ppm
- Exit signal: 4-20 mA
- Time for input in normal operation: 30 min
- Response time: max. 2 min
- Recovery time: max. 5 min
- Ex. Protection: Eex sBII T5

Expected impact:

- sensors for metabolic syndrome (PERMED proposal call 2020)
- Corrosive environments (National PD proposal call 2019).

Integrated sensor in H_2S detector

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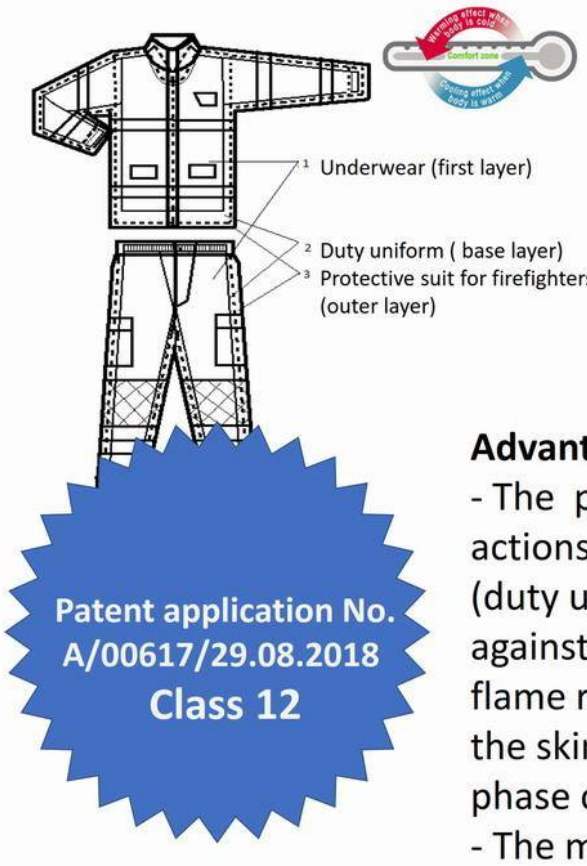
Protective clothing for interventions in emergency situations

Authors: Toma Doina, Popescu Georgeta, Popescu Alina, Olaru Sabina,
Salistean Adrian, Badea Ionela, Neagu Georgeta, Chiriac Iulia
The National Research & Development Institute for Textiles and Leather, INCDTP - Bucharest

Description: The invention refers to a system of protective clothing in modular structure for protecting emergency responders against the multiple hazards, specific to the intervention mission.

The system according to the invention consists of three layers (a, b and c) of different clothes, the first layer (a), worn in direct contact with the skin, is an undergarment made up of blouse and pants, made of knitted fabric of 70% cotton fiber mixed with 30% regenerated cellulosic fibers with content of phase change materials with a mass of 220-250 g/m^2, the second layer (b), the base, is a duty uniform, a suit consisting of blouse and trousers, made of woven fabric from a mixture of fibers including approximately 30-60% aramid fibers, 20-50% flame retardant cellulose fibers, 10-20% polyamide fibers, 2% antistatic fibers with a mass of 190-220 g/m^2 and the third layer (c) of protection, on the exterior, is a protective suit for emergency responders specific to the intervention missions, the patent demonstrator is intented for firefighters protection.

Fields of application:
Clothing system, in modular structure, for protection of emergency responders against multiple hazards present in a response area, during intervention missions (*see variations*).



Patent application No. A/00617/29.08.2018
Class 12

Advantages:
- The protective capability against the hazards specific of the intervention actions and improved comfort properties by integrating in the base layer (duty uniform) of the aramid fibers, with particular protection properties against thermal risks (heat and fire) and / or mechanical risks mixed with flame retardant cellulosic fibers and, in the layer worn in direct contact with the skin, the functionalized cellulosic fibers with content of non-encapsulated phase change materials with temperature control properties;
- The modular structure allows the use of component layers as individual layers or their integration in a configuration specific to intervention missions.

This work is funded by the Ministry of Research and Innovation within Program 1 - Development of the National RD System, Subprogram 1.2 - Institutional Performance - RDI excellence funding projects, Contract no. 6PFE/ 16.10.2018

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NATIONAL INSTITUTE FOR RESEARCH-DEVELOPMENT AND TESTING IN ELECTRICAL ENGINEERING - ICMET CRAIOVA

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

Patent application: RO 132402 A0 / 28.02.2018

Applicant: National Institute for Research Development and Testing in Electrical Engineering - ICMET Craiova;

Inventors: Sacerdoţianu Dumitru, Nicola Marcel - ICMET Craiova; Ivanov Sergiu, Ciontu Marian - University of Craiova; Chindriș Mircea Dorin, Cziker Andrei Cristinel - Technical University of Cluj-Napoca; Radu Alexandru, Dumitrescu Camil-Sorin - S.C. INDAELTRAC S.A. Craiova

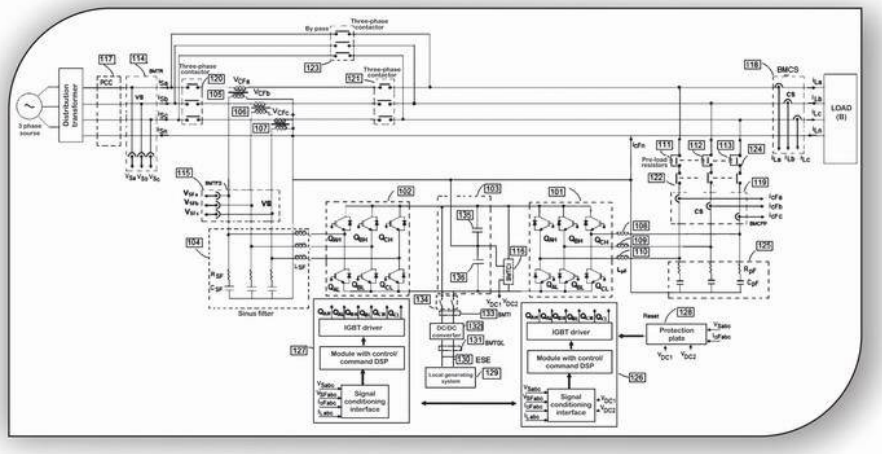
DESCRIPTION

The adaptive system for electric power quality in low voltage networks, according to the invention, consists of an active filter, connected in parallel with the electrical network and with the load and an active filter connected in series with the electrical network. The two active filters consist of two voltage source inverters 101 and 102, interconnected through a joint DC voltage circuit 103, a sinusoidal filter 104, 3 single-phase transformers 105, 106, 107 connected in series to the secondary network, 3 induction coils 108, 109, 110 and 3 power resistors 111, 112, 113 connected to the same point as the load. In order to ensure the necessary quantities, the system has a block 114 for measuring the network voltage, a block 115 for measuring the voltage at the output of the inverter 102, a 116 block for measuring the voltage in the intermediate circuit 103, a block 118 for load current measurement, a block 119 for measuring the current at the output of the inverter 101. The adaptive system is connected/disconnected to the secondary network by using three 3-phase contactors 120, 121, 122, a contactor 123 performing the by pass function, a contactor 124 for the pre-loading of the condensers in the DC voltage circuit 103, a high-pass filter 125. The system also contains two modules 126 and 127 for the control of inverters 101 and 102, an electronic protection module 128, a local generating system 129, energy storage equipment 130, a block 131 for the measurement of the local generator voltage, a DC/DC converter 132, a block 133 for the measurement of the voltage injected into the intermediate circuit 103 and an automated system 134 for connecting the converter 132 to the intermediate circuit 103, consisting of two identical capacitors 135, 136.

APPLICATION

The adaptive system for electric power quality is used in low voltage networks as follows:

- During the entire time of operation, and at any point of location of the adaptive system, the supply voltage values are in the range of Un ± 10%, considering Un = 230V A.C. between each phase and the neutral conductor;
- It provides the compensation of the supply voltage unbalance so that during the entire time of operation, and at any point of location of the adaptive system, the values of the negative unbalance factor of the supply voltage system will be limited to 2%;
- It provides the limitation of the actual values of each individual voltage harmonic at the values stipulated by the regulatory documents and of the total supply voltage distortion value (including all the harmonics up to 40th order) at 8%;
- It provides the compensation of the single-phase dips with 70% amplitude and 180 ms duration and of the three-phase dips with 50% amplitude and the 90 ms duration;
- It provides the compensation of the 10% amplitude voltage swells for a 230 ms duration if the phenomenon occurs on a single phase, and a 100 ms duration if the voltage swell occurs on all phases of the supply network;
- It provides the limitation of the actual values of each individual current harmonic at the values stipulated by the regulatory documents and of total mains current distortion value at 5%.



Architecture of the adaptive system

ADVANTAGES OF THE PATENT EMBODIMENT

The following advantages are obtained by applying the invention:

- It provides the compensation of the supply voltage distortion (harmonics, unbalance, slow and rapid fluctuations, etc.) and at the same time the compensation of currents distortion: harmonics and unbalance;
- It decreases the adaptive system losses by introducing sinusoidal filters and mains connection inductors made with very low-loss materials;
- It supplies the reactive power required by users;
- It provides the speed of response required to compensate the voltage and current distortion.

RESULTS

Functional model

a) Overview of the system; b) Overview of the measurement and control modules; c) Overview of power circuits

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MONITORING METHOD AND SYSTEM FOR THE SAG OF OVERHEAD POWER TRANSMISSION LINES CONDUCTORS

Patent application: A/01090/12.12.2018

Applicant: National Institute for Research Development and Testing in Electrical Engineering - ICMET Craiova

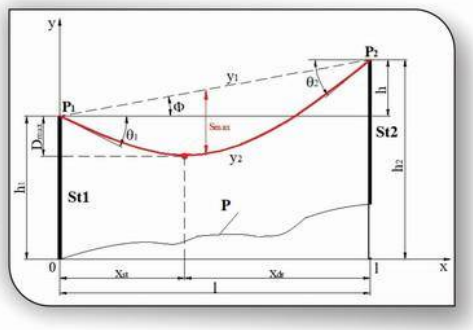
Inventors: Sacerdoţianu Dumitru, Nicola Marcel, Vintila Adrian, Nicola Claudiu, Hurezeanu Iulian, Lazarescu Florica - ICMET Craiova; Popescu Paul - University of Craiova - Faculty of Mathematics; Purcaru Ion, Albița Anca - S.C. VIG S.A. Craiova

DESCRIPTION

The invention refers to a method and a system for the continuous monitoring of the sag of high-voltage overhead power lines in the electric power transmission and distribution systems.

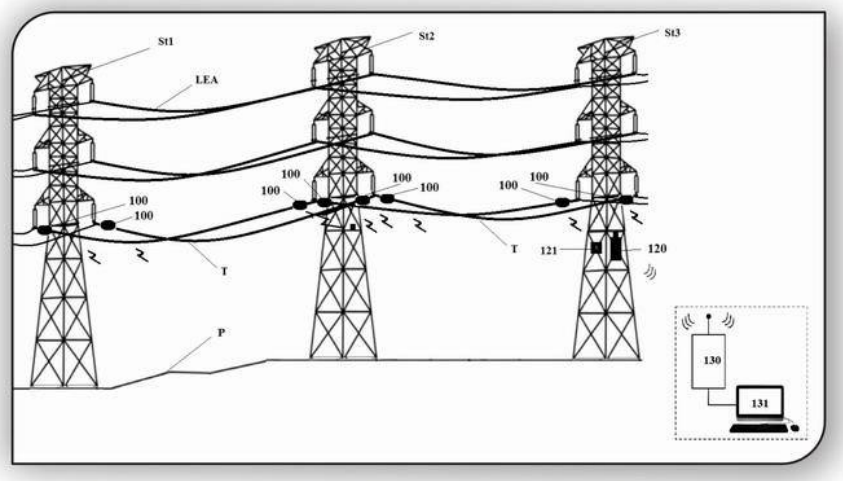
The method, according to the invention, consists in the acquisition of data from the acquisition modules (100) located at the potential of the line conductor, by using the tilt sensors of the line conductor, and these data are used for the calculation of the conductor sag, according to a generally valid method for all types of conductors.

The system, according to the invention, consists of two acquisition modules (100) located on a T-section of the high voltage overhead power line conductor, which include the tilt sensors of the line conductor, power supply sources, a WiFi module for communication with a local data acquisition and remote transmission unit (120), powered by an independent source (121), a communication module (130) and a system (131) for calculating the sag of the electric conductor.

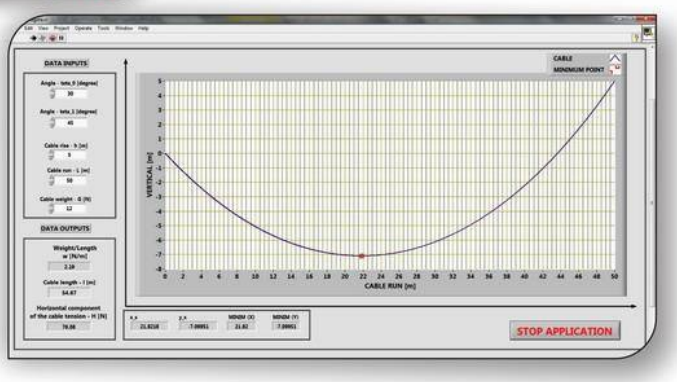


Representation of the operands for a section of the power line for rugged ground

Mini-test bench for the method
1 - Inclinometer; 2 - Support of inclinometer; 3 – Local display mode of the tilt with the output connected to a computer



Schematic representation of the component layout of the overhead power transmission line conductor sag monitoring system



Software interface

PROPOSED METHOD

In terms of the sag calculation method, starting from the inclinometers output it can be accurately determined by using the catenary equation, the information from the inclinometers output and the distance between two successive poles. All this is the result of the understanding the fact that the shape of a conductor stretching a ***T*** section between two points is approximated by using the catenary equation. For the general cases including uneven heights of suspension points and rugged ground as well as plane ground, the maximum sag is calculated according to the relationship,

$$S_{max} = \frac{l(B-A)}{C^2}\left[arcsh\frac{B-A}{C} + arcchA\right] - \frac{l}{C}\sqrt{1+\frac{(B-A)^2}{C^2}} + l\frac{A}{C} \quad (1)$$

where:

$$A = \sqrt{1+tg^2\theta_1} \quad (2)$$

$$B = \sqrt{1+tg^2\theta_2} \quad (3)$$

$$C = arcsh(tg\theta_1) + arcsh(tg\theta_2) \quad (4)$$

ADVANTAGES OF THE PATENT EMBODIMENT

The following advantages are obtained by applying the invention:

- The method is generally valid for all types of conductors, without introducing specific characteristics thereof;
- The system is simple and easy to achieve;
- The system uses quantities which can be measured with accuracy: the tilt of the conductor and the distance between the poles;
- It is a precise system;
- It detects the faults in their early stages, to prevent serious failures in the electric power transmission and distribution networks;
- A consistent database can be achieved, based on long-term data acquisition;
- The sag calculation relationships can easily be implemented;
- It provides increased efficiency of the maintenance technologies;
- It provides the proper protection of the operating personnel and the environment.

APPLICATION

The monitoring of the sag of the electrical conductors related to the overhead power lines and the location of the overhead power line section with potential operating hazard.

The influence of diisocyanate structure on the crystallization of polyethylene glycol-based polyurethanes

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"Petru Poni" Institute of Macromolecular Chemistry, Aleea Grigore Ghica Voda No. 41-A, 700487 Iasi
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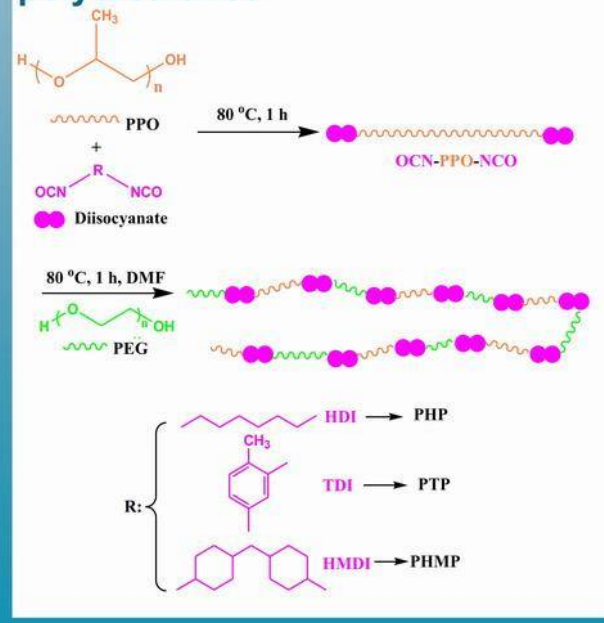
Aim of the work

- synthesis of new polyethylene glycol-based polyurethanes with different diisocyanates
- the influence of the diisocyanate structure on the crystallization of the PEG-based polyurethanes
- thermal stability, crystallization behavior and spherulitic morphology

Materials

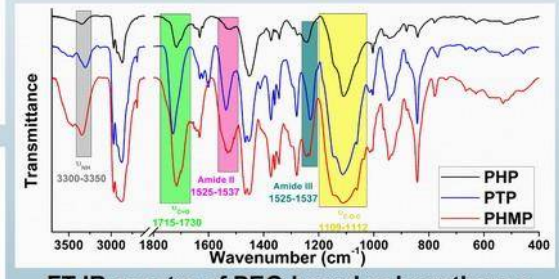
- polypropylene oxide 2000 (PPO)
- polyethylene glycol 1500 (PEG)
- 1,6-hexamethylene diisocyanate (HDI)
- 2,4-toluene diisocyanate (TDI)
- 4,4'-methylenebis(cyclohexyl isocyanate) (HMDI)
- N,N'-dimethylformamide

Synthesis of PEG-based polyurethanes

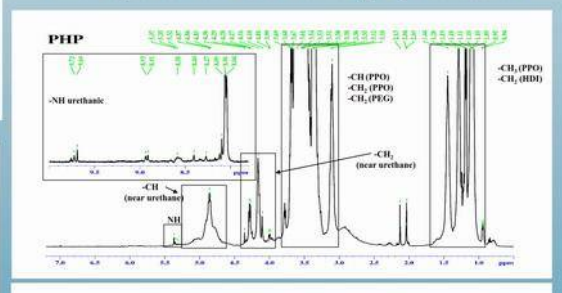


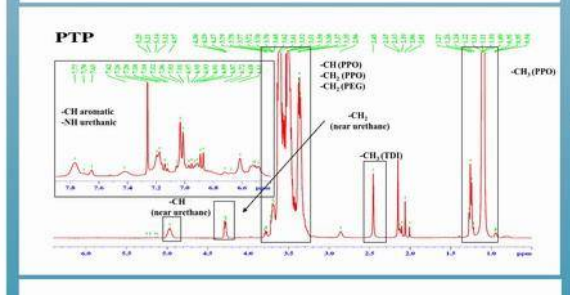
Results and disscusion

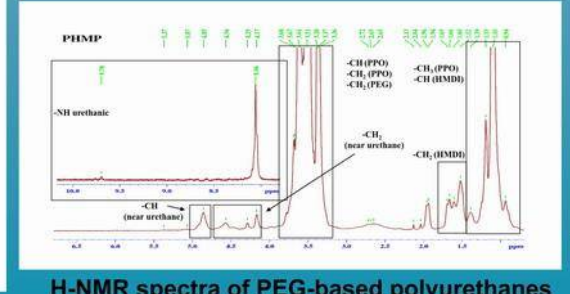
Structure confirmation



FT-IR spectra of PEG-based polyurethanes

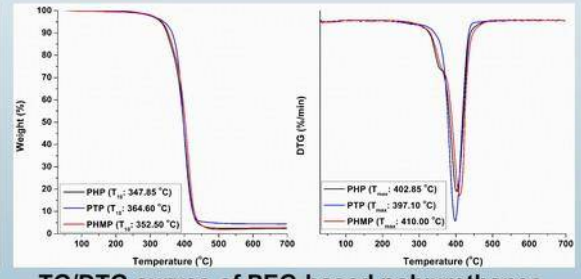




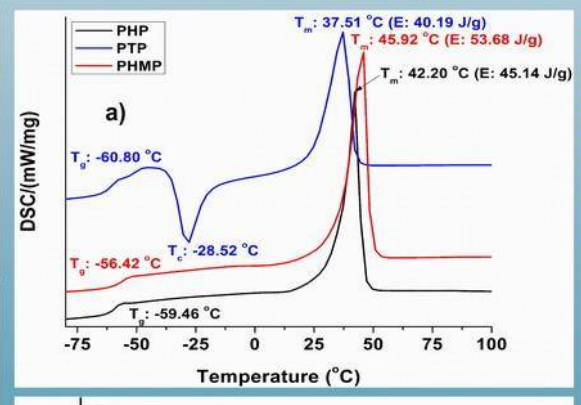


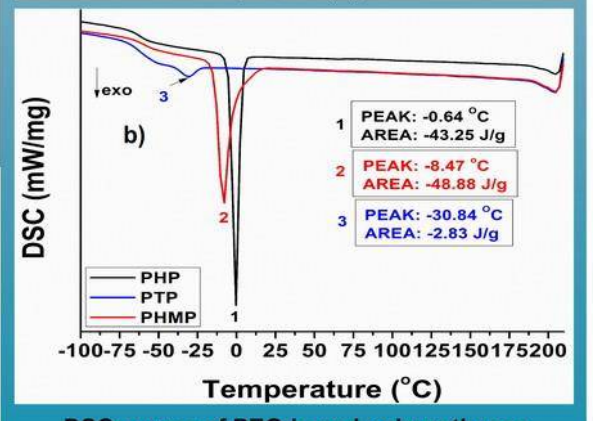
H-NMR spectra of PEG-based polyurethanes

Thermal characterization



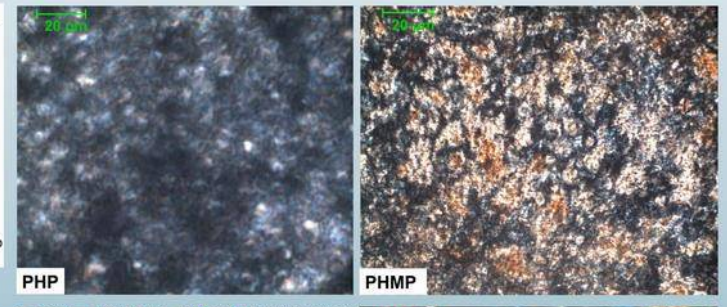
TG/DTG curves of PEG-based polyurethanes

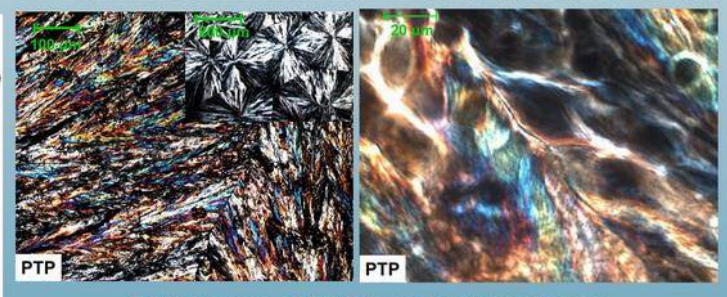




DSC curves of PEG-based polyurethanes (a-second heating, b-cooling)

Crystallization and spherulitic morphology





POM images of PEG-based polyurethanes

Conclusions

- ✓ as the flexibility of the PEG-chains plays a significant role in any crystallization process, we studied the crystallization-driven morphologies evolution of various PEG-based polyurethanes with different diisocyanates by DSC and POM techniques
- ✓ all polyurethanes have good thermal stability, aromatic diisocyante leads to improved properties (PTP)
- ✓ phase separation due to aromatic structure of diisocyanate (PTP) and also cold crystallization process
- ✓ a homogeneous distribution of nano-crystals were observed for the aliphatic polyurethane (PHP) and only tiny structural features for the cycloaliphatic one (PHMP)
- ✓ large spherulites are evident when it is used aromatic diisocyanates (PTP)

MINISTRY OF EDUCATION AND RESEARCH

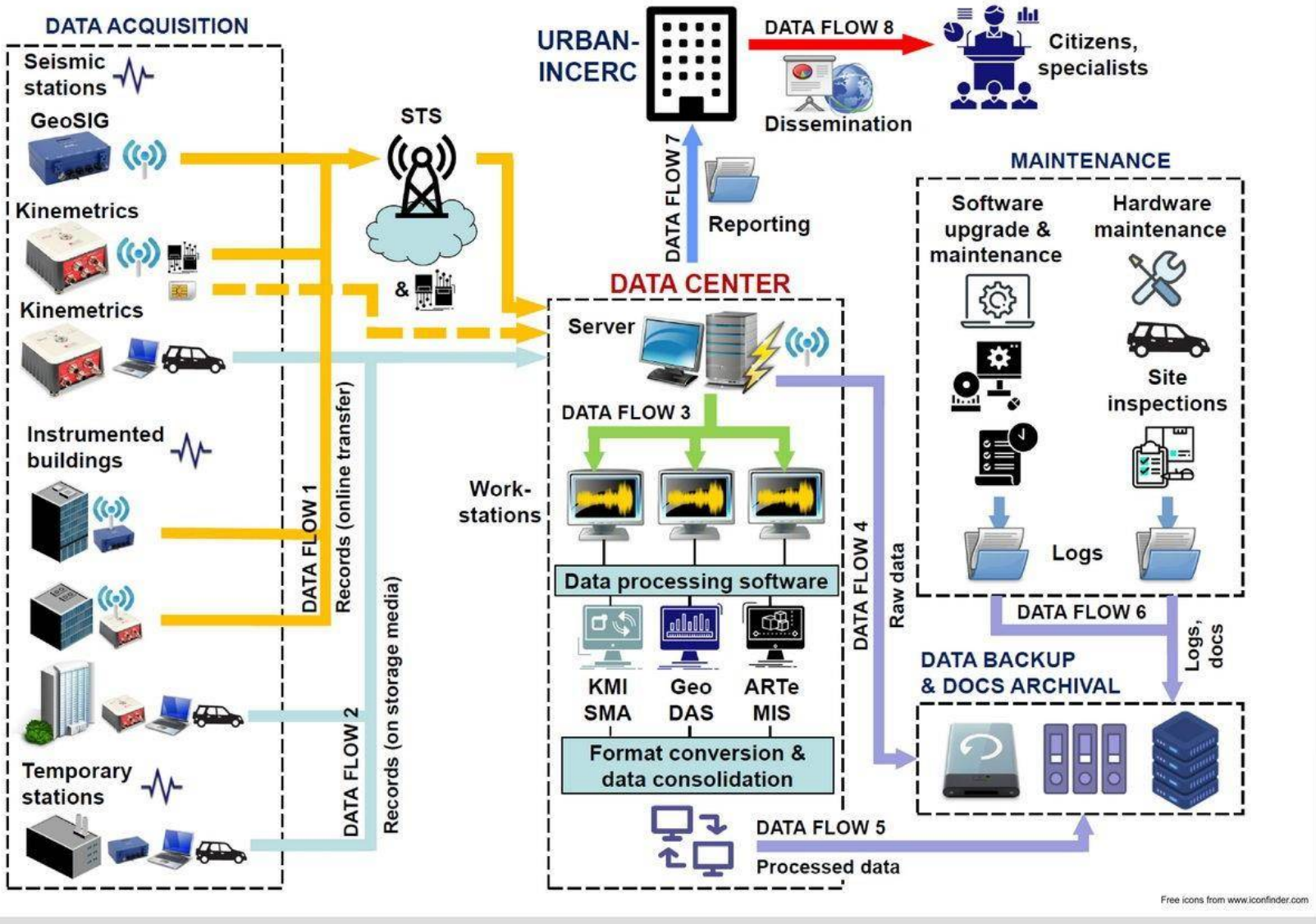
National Institute for Research and Development in Constructions, Urban Planning and Sustainable Spatial Development URBAN-INCERC

Innovative concept for the integrated management of data flows within the National Network for Seismic Monitoring and Protection of Building Stock at NIRD URBAN-INCERC

Claudiu-Sorin DRAGOMIR, Iolanda-Gabriela CRAIFALEANU, Vasile MEIŢĂ, Emil-Sever GEORGESCU, Daniela DOBRE, Adelin CIŞMELARU

THE NATIONAL NETWORK FOR THE SEISMIC MONITORING AND PROTECTION OF BUILDING STOCK

- The National Network for the Seismic Monitoring and Protection of Building Stock at NIRD URBAN-INCERC performs several activities involving the recording, processing, analysis and interpretation of natural and human induced vibrations.
- Data acquired from 62 permanent seismic stations, distributed all over the country, as well as data from temporary stations, is collected at the Network Data Center. This forms a huge amount of data, given that part of the stations is set for the continuous monitoring of seismic activity.
- Data comes in various formats, which requires using specific software applications for processing and analyzing it, as well as for unifying the display and presentation of results, for their coherent interpretation, reporting and dissemination.
- In addition, ensuring the functionality of the network involves permanent hardware and software maintenance, which is performed remotely, as well as by site inspections.
- The management of the network is based on a set of customized hierarchical procedures, that involve task distribution, data flow organization, equipment and software maintenance as well as logging and reporting of activities.
- The entire set of infrastructure management procedures have been created gradually by the members of the network team, during a work that extended over several years, in order to respond to the needs generated by the specific layout, configuration and functionality requirements of the network.



ACKNOWLEDGEMENTS:
THE 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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National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development "URBAN-INCERC"

Dynamic modeling of vibro-compaction process on granular soils

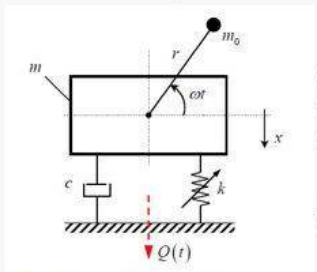
Cornelia-Florentina Dobrescu, Dr. eng

The present research is related to existing practice regarding the soil improvement by developing and implementing different mathematical and analytical simulation of soil dynamic response under dynamic loads during vibro-compaction process. The results of parametric modeling by using rheological models will conduct to a realistic assessment of soil behavior considering the effects of compaction process and controlling of technological parameters by predictive model

Experimental modeling to estimate dynamic effect of vibro-compaction process

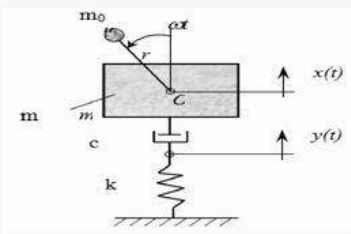
For the present study, the Voigt-Kelvin and Maxwell rheological models were used in order to reflect the process of interaction between compaction and intrinsic parameters of granular soils. The final results can be used to optimize the compaction technology, to increase the structural capacity of the road layers and the quality of the engineering works.

Scheme of Voigt-Kelvin model



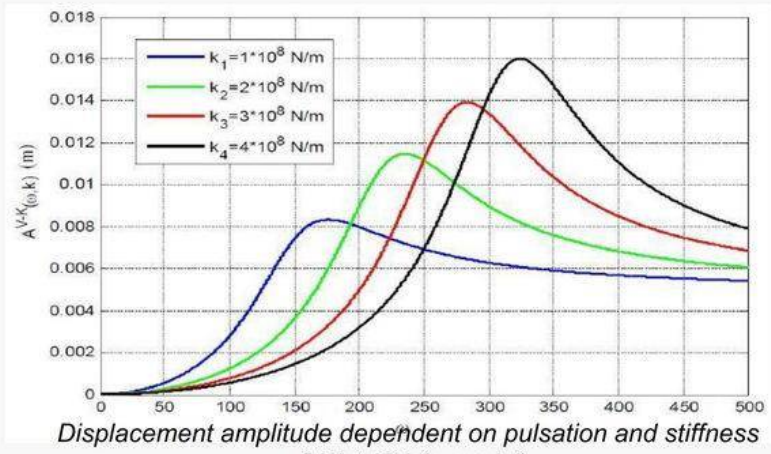
The model Voigt-Kelvin can be adopted for clayey soils mixed with mineral aggregates of 0-4 mm and 4-8 mm grain size and moisture content ranging from 12% up to 13%. The weight of mineral aggregates represents 60-70% of the mass of mixtures, while 30-40% is clay content.

Scheme of Maxwell model

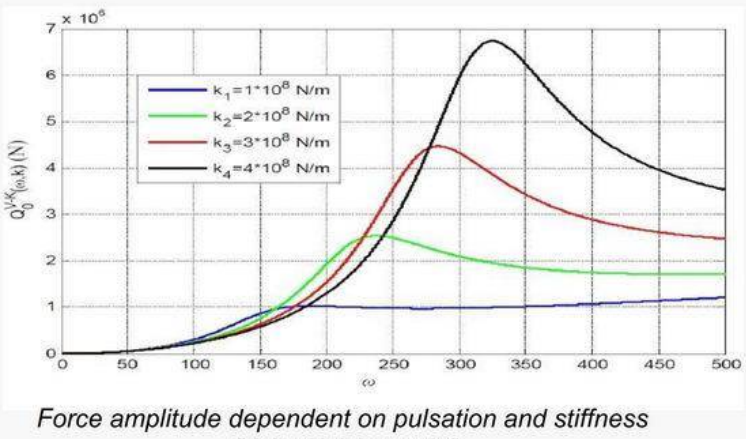


The Maxwell viscoelastic model can be used in the dynamic analysis of cohesionless soils with high content of mineral aggregates, with particle size range from 0-4 mm, 4-8 mm and 8-16 mm, mixed with 10-15% clay content and moisture content of 15%.

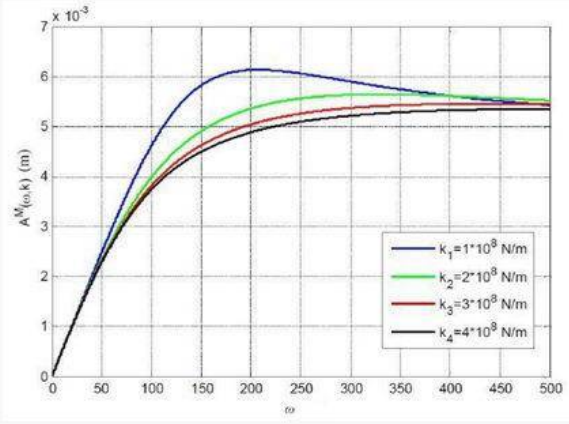
The families of curves developed based on Voigt-Kelvin and Maxwell rheological models are illustrated below, considering the displacement amplitude and the force amplitude as a function of pulsation and stiffness



Displacement amplitude dependent on pulsation and stiffness (Voigt-Kelvin model)

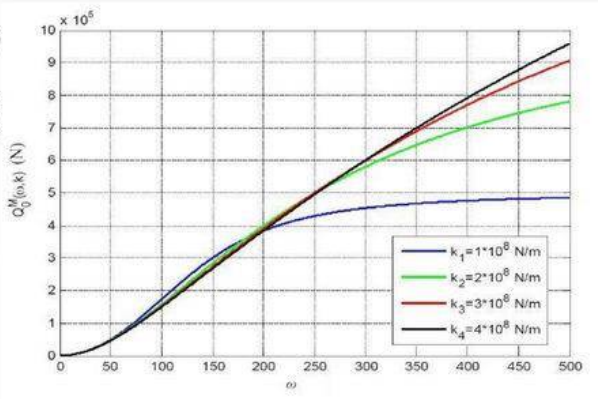


Force amplitude dependent on pulsation and stiffness (Voigt-Kelvin model)



Displacement amplitude dependent on pulsation and stiffness (Maxwell model)

- By using the Voigt-Kelvin model, the compacted lay (clayey sand class) is mainly characterized by a significant elastic component, linked to the self-pulsatio of value system for ensuring the post-resonant regime i the conditions of stationary forced vibrations with frequencies of 40-50 Hz.
- For granular soils, by using the Maxwell model, the viscous component was outlined, so that for the compaction process, the post-resonant regime can be ensured at 25-35 Hz, with the optimal amplitude to provide the force transmitted to the compacted layer.



Force amplitude dependent on pulsation and stiffness (Maxwell model)

Numerical simulation performed in the study by considering Voigt-Kelvin and Maxwell rheological models has led to a realistic assessment of soil dynamic response during the vibro-compaction process. This can be considered as an important tool for ensuring a high quality of engineering compaction works and improving design techniques.

Acknowledgements
The author acknowledge the financial support from The Ministry of Research and Innovation 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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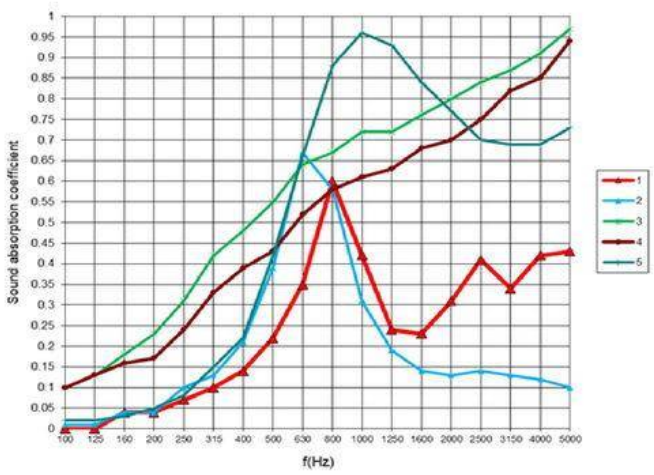
SOUND ABSORBING CHARACTERISTICS OF SOME MODERN AND RECYCLABLE MATERIALS WITH MACROMOLECULAR COMPOUNDS STRUCTURE

Marta Cristina ZAHARIA PhD.Dipl.Eng., Ioana Mihaela ALEXE PhD.Dipl.Eng., Ciprian ENE Dipl.eng.

In Romania, there were made researches and studies about the acoustic absorbing characteristics of some modern, ecological and recyclable materials and products, which can be used for construction and installation elements, and there were conducted during 2019-2020, in project PN 19 33.03.01, Phases 3 and 4, concluded with MEC.

The studies performed about a clasification of the types of modern materials and products that are environmentally friendly and recyclable, which can be used for building elements and installations in buildings with different destinations in urban areas.

Here are presented comparative studies, between the results of the acoustic characteristics of sound absorption obtained by testing: 1) a recycled product, uniquely designed within the project PN 19 33 03 01 Phase 3, obtained exclusively from recyclable materials respectively - Plastic bottles (PET) - (wrapped rolled), and 2) some modern materials made from: (a) polyethylene plates; (b) polyurethane foam boards, with flat surface; (c) two types of profiled polyurethane foam boards, with pyramidal profile. All this materials have some similar properties such as: a) the common chimical structure is based on macromolecular compounds, b) the density is low, apparent density is aprox. 15…25 kg/m³, c) samples thickness is between 30 to 65 mm. We selected some representative materials and presented the results as a table, in Table 1, and in graphical forms, for five analyzed materials.



Legend:

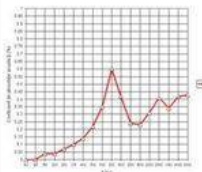
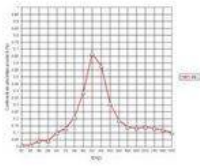
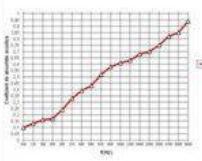
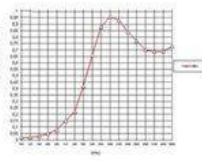
1. Polyethylene plates (PREGIS), with a thickness of 60 mm
2. ACOUSTICART decorative acoustic panels, open-cell polyurethane foam, with a thickness of 30 mm
3. Profiled polyurethane foam sheet N2244, pyramidal profile, white (960mm x 960mm x 65mm)
4. Profiled polyurethane foam sheet RF2828, pyramidal profile, anthracite gray (960mm x 960mm x 65mm)
5. Plastic bottles (PET), (wrapped rolled) - recyclable materials - , with an aprox. thickness of 10 to 60 mm

Fig.1 – Acoustic characteristics of sound absorbing for 5 modern and recyclable materials

Obs.: It is recommended to use the evaluation coefficient expressed by a unique value together with the entire curve of the sound absorption coefficient.

The results of the acoustic measurements that were presented, show that:
1) the polyethylene plates and the polyurethane foam boards with flat surface, have good acoustic absorption properties, in the medium frequencies, with top picks of αs = 0,65 ;
2) the two types of profiled polyurethane foam boards, with pyramidal profile., have good acoustic absorption properties, in the medium frequencies, αs = 0,55...0,70 , and very good acoustic absorption properties, in the high frequencies , αs = 0,70...0,95;

Table 1. Description and acoustic results for analyzed materials.

No.	Type of material	Description of material and photo of the sample mounted in reverberation room	Obtained result (α_w)	Graphical representation of results (α_s(%))
1	Polyethylene 	Polyethylene plates with a thickness of 60 mm and apparent density 25 kg/m³ (PREGIS) [1] 	α_w = 0,30 (M)	
2	polyurethane foam 	ACOUSTICART decorative acoustic panels, lightweight, open-cell polyurethane foam, applied in two layers, with a thickness of 30 mm [2] 	αw = 0,20 (M)	
3	polyurethane foam 	Profiled polyurethane foam sheet N2244, pyramidal profile, white (960mm x 960mm x 65mm) [3] 	αw = 0,55 (H)	
4	polyurethane foam 	Profiled polyurethane foam sheet RF2828, pyramidal profile, anthracite gray (960mm x 960mm x 65mm) [4] 	αw = 0,55 (H)	
5	plastic bottles (PET), (wrapped rolled) 	Plastic bottles (PET), (wrapped rolled) - recyclable materials - , with an aprox. thickness of 10 to 60 mm [5] 	αw = 0,4 (M,H)	

3) the recycled product, obtained exclusively from recyclable materials respectively - Plastic bottles (PET) - (wrapped rolled), has very good acoustic absorption properties in the medium frequencies, αs = 0,70...0,95, and has good acoustic absorption properties in the high frequencies, αs = 0,70...0,75.

Conclusion: Considering the results of the acoustic measurements, we can conclude that the recycled material has good acoustic absorption properties in the medium and high frequencies, which makes it advisable for the application as a new sound-absorbing material, very cheep, in rooms of different types of buildings, for example: industrial, schools, malls, open-offices, etc.

Acknowledgements: *The authors acknowledge the financial support from The Ministry of Education and Research through the project PN 19 33 03 01, (Phases 3 and 4) "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" .*

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INNOVATIVE CONSTRUCTIVE SOLUTIONS USING BY-PRODUCTS AND TRADITIONAL RAW MATERIALS, SUITABLE FOR PREFABRICATED BUILDING ELEMENTS

Cristian PETCU, Vasilica VASILE

Societal challenge. In order to meet the new requirements of energy performance, the application of thermal insulation is quickly expanding in ordinary buildings, its thickness grows, substantially increasing the volume of thermal insulation materials used in buildings. If are used only synthetic products, over time, this approach could harm the environment. A paradigm shift is necessary, as using low-cost, low-energy natural materials is both environmentally friendly and, with an appropriate building design, can create high-efficiency building elements.

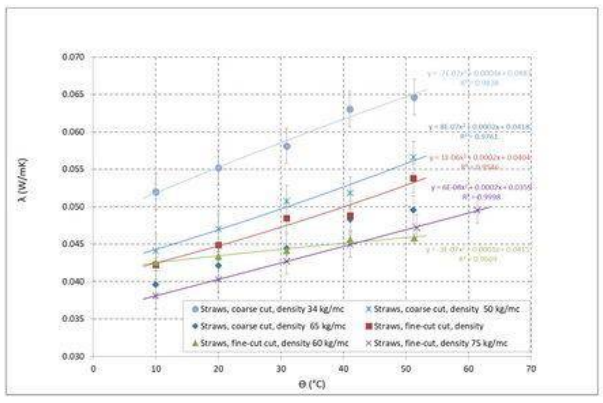
Applications. A series of constructive solutions, designed from the start with a focus on raw materials and by-products, are presented. A couple of materials, that pair well with this technology, were tested and results are given for finely chopped straws, coarse chopped straws, two types of sawdust, and a by-product consisting of fine shredded thin paper and cellulose, originating from the tobacco industry. Thermal properties of these materials are provided in the relevant figures and all of them prove good characteristics. In order to improve the adoption of these materials, we need adequate building designs, as exterior frame walls and hollow building elements filled with bulk insulation.

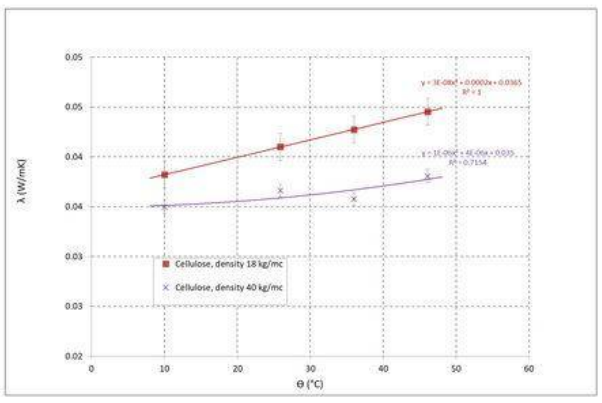
Fine sawdust

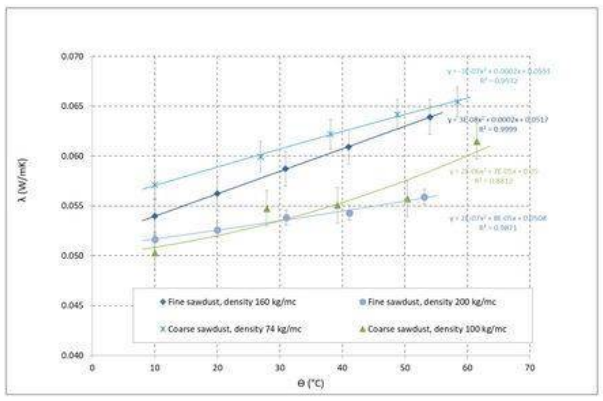
Coarse sawdust

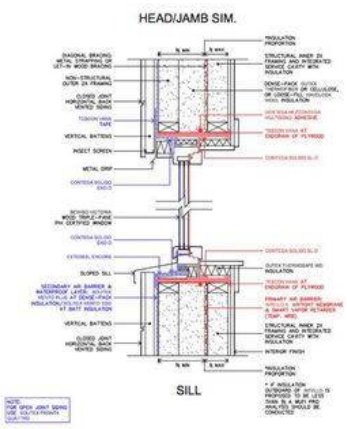
Fine-cut straws

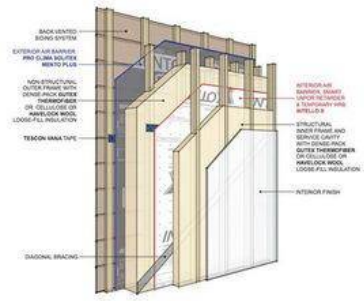
Coarse straws

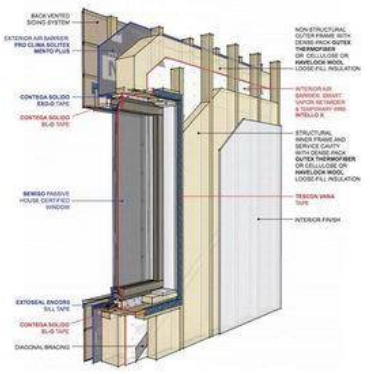


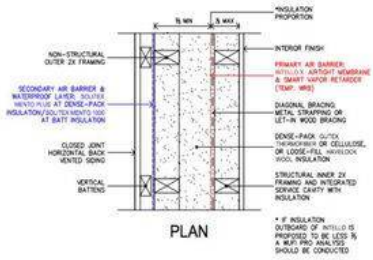












Advantages. Future buildings, using the presented concepts, would meet both the demand for superior insulation while integrating large amounts of by-products and storing the embedded carbon dioxide.

Petcu C, Petran H A, Vasile V and Toderasc M C 2017 Materials from Renewable Sources as Thermal Insulation for Nearly Zero Energy Buildings (nZEB), Conference on Sustainable Energy 12 159-167 DOI: 10.1007/978-3-319-63215-5
High performance building supply, The Double-Stud Wall Simplified, https://foursevenfive.com/blog/the-double-stud-wall-simplified-low-cost-high-performance/

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URBAN INCD INCERC

MINISTRY OF EDUCATION AND RESEARCH

National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development "URBAN-INCERC"

INNOVATIVE, RUSTIC AND SUSTAINABLE THREE-LAYERED COATINGS

Irina POPA, Alexandrina-Maria MUREŞANU

General presentation

The paper presents aspects from an experimental research that aimed to design the first basic recipes for innovative products intended to be used in constructions, as coatings with sunflower seeds husks additives.

Experimental program

The innovative coatings with vegetal additives had in their composition vegetal waste from sunflower seed shells and a binder - an acrylic paint (RM) characterized by a high density, low content of volatile compounds and a good ability to integrate and evenly disperse this type of waste. There were used two dimensional categories (4 mm and 6 mm) of sunflower seed husks waste, resulting three innovative products. Each of them was applied in three layers, with a stainless steel concrete trowel, on cement mortar surfaces previously treated with a suitable primer. The resulting systems, made of one primer layer and two layers of the product with sunflower seed shells addition, have been studied as appearance, thickness, adhesion to the cement mortar surface and cohesion between layers.

Experimental results

Layer	Function of the layer in the systems	Sunflower seed husks (ϕ4mm, ϕ6mm)*, g	Binder, g
a	Primer	0,5β (ϕ4mm)	5
b	2nd and 3rd layer	1,5β (ϕ4mm)	30
c	2nd and 3rd layer	1,5δ (ϕ6mm)	30
d	2nd and 3rd layer	1,25β (ϕ4mm)+ 1,25δ (ϕ6mm)	30

System	Total thickness, mm	Adhesion, MPa	Breaking type
RMabb	1,34	2,30	Adhesive
RMacc	1,57	2,51	Adhesive
RMadd	1,40	1,18	Cohesive

*β and δ, multiplication coefficients

Determination of adhesion to cement mortar surface for RMabb (left), RMacc (middle) and RMadd (right). Type of breacking of the coatings

Discutions

- The coatings had decorative properties despite the fact that they had a non-specific appearance for finishing products commonly used now in constructions .
- The thickness of the systems increased with the quantity and the maximum size of the vegetal waste when a single dimensional fraction of husks was used (RMabb and RMacc). It got lower when two dimensional fractions were added (RMadd) because of a different arrangement of those in the mass of the mixture.
- When a single-fraction of husks was used (RMabb and RMacc), the adhesions got higher with the increase in the characteristic size of the waste. When adding different fractions (RMadd), the adhesion to the support decreased, as a result of the formation of a more aerated, less cohesive structure. Proof of this is also the mode of cohesive breaking of the RMadd system, between the layers, as opposed to the first two systems, with an adhesive breaking, from the supporting surface. Both cases, the adherences were more than 1MPa, a good result for a coating.

Advantages of manufacturing and using such coatings in constructions

- A new method of superior recovery for sunflower seeds husks, a vegetal waste generated in large amounts at national and international level;
- A rustic, innovative, sustainable type of coating for constructions, integrated in a modern, circular economy.

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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Estimation of socio-economic costs resulting from air pollution in the indoor environment

Author – researcher Silviu Lambrache

An evaluation of the socio-economic costs of indoor air pollution can help reveal pollutants, buildings, sources and situations that should be prioritized, thus facilitating the development of appropriate public policies. Nevertheless, extensive evaluations of indoor air pollution have rarely been conducted to date, likely because of the difficulties associated with assessing burden of disease (BOD) values for a large variety of indoor pollutants and exposure situations.

Research studies have expressed the impacts of indoor air pollution in terms of disability-adjusted life-years (DALYs; the sum of years of life lost as a result of premature death and the years of life spent living with a disease).

From an economic perspective, indoor air pollution is a negative externality, (i.e., a consequence whereby no monetary compensation is initially planned for a transaction in which one party is affected by the intentional or unintentional behaviors of another). In this study, the socio-economic impacts of indoor air pollution are defined as the monetary value of the negative consequences of indoor air pollution, (i.e., the quantity of resources lost by society as a result of pollution exposure).

In this regard, there are two types of socio-economic costs of indoor air pollutants: external costs, which measure the opportunity costs of allocated resources resulting from the presence of indoor air pollution and impacts on public finances resulting from the presence of indoor air pollutants. To express the cost related to premature death and loss of quality of life, it is necessary to assign an economic value to human life.

In general, the value of a statistical life is expressed as an economic agent's willingness to pay to maintain its expected utility when a risk to which it is exposed varies. The costs of public financing are represented by the payment for treatments represents expenditures associated with the medical care of sick people.

The results of the study are divided into two broad categories of indicators: estimate of the health impacts associated with exposure to each of the six target indoor air pollutants and costs of indoor air pollution exposure for the target pollutants.
The first indicator gives us specific data regarding associated health effect, number of years with the disease, average age at death, number of years of life and pension lost.

Table 1. Estimate of the health impacts associated with exposure to each of the six target indoor air pollutants

Pollutant	*Associated health effect*	*Number of years with the disease*	*Average age at death*	*Number of years of life lost*[a]
Benzene	Leukemia	15	65	15
Trichloroethylene	Kidney cancer	1,5	65	15
Radon	Lung cancer	1,5	69	11
Carbon monoxide	Asphyxia	0	33	47
Particles	Lung cancer Cardiovascular diseases Chronic obstructive pulmonary disease (COPD)	1,5 13 12	69 77 79	11 3 1
Environmental tobacco smoke (ETS)	Lung cancer Infarction Stroke Chronic obstructive pulmonary disease (COPD)	1,5 13 11 12	69 77 80 79	11 3 0 1

[a] considering the life expectancy of the general population equal to 80 year old.

Pollutant	*Associated health effect*	*Number of years of pension lost*[b]	*Morbidity incidence*	*Number of deaths*
Benzene	Leukemia	15	385	342
Trichloroethylene	Kidney cancer	15	41	15
Radon	Lung cancer	11	2388	2074
Carbon monoxide	Asphyxia	20	-	98
Particles	Lung cancer Cardiovascular diseases Chronic obstructive pulmonary disease (COPD)	11 3 1	2388 10.006 10.390	2074 10.006 4156
Environmental tobacco smoke (ETS)	Lung cancer Infarction Stroke Chronic obstructive pulmonary disease (COPD)	11 3 0 1	175 1331 1180 150	152 510 392 60

[b] considering the age of retirement equal to 60 year old.

The second indicator shows the total costs regarding indoor air pollution what it takes into account external costs (premature death, quality of life loss, lost productivity) and the costs of public financing (health, research).

Also, these costs include the expenses related to the research in the field of indoor air pollution that have been calculated using an approximate estimate of the number of full-time equivalents allocated to this topic nationally and based on the average annual cost of a fulltime equivalent position, which includes salaries with charges and associated expenses.

Table 2. Costs of indoor air pollution exposure for the target pollutants (millions €)

	Benzene	*Trichlor-oethylene*	*Radon*	*CO*	*Particles*	*ETS*	*Total*
External costs							
Premature death	-453	-19.6	-2089	-237	-5760	-322	-8880
Quality of life loss	-383	-6.7	-309	0	-7350	-837	-8886
Lost productivity	-38	-1.5	-282	-72	-1102	-85	-1580
Total external costs	-874	-27.8	-2680	-309	-14.212	-1244	-19.347
Public finances							
Health	-18	-2.9	-61	-3	-236	-37	-358
Research	*	*	*	*	*	*	-11
Unpaid pensions	10.7	0.45	49	4	136.5	88	289
Raw costs for public finances	-7.3	-2.45	-12	0.9	-99.5	-29	-80
Total costs for public finances	-8.8	-2.9	-14.4	1.1	-119.4	-35	-96
Total costs	-883	-30.7	-2694	-308	-14.331	-1182	-19.443

[*] overall evaluation for all the selected pollutants; CO: carbon monoxide; ETS - environmental tobacco smoke.

It is necessary to ensure the health and safety of the population through the use of advanced and environmentally friendly materials in constructions, even if they entail additional costs for the manufacturer (investments for the development of eco-technologies supported by eco-projection).
The research carried out so far shows that the benefits obtained through the implementation of technologies and implicitly the results obtained (ecological materials) are superior if we compare to the costs during the lifetime use of materials and the environmental impact.

ACKNOWLEDGEMENTS
The authors acknowledge the financial support from The Ministry of Research and Innovation 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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MINISTRY OF EDUCATION AND RESEARCH

National Institute for Research and Development in Constructions, Urban Planning and Sustainable Spatial Development URBAN-INCERC

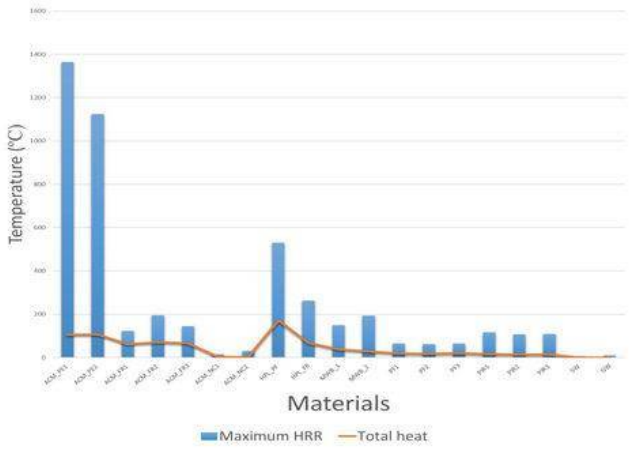
EXPERIMENTAL RESEARCH ON THE BEHAVIOUR OF THE SYSTEMS FOR VENTILATED FACADES EXPOSED TO THE FIRE ACTION

Eng. Horatiu Dragne, Dr. Eng. Adrian Simion, Eng. Daniela Stoica

When establishing the constructive structures that must reach the required levels of fire performance, one must start from the fact that the fire is an accident. The structures must remain viable for the normal fire time considered. The behavior of the construction to the fire is dependent, besides other factors, on the contribution to the fire of the elements and parts of the construction, of the materials and products for the construction, as well as on the fire resistance of some of them. Due to the fact that the initiation and evolution of the fires is different, it was imposed that the determination of the fire behavior of the constructions and the materials that enter their composition should be done under different scenarios, by exposing them to a specified ignition source, in a good context. During the compartment fires, the ventilated façade systems of the buildings must have isolation behavior so as not to allow the fire to be transmitted vertically, from one floor to another of the building.

Researchers from the INCERC Fire Safety Research and Testing Laboratory conducted several experimental tests to assess structural behavior of buildings with ventilated façades exposed to the action of fire. Specifically, it refers to an approach in designing and evaluating the structural components of steel buildings with ventilated façades, which are efficient in their fire performance. The knowledge and practical results regarding the fire resistance of steel buildings with brick masonry facades were obtained based on an estimation and evaluation of the fire resistance of more details of the construction of the building envelope.

The study focuses on the thermal analysis of steel structural elements, whose cross-section consists of the steel element core, thermal insulation and fire protection and other layers. Due to the complexity that governs the equations that describe the thermal phenomena, the detailed structural models have been studied using the finite element method. This is a thermal analysis that allows quantifying the response of the respective structural elements in terms of temperatures at certain times of time.
Following the largescale tests, during fire reaction tests carried out by the INCERC laboratory for applied research and construction tests, similar results were obtained.



Studying the spread of fire is a necessity, considering the fire as a complex action on the constructions and the effects it produces. Therefore, the experimental determinations were made within the Laboratory, with the purpose of determining the optimal test parameters, the optimal mounting positions of the thermocouples and the other measuring and control devices, as well as the flame propagation mechanisms on the glass front, under natural ventilation conditions.

This research work is funded within National Research Programs Researches for sustainable and ecologically integrated solutions in development and safety of the built environment, with a potential advanced of open innovation – ECOSMARTCONS, Project code: 19 33 02 01/2019.

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URBAN INCD INCERC

MINISTRY OF EDUCATION AND RESEARCH

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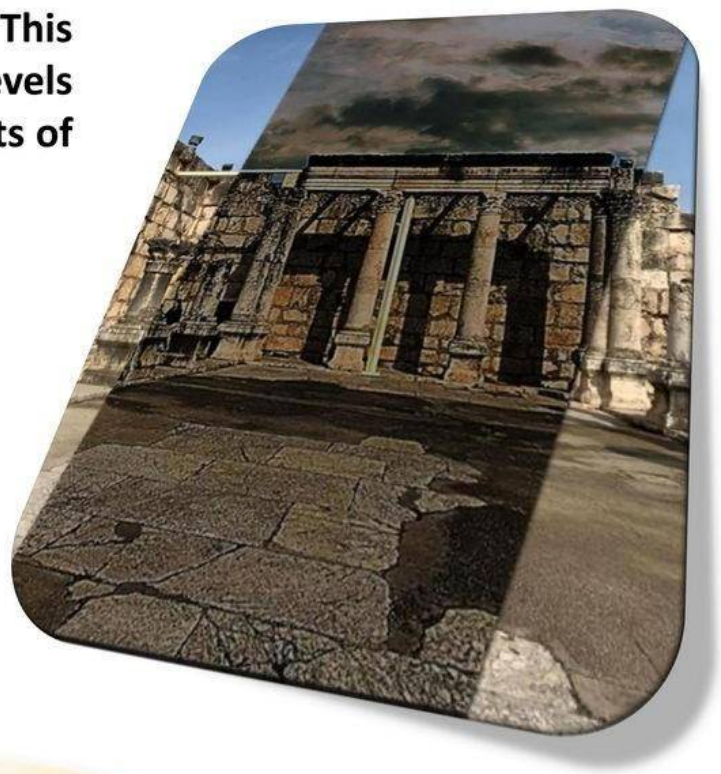
Urban environment influence on materials

Mihaela SANDU, Vasile MEIȚĂ, Gabriela CIULINARU

The urban environment, which measures high levels of pollution influence the materials and also the Romanian heritage monuments degradation. This process of degradation occurs at different levels and phenomena and thus involves different costs of rehabilitation and conservation.



The study shows:

- **cultural infrastructure projects realization that use new technologies, innovative and ecological building materials and which propose an original architecture;**
- **necessary improvements that can be made without affecting the cultural value of buildings;**
- **optimized costs in relation to economic impact.**

ACKNOWLEDGMENTS: This paper is supported by the Programme: Research for sustainable and ecological integrated solutions for space development and safety of the built environment, with advanced potential for open innovation – "ECOSMARTCONS", Programme code: PN 19 33 04 02: "Sustainable solutions for ensuring the population health and safety within the concept of open innovation and environmental preservation, financed by Romanian Government.

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MINISTRY OF EDUCATION AND RESEARCH

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PROCESS FOR THE REALIZATION AND ALKALINE ACTIVATED GEOPOLYMER BINDER, WITHOUT CEMENT

Adrian-Victor LĂZĂRESCU, Henriette SZILAGYI, Cornelia BAERĂ, Andreea-Cristina HEGYI, Vasile MEIȚĂ

PATTENT APPLICATION No. A/00500 from 19.08.2019

The invention refers to an alkaline activated geopolymer process and binder, without cement content, using as raw materials fly ash available in Romania and an alkaline activator based on sodium silicate (Na_2SiO_3) and sodium hydroxide (NaOH), intended for the construction of civil and industrial building elements and their interior and exterior finish.

Following the process of producing the alkaline activated geopolymer binder, without cement content, an innovative material is obtained, the geopolymer binder itself, in paste form, respectively hardened product after going through the heat treatment stage included in the process.

AIM

The aim of this invention is to provide, by using local materials in Romania, a complete solution and a user-friendly environment for producing alternative materials, with no negative impact on the environment through the application of the concept of the circular economy, by using fly ash as raw material fot producing alkali-activated geopolymer binders.

- **Fly ash:**
  ($SiO_2 + Al_2O_3 + Fe_2O_3$) >70%;
  SO_3<5%; PC<6%.
- **NaOH solution**
  8M – 10M – 12M
- **Na_2SiO_3/NaOH solution ratio**
  0,5 – 2,5
- **Heat treatment**
  50ºC -80ºC / 4-48 h

- **Apparent density: 1200 - 1400 kg/m³**
- **Flexural strength: 1,3 – 6,5 N/mm²**
- **Compressive strength: 5 – 35 N/mm²**

ACKNOWLEDGMENTS: This paper is supported by the Programme: Research for sustainable and ecological integrated solutions for space development and safety of the built environment, with advanced potential for open innovation – "ECOSMARTCONS", Programme code: PN 19 33 04 02: "Sustainable solutions for ensuring the population health and safety within the concept of open innovation and environmental preservation, financed by Romanian Government.

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PROCESS FOR THE REALIZATION AND A SYSTEM OF PAVEMENTS, PAVING SLABS AND ROAD EDGES MADE OF ALKALINE ACTIVATED GEOPOLYMER, WITHOUT CEMENT CONTENT

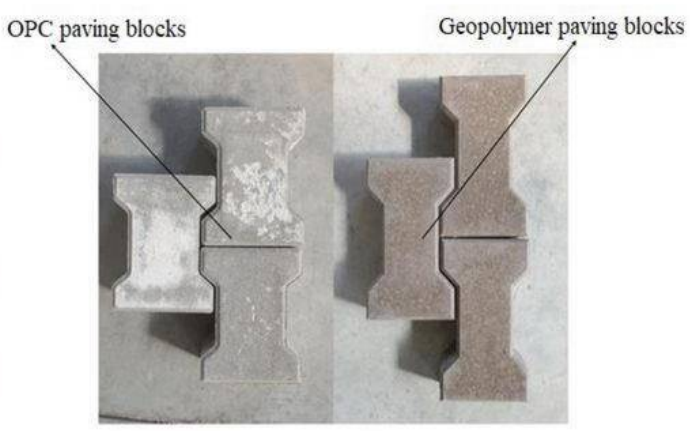
Adrian-Victor LĂZĂRESCU, Henriette SZILAGYI, Cornelia BAERĂ, Andreea-Cristina HEGYI, Vasile MEIȚĂ

PATTENT APPLICATION No. A/00499 from 19.08.2019

The invention refers to a process for the realization of paving blocks, slabs and street curbs with alkali-activated geopolymer concrete, without cement content, using as raw materials available fly ash from Romanian power-plants, an alkaline activator based on sodium silicate (Na_2SiO_3) and sodium hydroxide (NaOH) and natural river aggregates with a maximum size of 8 mm, intended for the production of prefabricated materials.

AIM

The aim of this invention is to provide, by using local materials in Romania a complete solution and a user-friendly environment for the production of alternative construction materials, with no negative impact on the environment through the application of the concept of the CIRCULAR ECONOMY, since the fly ash becomes the raw material in the designing and production of the alkali-activated geopolymer materials, therefore preventing environmental pollution.



CHARACTERISTICS

- **Apparent density: 1600-1900 kg/m³;**
- **Water absorption: maximum 6%;**
- **Tensile splitting strength: minimum 3,6 MPa;**
- **Abrasion resistance (Boehme): max. 20000 mm³ / 5000 mm²;**
- **Freeze-thaw resistance: max. 1kg/m²;**
- **Slip potential: moderate;**

APPLICATIONS

Pedestrial roads
Pedestrian zones
Bicycle paths
Parkings
Roads
Bus stations
Etc.

ACKNOWLEDGMENTS: This paper is supported by the Programme: Research for sustainable and ecological integrated solutions for space development and safety of the built environment, with advanced potential for open innovation – "ECOSMARTCONS", Programme code: PN 19 33 04 02: "Sustainable solutions for ensuring the population health and safety within the concept of open innovation and environmental preservation, financed by Romanian Government.

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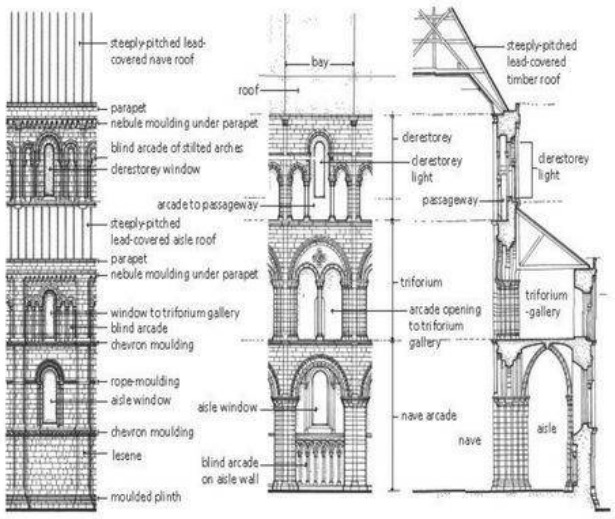
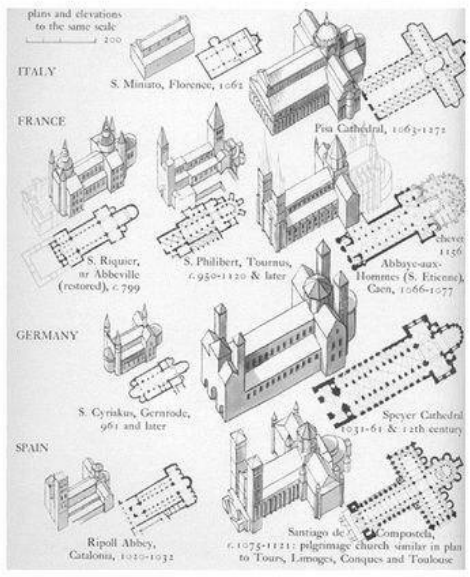
"ROMANESQUE" STRUCTURES- REHABILITATION METHODS

Anamaria BOCA, Tudor Panfil TOADER, Anamaria Cătălina MIRCEA

The first European architectural style well defined after the architecture of the Roman Empire is the Romanesque style and is a unitary whole, with no separation between its architecture and structure. In the sixteenth century, the notion of style in art appeared in the work of the Italian architect Giogio Vasari entitled "Le Vite de 'più eccellenti pittori, scultori, ed architettori", published in 1550. The XI-XIII centuries are marked by the development of the art of Western European space where the architecture constituted the branch with the strongest definition and manifestation. Romanesque style or Romanesque art was defined as the ensemble of artistic evolution from the beginning of the Middle Age until the period of Gothic art. and is often found in the literature before the 19th century, under the name of Romano-Byzantine or Latin style.





In the transition period from early feudalism to the developed one XI- XII centuries, Romanesque architecture was formed and developed in the same period that the foundation of medieval cities and the centralized states in the Western Europe. The birthplace of the Romanesque style is France (Normandy and Provence) and northern Italy (Lombardy).

Strei·Church·-·Portal·–·Window·-·Tower¶

Herina·Church·-·Portal·–·Window·-·Tower·-·Boxed·ceiling¶

The interventions on Romanesque style are based on biological, physical, mechanical, geotechnical studies on the bearing structures. The elaboration of a documentation which will include recommendations regarding the protection of Romanesque structural assemblies is the final aim.

Moisescu C., 2001, Arhitectura românească veche, I, Editura Meridiane, Bucureşti, România.
Boca A., Toader T.P., Mircea A.C. (2020), Rehabilitation of "romanesque" structures, The Scientific Buletin Addendum, No. 5/2020, The Official Catalogue of the "Cadet INOVA" Exhibition, Research and Innovation in the Vision of Young Researchers, THE INTERNATIONAL STUDENT INNOVATION AND SCIENTIFIC RESEARCH EXHIBITION – "CadetINOVA'20" – "Nicolae Bălcescu" Land Forces Academy, Editura Academiei Forțelor Terestre "Nicolae Bălcescu", Martie 26-28, 2020, pag.195-198

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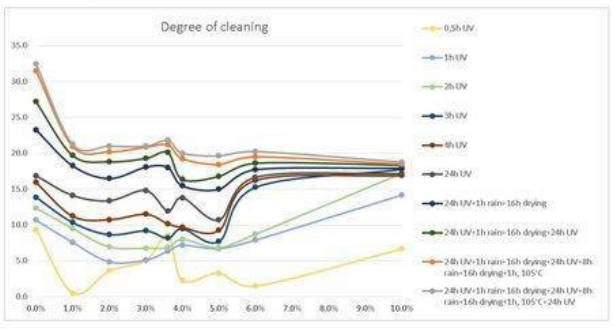
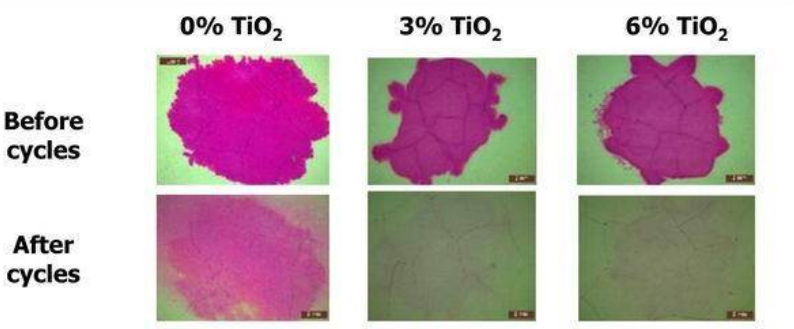
RESEARCH ON SELF-CLEANING CAPACITY OF CEMENTITIOUS COMPOSITES WITH TiO_2 NANOPARTICLES ADDITION

Elvira GREBENISAN, Andreea-Cristina HEGYI, Adrian-Victor LĂZĂRESCU

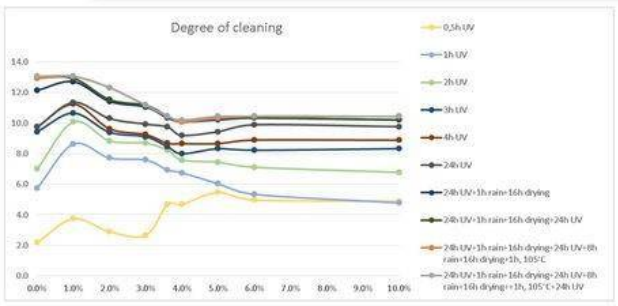
The aim of this paper is to demonstrate the influence of titanium dioxide (TiO_2) nanoparticles on the ability of the self-cleaning of the cementitious composites, in terms of staining with the different agents (aqueous solutions of: rhodamine B (1g/l), methylene blue (0.02 g/l) and exhaustion gas solution (1 g/l), followed by exposure to the action of the sun's UV rays, rain, and artificial drying, by determining of the degree of white.

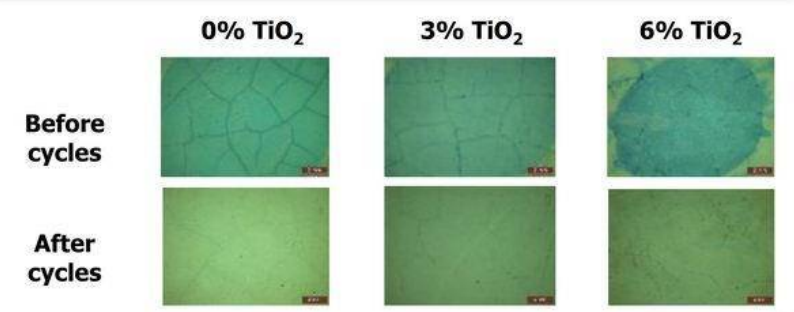
Staining with RHODAMINE B



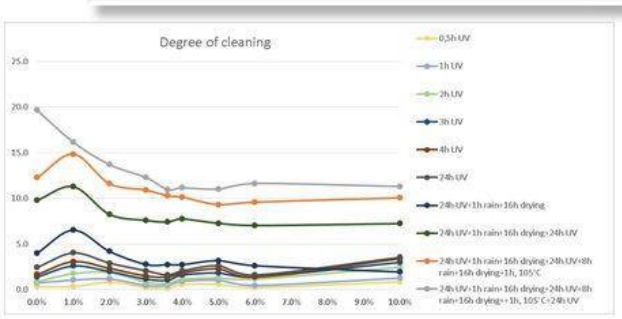


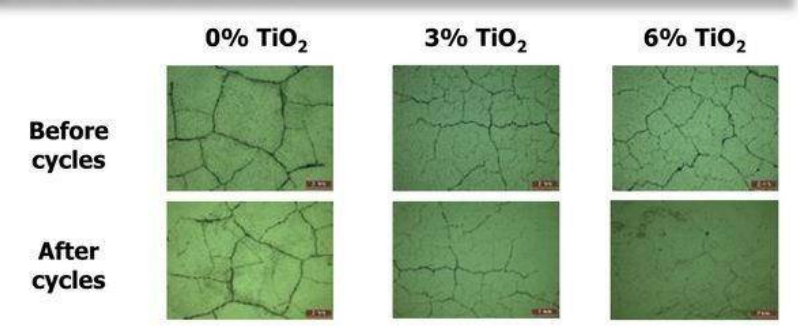
Staining with METHYLENE BLUE





Staining with EXHAUSTION GAS





CONCLUSIONS

On the basis of the experimental results, it can be said:
- The amount of TiO_2 nanoparticles to achieve optimal results is in the range 3-6% (relative to the amount of cement).
- A quantity of more than 6% TiO_2 nanoparticles reduces the self-cleaning performance of the cementitious matrix.
- The cleaning capacity is influenced by the intensity of activation in the presence of UV, the duration of exposure, as well as the molecular structure of the staining agent.

IMPORTANCE

Making cementitious composite matrices with the addition of TiO_2 nanoparticles is important as a result of the interest in achieving sustainable, aesthetic constructions with low maintenance costs, with improved and environmentally friendly performance.

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EVALUATION OF MINERAL LOCAL RAW MATERIALS FOR THE PRODUCTION OF ALKALI-ACTIVATED GEOPOLYMER BINDERS

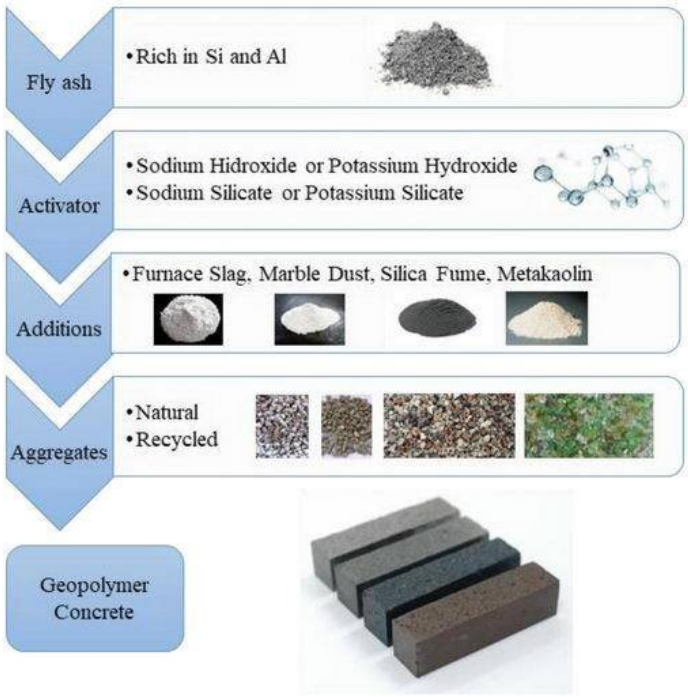
Brăduț Alexandru IONESCU, Adrian-Victor LĂZĂRESCU

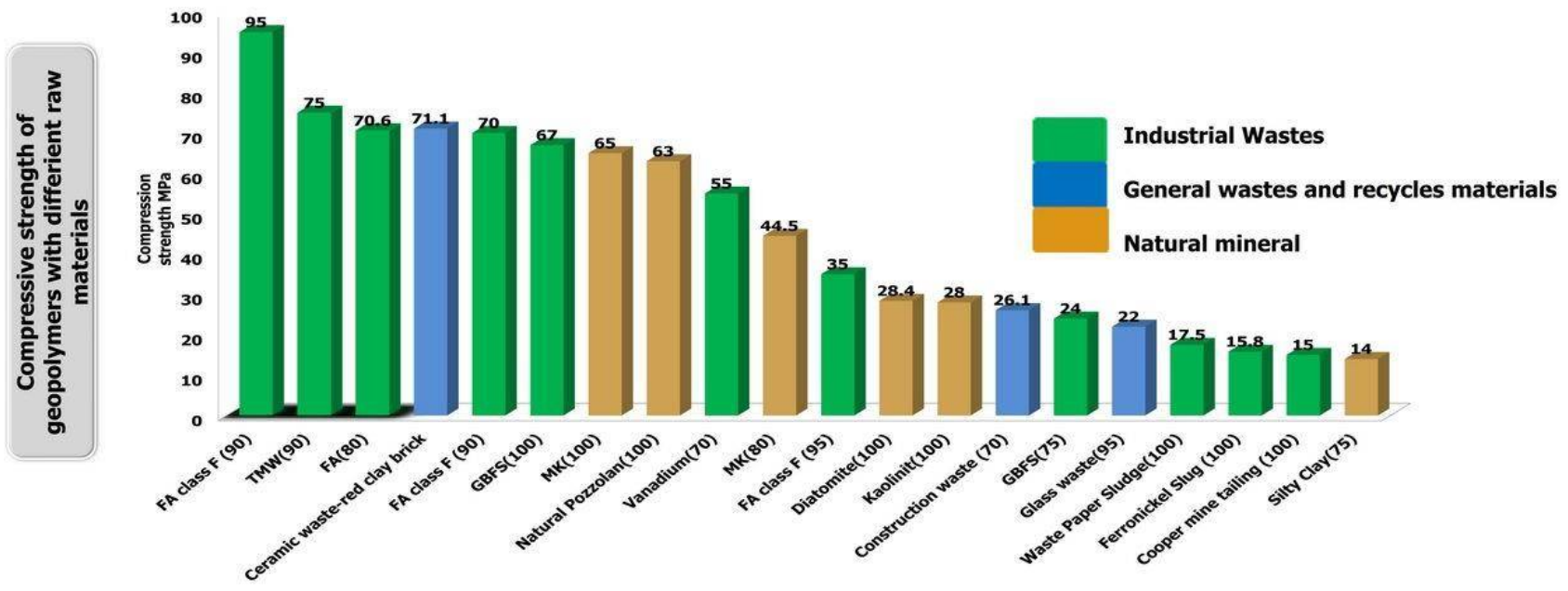
Rapid growth in population has led to the generation of large amounts of waste and environmental degradation. In order to protect the environment for future generations and to preserve the already limited mineral resources, a sustainable solution for traditional Portland Cement Concrete is more than necessary. This can be achieved by producing geopolymer binders.

In order to produce geopolymer binders, raw materials rich in aluminum and silicon are alkali-activated. Some of the raw materials, for the production of the geopolymer binders can be obtained from natural sources, such as kaolin, metakaolin (calcined kaolin), diatomite, volcanic rock, etc., or industrial waste arising from production processes, such as fly ash , iron slag, blast furnace, granulated blast furnace slag, silica fume, marble dust, etc. For the production of alkali-activated geopolymers, the most used activators are a combination of sodium hydroxide (NaOH) and sodium silicate (Na_2SiO_3) or a solution of potassium hydroxide (KOH) and potassium silicate (K_2SiO_3). Geopolymers show high compression resistance from an early age, low shrinkage, acid resistance, fire resistance, frost-thaw resistance and low thermal conductivity.

Alkali-activated geopolymer materials have the following advantages:

- **Compressive strength up to 95 MPa at early ages (7 days).**
- **Reduced shrinkage due to the heat treatment to which mixtures of alkali-activated material are subjected;**
- **Low water absorption, due to the dense matrix of the binder;**
- **Good freeze-thaw resistance;**
- **The density of the Geopolymer Concrete depends on the mass of aggregates used in the mixture, but by optimizing the mixtures, density below 2000 kg/m³ can be also acheived;**
- **High resistance in alkaline environment - can be used in constructions exposed in marine environment**





ACKNOWLEDGMENTS: This paper is supported by the Programme: Research for sustainable and ecological integrated solutions for space development and safety of the built environment, with advanced potential for open innovation – "ECOSMARTCONS", Programme code: PN 19 33 04 02: "Sustainable solutions for ensuring the population health and safety within the concept of open innovation and environmental preservation, financed by Romanian Government.

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A SUSTAINABLE APPROACH REGARDING THE DEVELOPMENT OF ENGINEERED COMPOSITES MATERIALS (ECCs)

Anamaria Cătălina MIRCEA, Tudor Panfil TOADER, Carmen DICO

Engineered Cementitious Composites in the last years became an alternative for classical materials due to their high performances and represent a unique group of ultra-high ductility materials that have incorporated short fibers that can be used in either new construction or as repair retrofitting materials, in infrastructure for bridges, roadway repairs or new buildings.

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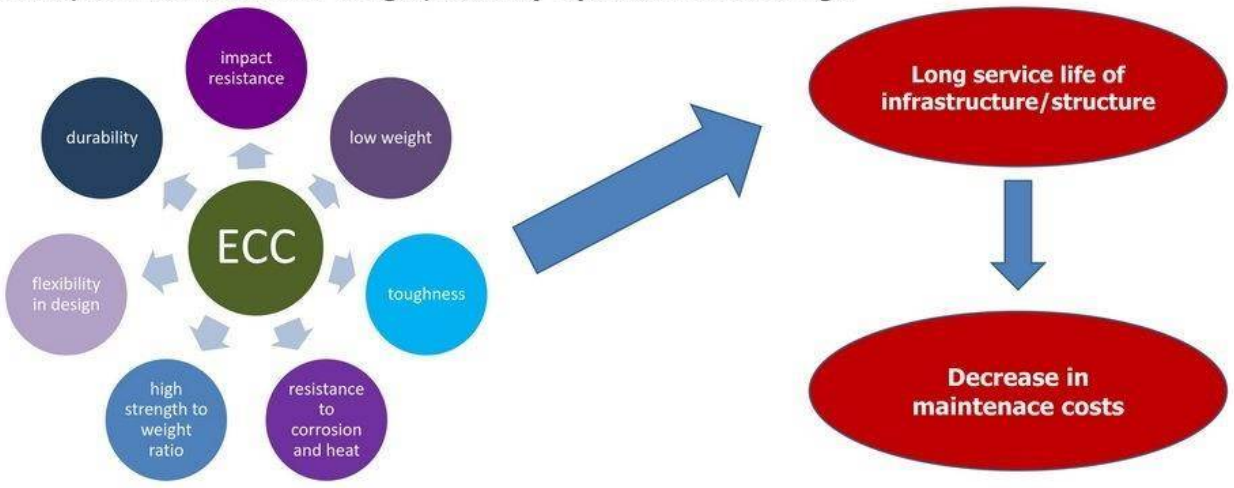
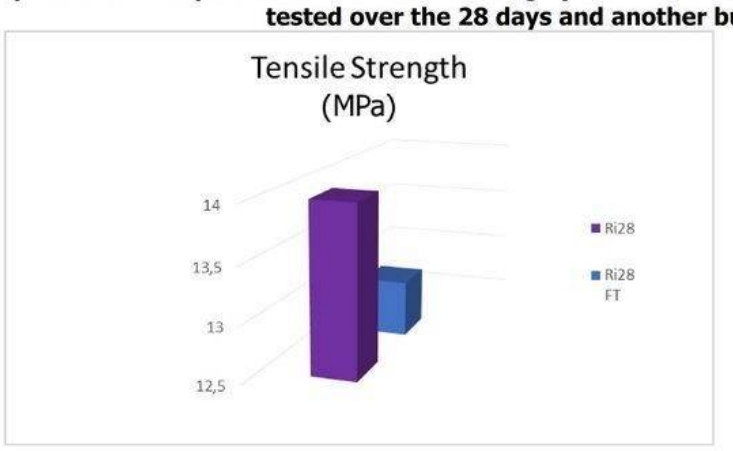
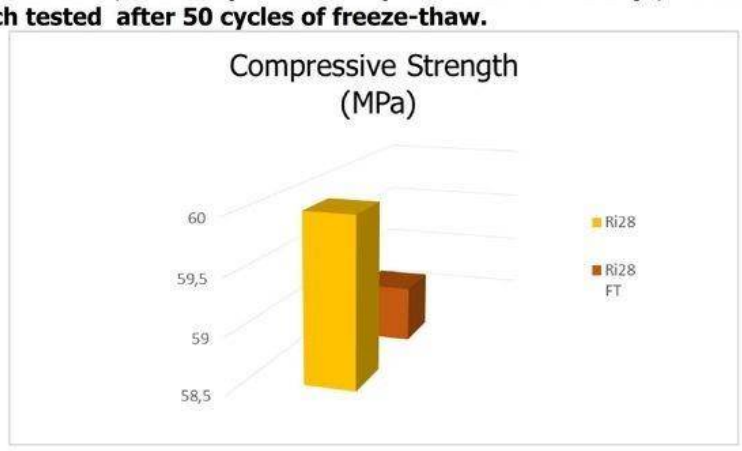
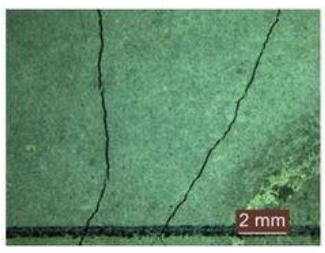


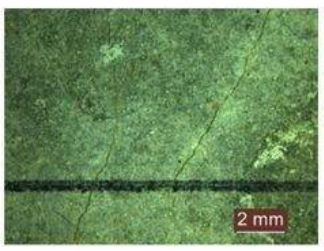
The experimental program was structured in Mechanical tests (compressive strength and tensile strength at different conditions) and the evaluation of the Self- Healing Capacity. The self-healing (SH) phenomenon was evaluated microscopic before and after the exposure of the specimens to the self-healing cycles. For mechanical tests, the samples were kept in water for 28 days, a bunch tested over the 28 days and another bunch tested after 50 cycles of freeze-thaw.





Microscopic evaluation **before** and **after** the exposure of the specimens to the self-healing cycles





Due to the characteristics and performances obtained, the material can be adjusted in accordance to the identified need and can be used for all types of application. Besides all this advantages, ECC are using materials considered wastes, incorporating and recycling them.

ACKNOWLEDGEMENTS

This paper 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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SPECIAL CONCRETE USED TO REDUCE POLLUTION IMPACT IN TRANSPORT INFRASTRUCTURE

Tudor Panfil TOADER, Anamaria Cătălina MIRCEA, Carmen DICO

An appropriate material to be used for transport infrastructure is concrete to provide protection against aggressive outside agents, to take over the compression effort in the element sections and for conferring rigidity of structures.
Reinforced concrete elements, under the action of aggressive factors in the environment and being predisposes to microcracking / cracking due to exploitation conditions, can lead to loss of the load-bearing capacity of elements by the reinforcement corrosion.

The infrastructures where concrete with self-healing properties is used, due to their behaviour in exploitation, have an increased lifespan, leading implicitly to the reduction of the need to carry out maintenance and repair works. Amounts of materials removed from the repair works could be reduced.

Repair works, transport of materials, storage/recycling of waste resulting from construction materials, increase the cost for transport infrastructure and damages he environment.

Incorporating materials that are considered wastes (concrete crushed from out-of-use structures, thermal power plants powders, powders resulted from the cutting of marble tiles) removes a part of the negative impact on the environment.
The research tends to contribute at reducing the environmental problems by using Self-healing Concrete.

ACKNOWLEDGEMENTS

This paper 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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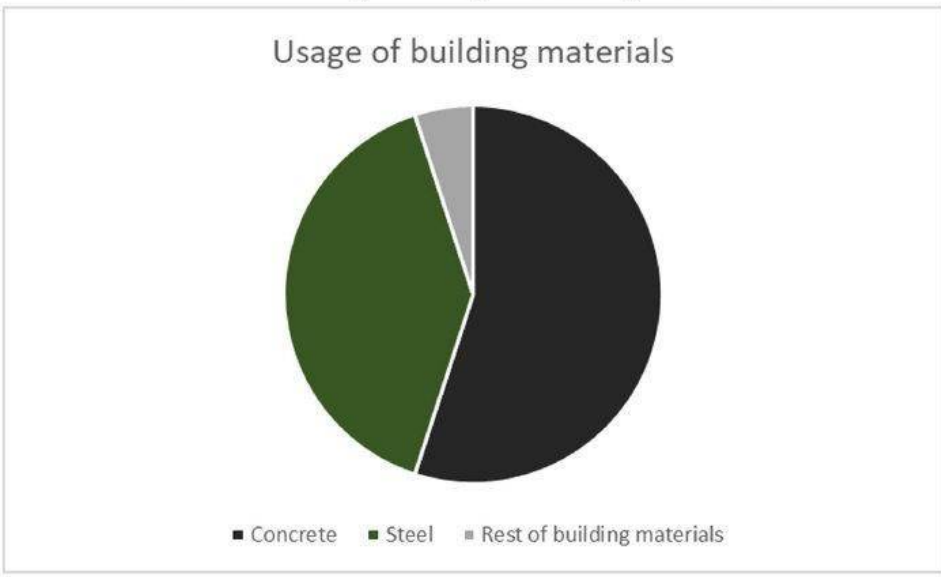
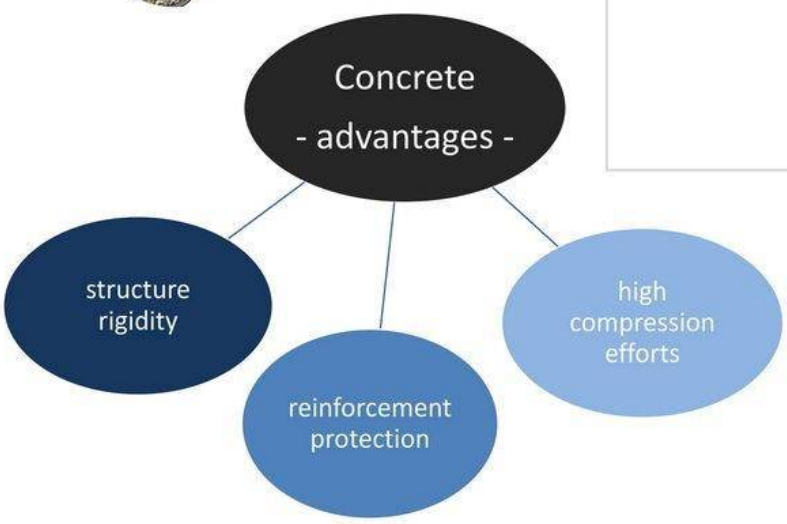
SELF- HEALING CONCRETE

Tudor Panfil TOADER, Anamaria Cătălina MIRCEA, Carmen DICO

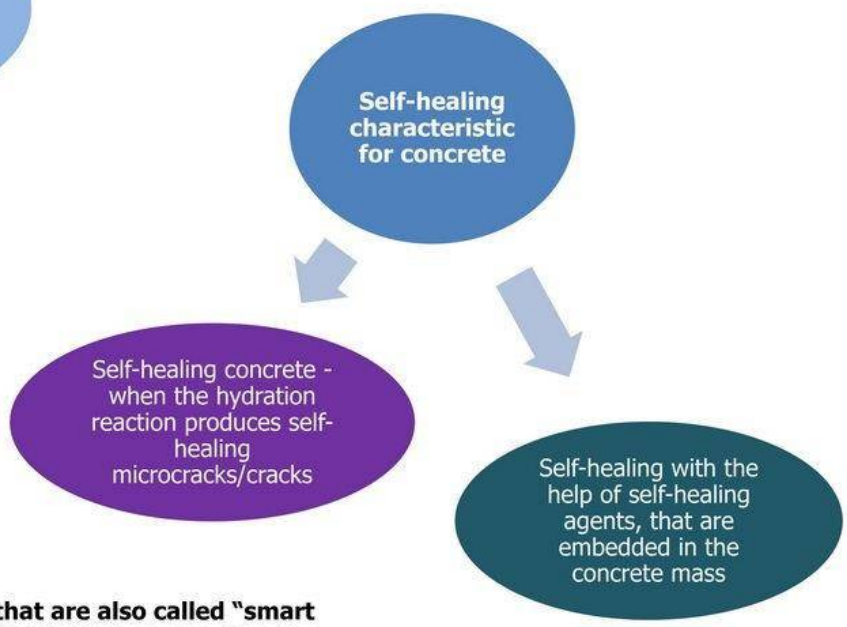
One of the most used materials is concrete. The advantages that recomand it are high compression efforts, structure rigidity and reinforcement protection. A structural failure can be produced by the loss of load-bearing capacity of the reinforcement, if no intervention is taken on filling the access ways of aggressive external factors that are generating the cracking of the concrete.





Due to the external agents like rain, fog, snow, that are also aggressive, the infrastructure is exposed. The access of external aggressive agents to the reinforcement is reduced by incorporating self-healing agent into the concrete which is acting on cracks/microcracks, by closing them.
At early stages, microcracks are hard to detect and manual intervention is required for periodic inspections and repairs. Lowering the costs of maintenance and repairs and increasing the life and exploitation of the infrastructure are the main advantage in choosing concrete with self-healing properties.

The Self-healing characteristic for concrete, according to the literature, can be classified into two categories:



Designing and using materials with self-healing properties, that are also called "smart materials" and can adapt to environmental conditions according to their properties, is a required necessity in order to improve and increase the life of the elements.

ACKNOWLEDGEMENTS

This paper 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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CORPORATE GOVERNANCE RELATED TO RESEARCH - DEVELOPMENT ACTIVITIES IN ROMANIA

Mircea-Iosif Rus

Corporate Governance represents a set of "rules of the game" by which the companies are internally managed and supervised by the Board of Directors in order to have the interests of all the participating parties protected. Thus, this governance has as its specific the distribution of rights and responsibilities between the various participants in a company, like the board, shareholders and other participating parties and which specified the rules and the procedures involved in making the decisions related to the respective company business

The necessity of this corporate governance appearance came up when many companies filed for bankruptcy, financial crises and, above all, the gap between the compensations granted to managers and the corporation performance of the last years, all this demonstrating that the introduction of the corporate governance was not just a manner of the company's survival but, most important, a prosperity manner of the corporation

The necessity of this corporate governance appearance came up when many companies filed for bankruptcy, financial crises and, above all, the gap between the compensations granted to managers and the corporation performance of the last years, all this demonstrating that the introduction of the corporate governance was not just a manner of the company's survival but, most important, a prosperity manner of the corporation

The rules related to corporate governance applicable to Romanian companies may be found in Law no.31/1990 but also in the supplementary legislation applicable to them. It may be the case of Law no. 24/2017 on the issuers of financial instruments and market operations, of the Law no. 297/2004 on the capital market, with the subsequent amendments and completions, or of the Government Emergency Ordinance no. 109/2011 on the corporate governance of public companies, with the subsequent amendments and completions.

Mainly, the joint stock companies are managed by a board of directors and a Supervisory Board.
Thus, the joint stock company management rests with the board of directors which fulfills the necessary and useful acts and facts for the achievement of the company field of activity, except for those set aside by the law to the Supervisory Board and to the general assembly of the shareholders.

The board of directors exercises its assignments under the audit of the Supervisory Board. This board is composed of one or several members, the number being usually odd. When there is only one member, this is the sole general manager. At the same time, in the case of joint stock companies whose financial statements make the object of an audit legal obligation, the board of directors is composed of at least three members.
The members of the Supervisory Board are nominated by the general assembly of shareholders, except for the first members who are nominated by the memorandum of association. The candidates for the positions of member of the Supervisory Board are nominated by the existing members of the board or by the shareholders.
The number of members of the Supervisory Board is set up by the memorandum of association and it cannot be below 3 or over 11. From its members, the Supervisory Board elects one Chairman. Also, the members of the Supervisory Board cannot be members of the board of directors at the same time and they cannot cumulate the position of member of the Board with that of company employee.

CEPROCIM SA is a private company with research-development activity listed at the Bucharest Stock Exchange (BVB) and bearing the symbol CEPO. In terms of organization, CEPROCIM SA has a Board of Administration and a Board of Directors which has a supervisory role, besides a Scientific Board composed of researchers as well. As it is listed at the Stock Exchange, CEPROCIM SA offers a wider transparency related to its activity as compared to other entities of the research-development activity, because its results are public for all the shareholders and the activity of this company is subject to a greater number of rules as compared to other competitors of the same market. At the same time, the negative financial results may lead to the decrease of the market value of a share as compared to the value of a share of research-development companies which are not listed and which, usually, the shares majority is owned by a small number or just by one person.

As a conclusion, I believe that it could be recommendable that the principles of the corporate governance be implemented by all the entities of the research-development activity (less the universities and those subordinated to the Romanian Academy) because this means that there could be a total transparency related to the funds allocated by the state budget for the research-development

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Sustainable construction materials in an environment complying with the principles of tradition and innovation

Monica CHERECHES, Adrian CIOBANU, Florina FILIP, Aurelia BRADU, Marius MART, Daniel GHERGHEL, Ionel PUSCASU

The architectural typologies of Romania have registered a considerable improvement in the last years and this is due to the large-scale use of the advanced technologies meant to support architectural design and creativity. But among these, we must not forget about sustainability and energy efficiency.

The research aimed to develop thermal-insulation products with vegetable fibers (sawdust, straw, hemp, etc) which allow rehabilitation of existing buildings or new one at low cost, with natural and renewable materials, locally available with respect for the environment and the health of people.

Thermal-insulation products with lime, clay, sand and cement

Materials	Percentage of material (%)				
Lime (V)	50	65	80	35	20
Clay (A)	50	35	20	65	80
Sand (N)					
Cement (CI)					

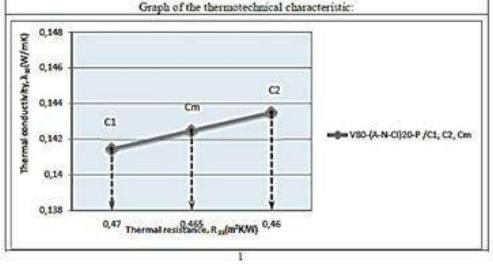
Results:

- energy efficient insulation materials, based on straw, hemp, sawdust for rehabilitation applications, with comparable building physics and mechanical properties to commonly used insulations materials;
- database containing the files of the developed products.

Phase 4 - Studies and researches for the elaboration of a database on the acoustic and thermotechnical characteristics, of some modern ecological-green, ecological and recyclable materials and products, which can be used for construction and installation elements.

FILE DATABASE

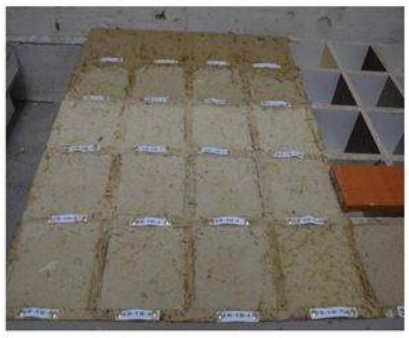
Sample name (material / product):	Thermal insulation composite based on vegetable fibers with HEMP
Description:	Thermal insulation composite based on Lime 80% + (Clay + Sand + Cement) 20% + HEMP (C), thickness range 70 mm - 150 mm
Use: Thermal insulation of constructions	
Product code: V80-(A-N-CI)20-C	
Photo material / product:	
Specific thermotechnical data:	
Sample size:	
Length, width, thickness:	300 × 300 x 70 mm
Sample area:	0.09 mp
Material density: 1. 1. Effective density (as an average of the tested samples): 591 kg/m^3	
Graph of the thermotechnical characteristic:	



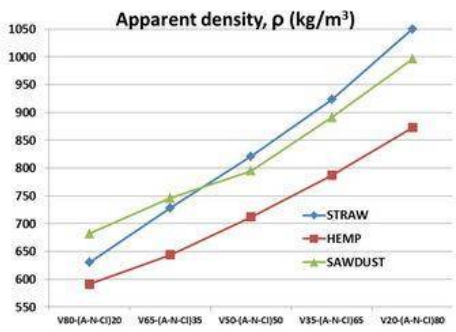
Applications:

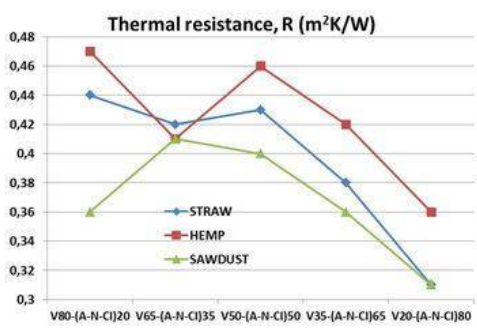
- concrete application of the thermal insulation solutions on a traditional building from Iasi, Romania (layers of straw treated in natural lime and clay).

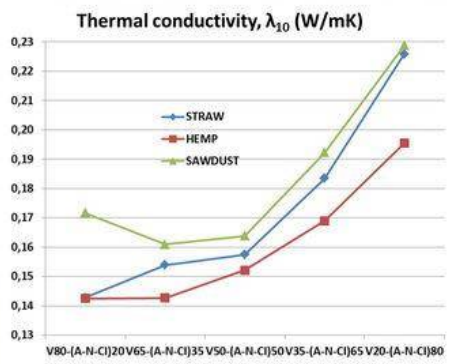
Drying and testing of thermal insulation products with clay, lime and local vegetable materials (straw, hemp and sawdust)

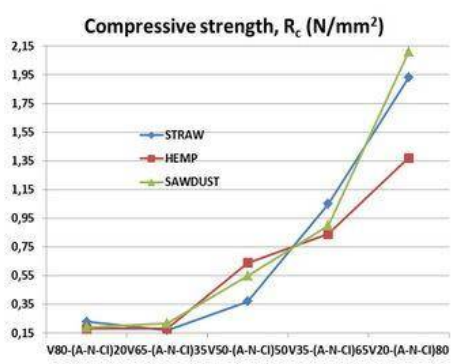


Comparative analysis: apparent density, thermal resistance, thermal conductivity and compressive strength of composite heat-insulating materials (straw, hemp and sawdust)









Acknowledgment:

- This study was performed within the frame of the scientific project "Researches to achieve the acoustic and thermal comfort inside the buildings, using an innovative tool for choosing the optimal structures of construction elements, from classical versus modern materials", PN 19 33 03 01 ((Phase 4), Contract No. 24N/2019. The authors would like to acknowledge the financial support provided by Ministry of Education and Research.

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I A S I BRANCH

EXPERIMENTAL DEVICES FOR DETERMINING THE THERMAL RESISTANCE FOR HIGH PERFORMANCE THERMAL INSULATION

Adrian CIOBANU, Monica CHERECHEȘ, Florina FILIP, Ionel PUȘCAȘU, Aurelia BRADU, Daniel GHERGHEL, Marius MÂRȚ

Description:

The principle of this experiment consisted in creation of an experimental stand (¹)that would allow to determine the thermal behavior of the flat solid bodies of the high performance insulation panels. The role of this device is to establish a unidirectional, constant and uniform thermal flux density through homogeneous plates in the form of flat and parallel plates, which are components of the conventional or high-performance thermal insulation materials, and create new opportunities for architects and engineers to design energy efficient buildings.

Key applications:

- Vacuum insulation materials (VIM)
- Polystyrene plates (EPS/XPS)
- Structural insulated panels (SIPs)
- Plasterboard boards etc.

The Elements of the Experimental Device

✓ **A device with a Guarded Hot Plate** – has the role of determining the thermal conductivity and thermal resistance of insulation, building and construction materials.

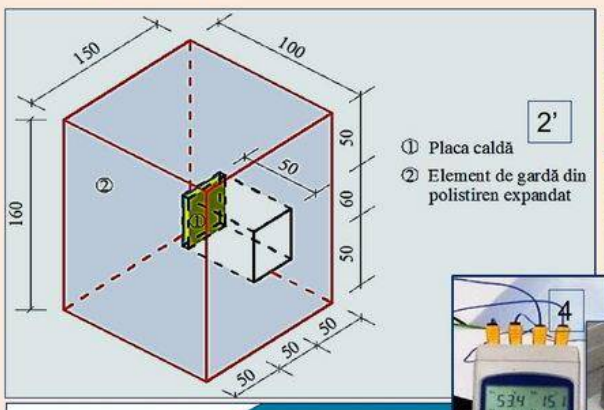
The generation of a constant, uniform thermal flow through the specimens it was secured with the heating plate. (2'')

(The thermal conductivity, λ, is calculated from the power introduced in the heating plate (power = voltage x current), the thickness of the sample (thickness, dimensions) and the temperature difference. The result is a valid material constant regardless of the sample size. The thermal resistance is the reciprocal of the thermal conductivity (1 / λ). (2'). The electrical resistance was obtained with two stainless steel wires connected in parallel. (2''')

The components of the heating plate are:

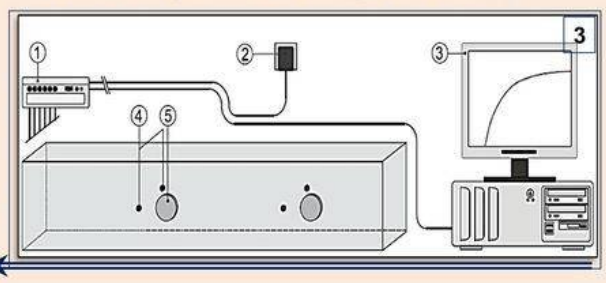
- a PAL board with dimensions of 500x600x18 mm³; stainless steel wire with electrical resistance role;
- a plate made of MDF with dimensions of 500x600x6 mm³;
- and an extruded polystyrene plate with dimensions of 500x600x20 mm³.

✓ **A Flow Meter** (type TRSYS01) - is a high-accuracy system for on-site measurement of thermal resistance, R_{value}, and thermal transmittance, U_{value}, of building envelopes. The system is equipped with two heat flux sensors of model HFP01 as well as two pairs of matched thermocouples for differential temperature measurements. (3)

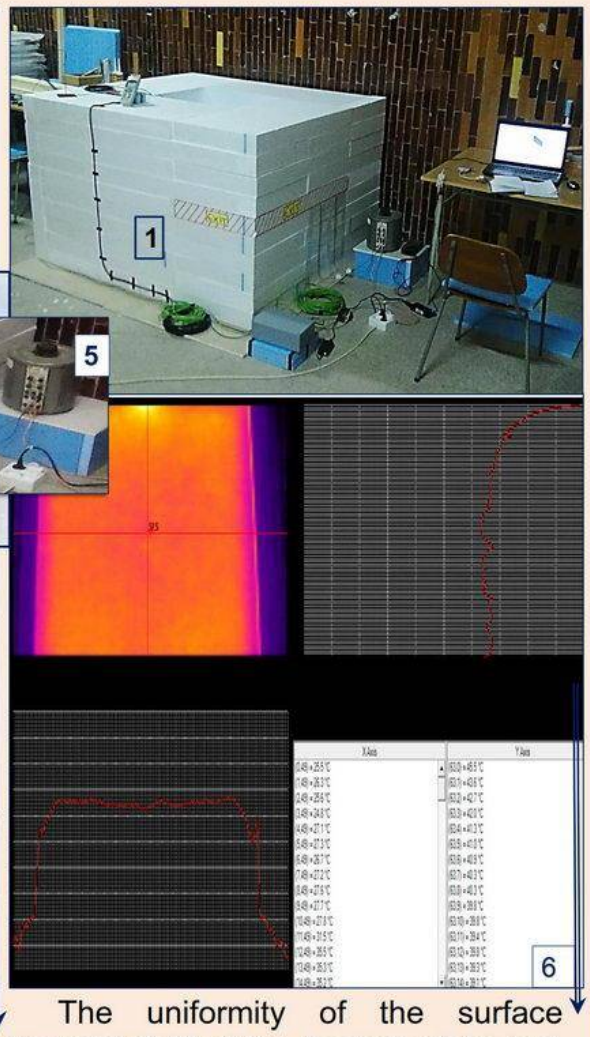


✓**Thermometer with four thermocouples inputs** (4)

✓**And an adjustable voltage source** (5)



Flowmeter type TRSYS01: 1 - central unit of measurement and control; 2 - adapter for power supply to the mains; 3 - computer; 4 - KX type thermocouples; 5 - flow sensors type HFP01



The uniformity of the surface thermal field of the heating plate was checked with the infrared chamber (6)

Observation following the test results:

Analyzing the horizontal distribution it is observed that the temperature is constant throughout the width of the plate. Regarding the vertical distribution the temperature value is constant, but, in the central area, at the top of the plate, higher values of the temperature are observed. The achievement of these higher temperatures, at the upper edge of the plate, is due to the chosen mode of parallel bonding of the two stainless steel wires, which led to the overlap of two wires in the central area (2''')

Acknowledgment: *The authors acknowledge the financial support from The Ministry of Education and Research through the project PN 19 33 03 01, (Phase 4) "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" .*

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MINISTRY OF RESEARCH AND INNOVATION

THE NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT IN CONSTRUCTIONS, URBANISM AND SUSTAINABLE SPATIAL DEVELOPMENT "URBAN-INCERC"

THE POTENTIAL OF AUGMENTED REALITY IN THE DISSEMINATION OF URBAN PLANNING DOCUMENTATION

Authors: PhD. Stud. Arch. Teodora UNGUREANU, PhD. Stud. Arch. Gabriela VOLOACĂ, PhD. Stud. Geogr. Andreea POPA

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Introduction

Emerging technologies are starting to have an important influence over many aspects of urban life. Augmented Reality (AR) is in the first instance associated with the gaming industry, but it can prove a valuable tool in smart city scenarios. This study explores the possibilities of using AR in order to visualize important urban information in urban planning documentations, at a level that can be understood by non-specialists or representatives for other practices. The plan, the universal way of representing the urban project, can generate certain limitations in the understanding of the project, of urban interactions generated by the urban processes, for the local comunities that do not have an urban planning specialisation. Thus, AR can become a *lens* that focuses on translating the important aspects of the project in an accessible way.

AR is an interactive experience where the real environment is modified through technologies to alter or add experiences that challenge the visual, auditive and sometimes olfactive senses. Thus this experience is a combination of real-world with augmented, digital objects that creates an immersive experience for the person viewing it. In the current study, the augumented object represents the urban data that are interpreted in a graphic design that should enable a deper understanding of the urban processes.

Accesibility of data and information

The visualisation of urban data becomes an essential process for the dissemination of urban planning projects. This enables better communication between the actors involved in the city: the citizens, the local administrations and different specialists. The person using the AR gets to understand the implications and aims of the project, the way the planners intended for the project to evolve.

These graphic visualisations should include not only renders and different presentations of 3D models and simulations but also technical data. The use of visual analogies, like animations and other 3D graphics, can help the citizen understand the complexities of urban developments and how they can become directly involved in the growth of the city.

Accessible technology

From a technical perspective, AR technology could be easily implemented using the devices citizens own. It involves an app that can is instaled on a smartphone or tablet. With this app, using the device's camera, the user has to scan a *marker* that will open the AR visualisation. Another opportunity for AR technology is the flexibility of these markers. They can be the drawing from the documentations; they can be physical models or real places. This las marker can use the actual image of a street to show the direct impact of a project on the physical form of the city.

Thus, if you any citizen that wants to understand more of the projects that concern their city or neighbourhood, can scan the markers with their own device, to view another side of the project.

On future directions

One problem that could appear in this scenario is the manipulation of the user into seeing only the positive aspects of a project. This problem is also present in the architectural visualisation industry, where renders can depict projects of a higher quality than they can be built. Therefore, there needs to exist a standard for these visualisations. The citizens need to understand the whole project, the good parts and the compromises.

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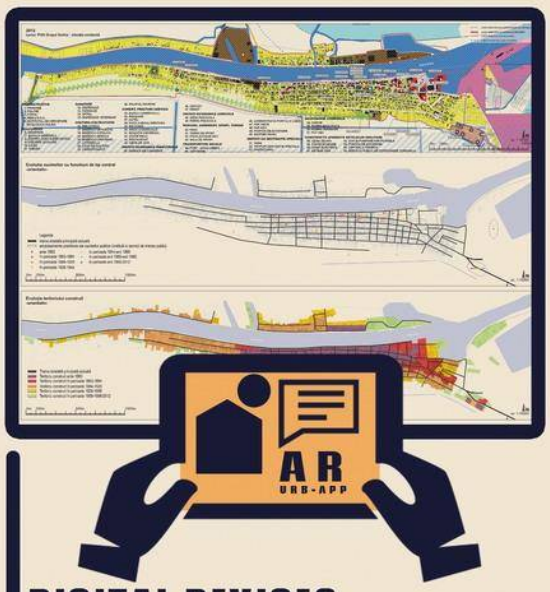

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URBAN INCD INCERC

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Assessing ecological connectivity in the Romanian Carpathian Mountains in the context of spatial planning

Authors: SRIII PhD Antonio Tache, SRIII PhD Oana Popescu, SR Cristina Ivana

THE PROBLEM

Urban development obstructs connection between habitat species and creates isolated patches, which limit the movement of species and creates loss of wildlife habitats. The Carpathian Convention outlines the need to ensure the ecological connectivity and the species continuity in order to protect the migration routes of wild animals, by developing ecological networks. In most European countries, Romania included, there is a lack of legally established ecological corridors at national or local scales.

THE SOLUTION

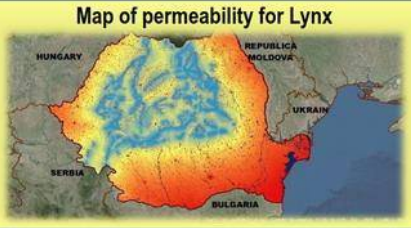
The poster presents a method to ensure connectivity between the Romanian Natura 2000 sites by identifying ecological corridors used in the movement of three species of large carnivores in Romanian Carpathian Mountains: the brown bear (*Ursus arctos*), the grey wolf (*Canis lupus*) and the lynx (*Lynx lynx*), species requiring special protection. The method is very important in the context of spatial planning, since the identification of migration corridors can ensure their implementation into spatial plans. Thus, a bridge between spatial planning and nature protection will be created, as a solution for effective nature conservation.

At national level

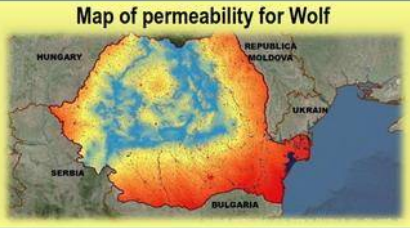
Linkage Mapper 2.0.0. software was used to define ecological corridors between protected areas at national level, according to the degree of the resistance of the land to the following factors: land use, transport networks, altitude, slope. The maps of **permeability** were obtained in the case of brown bear, grey wolf and lynx (in this case, *the permeability refers to let animals to safely pass through linear transport infrastructure or landscape*).

Map of permeability for Bear

Map of permeability for Lynx



Map of permeability for Wolf



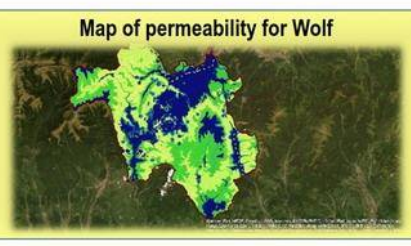
At local level (Bucegi – Piatra Craiului)

To define ecological corridors between protected areas at local level, *the CorridorDesigner* software was used, due to its capacity to define the permeability and to calculate the shortest routes between protected areas.

Map of permeability for Bear

Map of permeability for Lynx

Map of permeability for Wolf



RESULTS

The *Habitat Suitability Map* from *CorridorDesigner* software and the *Linkage Mapper* were used to identify all the possible least-cost paths between **core areas** (*areas meeting the habitat and size requirements of target species*). For the consistence of the analyze with the real situation, the factors that influence the habitat of the three species were chosen according to classification and weights from national documents and certified field studies (Szilard *et al., 2012*).

Ecological Corridors at national level

Bear

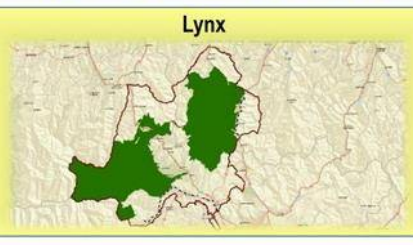
Lynx

Wolf

Ecological Corridors at local level

Bear

Lynx



Wolf

CONCLUSIONS

Identification and implementation of ecological networks is an essential requirement in minimizing the impact of plans that can alter large areas, such as those of transport infrastructure or urban development. Also, the green infrastructure approach can minimize conflicts between environment and the economic development. Establishing ecological networks and finding a way to a legal implementation can be an important step for their integration into urban and spatial planning documentation.

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REMARKS

The poster is based on the research carried out within the project „Restoring and managing ecological corridors in mountains as the green infrastructure in the Danube Basin - ConnectGREEN" (2018-2021) within the Interreg Danube Transnational Program.

Interreg Danube Transnational Programme ConnectGREEN

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URBAN INCD INCERC

MINISTRY OF EDUCATION AND RESEARCH

National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development "URBAN-INCERC"

Economic vulnerabilities in the cities of the Danube. Case study Turnu Măgurele

Authors: PhD(c) geogr. Andreea Cătălina Popa, PhD(c) arch. Teodora Ungureanu, PhD(c) arch. Gabriela Voloacă

Introduction

Romanian cities, located along the Danube corridor, are experiencing a decline in economic activities, in the context of closing the largest economic agents.

An important moment in the development of the port was the construction in 1885 of the first wooden quay. This fact was determined by the growing demand for cereals produced on Romanian territory.

By building a chemical compound in 1962, Turnu Măgurele has developed a lot. Subsequently, the opening of other industrial units led to an expansion of the city, correlated with the increase in the number of inhabitants.

Chemical Fertilizer Plant in 1968
Source: http://www.comunismulinromania.ro/index.php/21-iunie-1968-combinatul-de-ingrasaminte-chimice-turnu-magurele/

In the 1960s, Turnu Măgurele was the fourth most important Romanian port, after Galați, Brăila, and Giurgiu. The production of chemical fertilizers represented a fifth of the national production.

Currently the port has passenger berths, grain berths, berths for general cargo. The general condition of the port is degraded. Of the existing buildings in the port area, only one building has electricity, water, sewerage, the other buildings are closed, requiring redevelopment works.

Materials and methods

The definition of vulnerability refers to how an incident will affect a system. We can evaluate economic vulnerabilities using variables such as gross domestic product, unemployment rate, investment level.

A collection of statistical data, provided by the National Statistics Institute, was used to assess economic vulnerabilities. The data were synthesized using the statistical mathematical method.

Conclusions

Given the fall of the industrial sector, the local economy is currently oriented towards subsistence agriculture and fish farming.

The municipality of Turnu Măgurele has a great potential for development, taking into account the location on the banks of the Danube, and the funds that can be accessed.

At the municipal level, the low volume of investments is highlighted by the existing conditions, both for the inhabitants and the business environment. Thus, many streets in the city have problems with water and sewerage infrastructure.

Port infrastructure capitalization works are needed, such as the rehabilitation of the quay, the platforms, the arrangement of the passenger and leisure berths.

Results

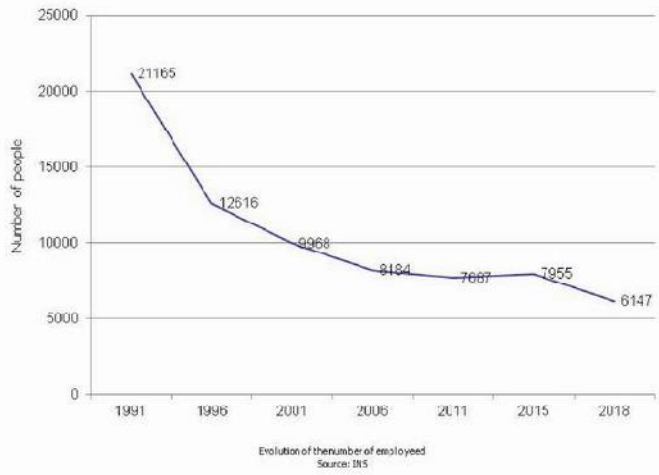
After 1990, because of the decline of the Chemical Fertilizer Plant, the industrial production started to decrease. In 2004, the company is privatized.

Ruined buildings belonging to the chemical plant
Source: https://www.vice.com/ro/article/j57ig3/turnu-magurele-orasul-in-care-dragnea-s-a-imbogatit

The number of goods transited in the port decreased by about six times, as a result of the decrease in industrial production.

In the last two decades, the city has faced several waves of layoffs. Under these conditions, the number of employees has been steadily declining from 1991 to the present. The decline in industrial activity has led to a decline in employment opportunities. The most important industrial units, the Chemical Plant, the textile manufacturer Imperial, the manufacturer of electric motors Electroturris, laid off a large number of employees.

The lack of opportunities has caused a large number of people to leave in other parts of the country or even abroad. Thus, the available labor force in the municipality is aging. There is also a lack of specialized staff.



Evolution of the number of employeed
Source: INS

Since 2001, there has been no passenger traffic in the port. This leads to the undervaluation of the tourist function.

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*** Google Maps

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CEMENT-BASED MATERIALS WITH SELF-REPAIRING PROPERTIES INDUCED BY REACTIVE GRAINS WITH PROTECTIVE COATING

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

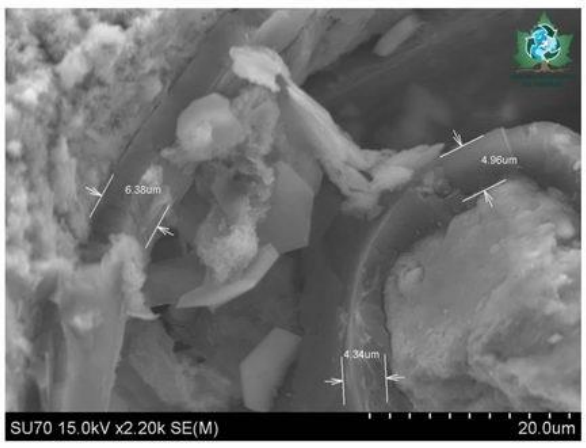
PATTENT APPLICATION No. A/00022 din 20.01.2020

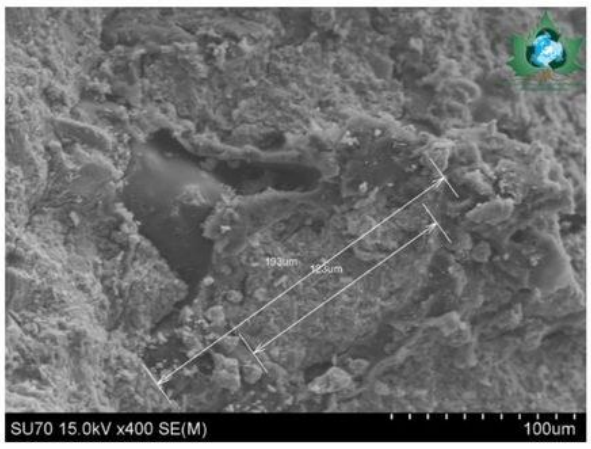
The invention refers to ***cementitious materials with self-repairing properties***, generated by the use of an **intelligent reactive addition** to the cement-based matrix. The addition consists in reactive grains with protective, impermeable polymeric coating against inherent hydration during mixing and also with friability capacity when necessary, namely when cracks occur within the cementitious matrix. This way the contact between the reactive core and water or other components is produced, developing the specific reactions which would generate reaction products with crack clogging, self-healing effect. The intelligent addition is obtained by mixing the reactive grains with polymer solution or the melt thereof, followed by the specific stages of drying / cooling, in order for the waterproofing effect to be achieved. The incorporation of the intelligent addition into the cementitious composite is performed by applying the usual technology for concrete manufacturing, at the concrete plant, or by adding it at the casting location, in the last stage of mixing. The advantages of the concept are emerging from effective increase of durability and structural lifespan extension of infrastructure where used, with resource savings considering less repair and maintenance activities required. Apart from long-term economic benefits, by applying this preventive approach the environmental protection is also achieved, by energy, labor and natural resource savings when compared to classical cement-based materials.

CLAIMS

The scientific concept is built on the foundation of the three major claims:

1. **Identifying *the reactive grains* with suitable characteristics for optimum results (Typology: clinker, aluminum cement, blast furnace slag as grinded cement-type material, active hydraulic materials, lime), Physical characteristics: particle diameter below 160 micrometers, reactive grain content must represent at least 80% of the smart addition mass; the total mass of the addition represents 5-10% of the total mass of the material with cement-based matrix), etc.**
2. ***The coating:* The encapsulation with the polymer film is obtained by immersing the reactive granules in polystyrene solution/melt, representing a maximum of 20% of the total mass of the addition with self-repair properties.**
3. ***The cement-based matrix material with self-repair capacity:* Cementitious composites containing the addition of reactive granules, encapsulated with a polymeric film, with preserved physical and mechanical characteristics with respect to the reference, addition free composite.**





SEM Capture: Evaluation of the healing degree

Considering the largest uniaxial size of a polymer film-reactive addition granule to be approximately equal to 193μm, respectively the uniaxial size of the crystallization zone of the hydration products formed after the destruction of the film (cured area ≈ 123μm), a degree of healing of about 64% is considered achieved.

SEM Capture: Healed area within the cementitious material, containing CSH healing products in the vicinity of a broken capsule containing the reactive grains.

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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SELF-HEALING EFFECT OF REACTIVE GRAIN ADDITION FOR LONG-TERM CONTINUOUS HYDRATION IN CEMENTITIOUS COMPOSITES

Vasile MEIȚĂ, Mihaela SANDU, Claudiu-Lucian MATEI, Henriette SZILÁGYI, Aurelian GRUIN, Andreea-Cristina HEGYI, Cornelia BAERĂ

Concrete and the generic category of cement-based composites as building materials are generally prone to ***cracking***, the typical way of *damage* induced by diverse causes into the concrete mass. *Similar to living organisms, capable of self-healing their wounds, there was proved that concrete also develops a certain intrinsic ability of recover its integrity via crack healing* (Fig. 1). Upgrading this intrinsic material potential to higher degrees can bring cumulative beneficial effects in improving the durability of structures with low costs and resource consumption.

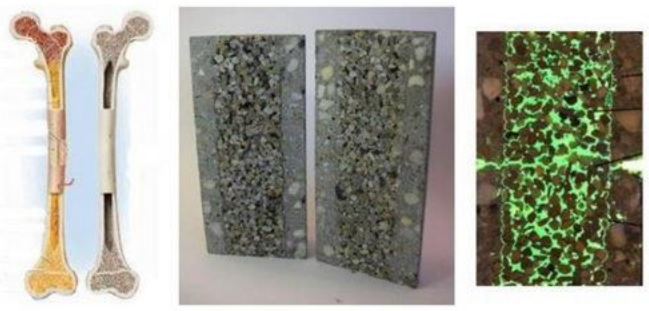

Fig. 1. Self-Healing of Concrete - association of the phenomenon with the healing of living tissues (Snoeck, 2015)

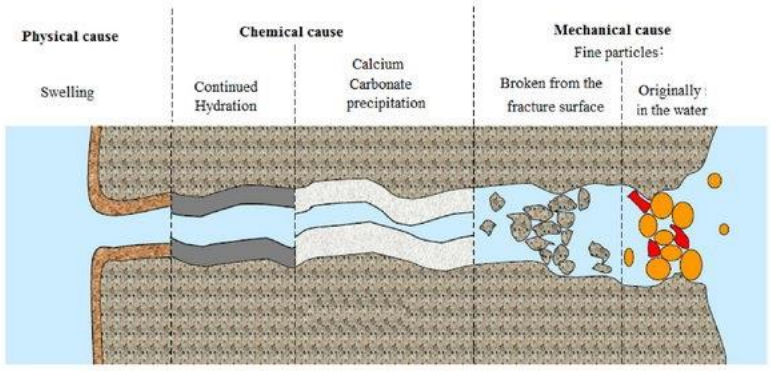

Fig. 2. Self-Healing of Concrete – Main processes associated to the healing of concrete cracks (Psychical, Mechanical and Chemical:Calcium carbinate precipitation and Continuous hydration) (de Rooij et al., 2013)

The continuous hydration of unhydrated particles present in hardened concrete was proved to be an essential source for the healing effect but in time this potential diminishes (Fig. 2).

The concept of the present research is related to identifying a practical solution for providing the long-term continuous hydration potential, for preservation of healing effect as well (Fig. 3). This aim could be achieved by including to the generic cement-based composition *an intelligent addition*, containing *reactive grains as source for further hydration products*, but designed with *polymeric coating as protection against initial hydration*.

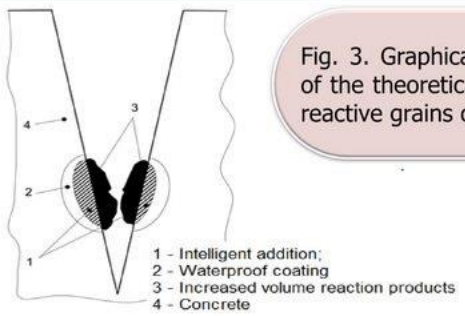

Fig. 3. Graphical representation of the theoretical design for the reactive grains concept

The concept of the present research is related to identifying a practical solution for providing the long-term continuous hydration potential, for preservation of healing effect as well (Fig. 3). This aim could be achieved by including to the generic cement-based composition *an intelligent addition*, containing *reactive grains as source for further hydration products*, but designed with *polymeric coating as protection against initial hydration (Fig. 4)*.

Fig. 4. Active hydraulic grain, aspect during the coating procedures

The challenges of the research are multiple, starting from identifying the optimum materials with reactive potential, efficient coating technology and evaluation of the compatibility between the cement-based matrix and the smart addition.

CONCLUSION: The preliminary results are encouraging, proving the viability of the proposed theoretical concept.

ACKNOWLEDGEMENTS: 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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EURO INVENT
10th European Exhibition of Creativity and Innovation
Iasi, Romania, 21-23 May 2020

SWITCH TYPE CHEMORESISTIVE HUMIDITY SENSOR

ROMANIAN PATENT APPLICATION A/00442/22.07.2019

ASSIGNEE: IMT BUCHAREST

INVENTORS

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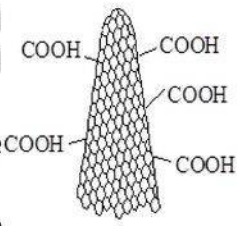
This patent application does address the development of new, innovative sensing layers to be used in the development of chemoresistive relative humidity sensors. The sensitive layers described in this patent application are triblock – copolymer nanocomposites, i.e. PEG-PPG-PEG (polyethylene glycol-polypropylene glycol - polyethylene glycol) / oxidised carbon nanohorns. The electrical resistance of these layers will change proportional to the relative humidity level in the working environment.

The use of the oxidised carbon nanohorns will provide a series of significant advantages and enhancements, in comparison with other chemoresistive humidity sensors:

a. a high ratio between specific surface and volume;
b. a very good detection over a wide range of temperature;
c. the hydrophilic character of the sensitive layer can be easily modulated based on the oxidation parameters specific to the method employed (plasma power, nitric acid concentration, reflux time, etc.);
d. due to the "swelling" effect, generated by the expansion of triblock - copolymer for RH values higher than 75%, a "switch" type of transfer characteristic is recorded. This is an interesting feature, with relevance for certain applications, such as those for the electronics industry.

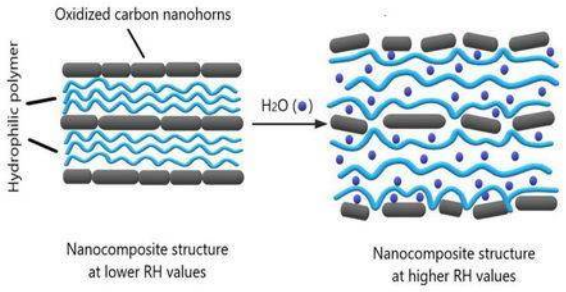
Poly (ethylene glycol)-block-poly (propylene glycol)-block-poly ethylene glycol/oxidized carbon nanohorns nanocomposite

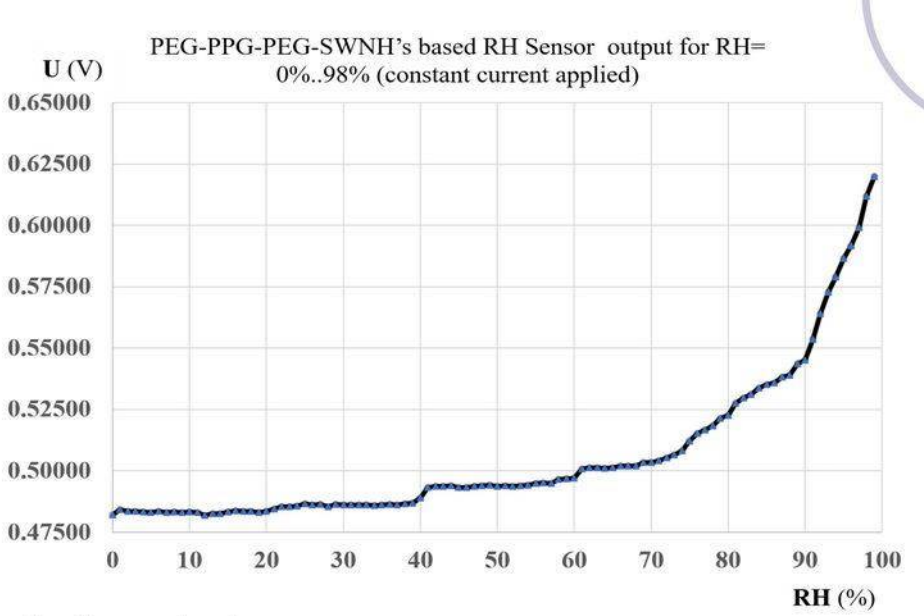
- The PEG-PPG-PEG triblock copolymer (M = 1100 Da, 1 g) was dispersed in 25 mL DI water and subjected to magnetic stirring.
- Add 0.01 g of oxidized SWCNH's to the solution; continue stirring for 2 h.
- The solution obtained deposited by the "spin coating" on IDT.
- The obtained sensing layer is subjected to heat treatment at 90°C/4h - vacuum.



The structure of oxidized SWCNHs.

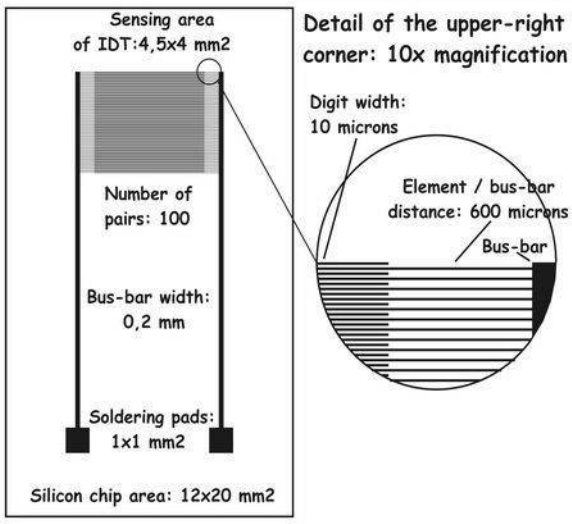
The swelling effect





Sensing mechanism:

- Small electrical resistance increase due to holes concentration decrease by electrons donated from water to SWCNH's (p-type semiconductor behavior at lower RH values)
- Sharp electrical resistance increase ("switching behavior") due to the decrease of number of SWCNH's in contact and increase of distance between isolated SWCNH's enabled by swelling of polymer-SWNH's composite at higher RH values.



- Interdigitated (IDT) structure, manufactured on Si (470 microns) covered with SiO_2 (1 micron).
- IDT's metal stripes have been made by successive deposition of Cr (10 nm) and Au (100 nm).
- The width of the electrodes is approx. 200 microns, with a 6 mm separation between them.

Acknowledgment: 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

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Iasi, Romania, 21-23 May 2020

CHEMORESISTIVE HUMIDITY SENSOR BASED ON CARBONIC NANOCOMPOSITES

ROMANIAN PATENT APPLICATION A/ 01005, 29.11.2018

ASSIGNEE: IMT BUCHAREST

INVENTORS

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INTRODUCTION

This patent application refers to the development of new chemoresistive humidity sensors, using nanocomposite materials based on oxidised carbon nanohorns and a hydrophilic polymer. The selected hydrophilic polymers are polyvinylpyrrolidone (PVP) and polyvinyl alcohol(PVA). The proposed design of the sensors employes: a dielectric layer (glass, PET, Kapton), a series of metal electrodes (aluminium, chrome, copper) and the humidity sensitive layer. The carbon nanocomposite layer is deposited on the electrodes by using one of the following methods: spin coating, drop-casting or electrospinning.

The proposed sensing structure has a couple of significant advantages:

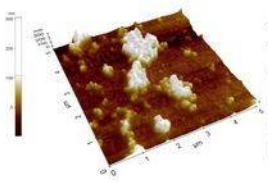
1. enhanced viscoelastic properties for the sensitive layer, resulting in better processability of the layer;
2. the existence of the oxidised carbon nanohorns will result in a high ratio between specific surface and volume;
3. fast response at room temperature functioning.

RESEARCH

- oxidized Single-walled carbon nanohorns (SWCNHs) were dispersed deionized water and subjected to magnetic stirring for 2 hrs at RT.
- Polyvinylpirrolidone (PVP) is a water - soluble polymer, with film -forming properties and resistant to thermal degradation. It is dispersed in the first dispersion and subjected to magnetic stirring for three hours at room temperature.
- the resulted dispersion was deposited by the "drop casting" method on an IDT the sensing structure
-the sensing layer was subjected to heat treatment at 80° C, for one hour, under vacuum.

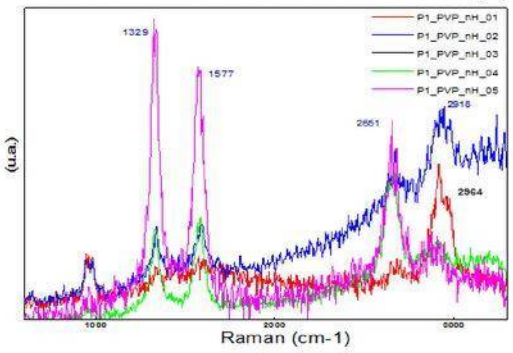
RESULTS

The relative humidity (RH) sensing response of a resistive sensor was obtained using a sensing layer based on oxidized carbon nanohorns- hydrophilic polymer nanocomposite (polyvinylpirrolidone) at different w/w ratios. There were used two ratio (w/w) oxidized carbon nanohorn / PVP (1/2 and 1/1) in precursor dispersion.



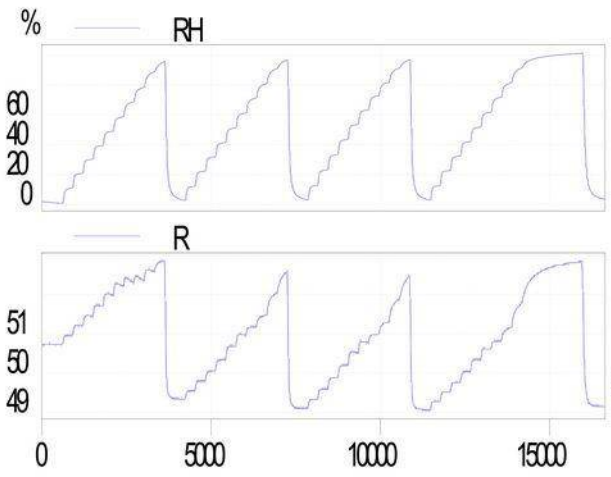
AFM image for oxidized carbon nanohorns - PVP nanocompozite (1/1 w/w) sensing layer

The spectrum exhibits D (~1315 cm^{-1}) and G (~1590 cm^{-1}) modes, which are characteristic for carbon nanomaterials. The G mode corresponds to tangential atomic vibrations of the graphite mesh, while the D mode reveals defect carbon states different from the graphite mesh. The spectra reveals Raman shifts due to the formation of the hydrogen bonds between oxidized carbon nanohorns and PVP.

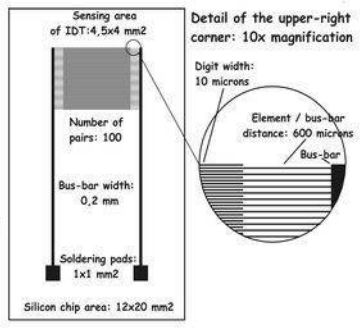


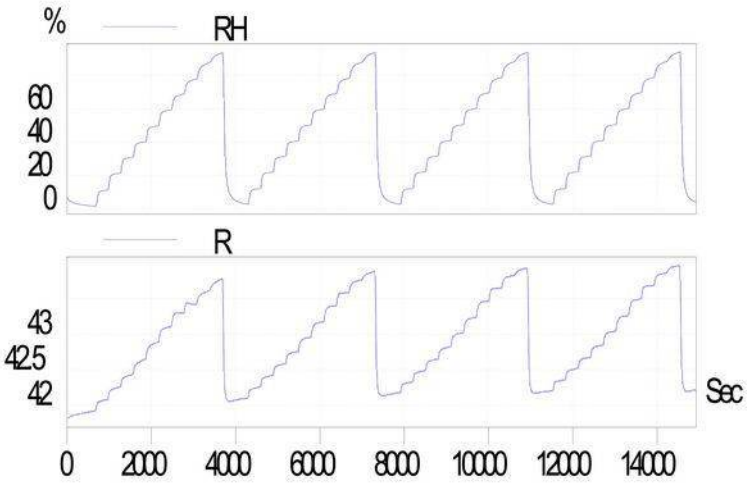
The Raman spectra for oxidized carbon nanohorns - PVP nanocompozite (Raman @532 nm ; Power laser 45.8 mW)

The Interdigitated (IDT) structure was manufactured on Si covered with SiO_2 (1 micron).



Sensor response in humid nitrogen - curve "R", (curve named RH corresponds to the reference sensor) PVP / oxSWCNHS 2/1





Sensor response in humid nitrogen - curve "R", (curve generically called RH corresponds to the reference sensor) PVP / oxSWCNHS 1/1

CONCLUSIONS

The relative humidity monitoring capacity was investigated by applying a current between the two electrodes and measuring the voltage at different values of the relative humidity level at which the sensitive layer was exposed. Measurements were performed in humid nitrogen at room temperature at different relative humidity values, comparing with the response of a commercial moisture sensor.
Thus, in the case of oxidized carbon nanotubes and the PVP nanocomposite matrix, the resistance increase is quasi-linear over the entire RH range.

Acknowledgment: 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

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CHEMORESISTIVE HUMIDITY SENSOR BASED ON OXIDISED CARBON NANOHORNS

ROMANIAN PATENT APPLICATION A/00443/22.07.2019

ASSIGNEE: IMT BUCHAREST

INVENTORS

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INTRODUCTION

This patent application addresses the development of innovative, sensitive layers, to be used for the development of new, relative humidity chemoresistive sensors. The sensitive layers proposed in this patent application are based on oxidised carbon nanohorns, which can be synthesised through three distinct procedures:

a. Oxidation of simple carbon nanohorns in nitric acid;
b. Exposure in oxygen plasma;
c. Exposure in water plasma.

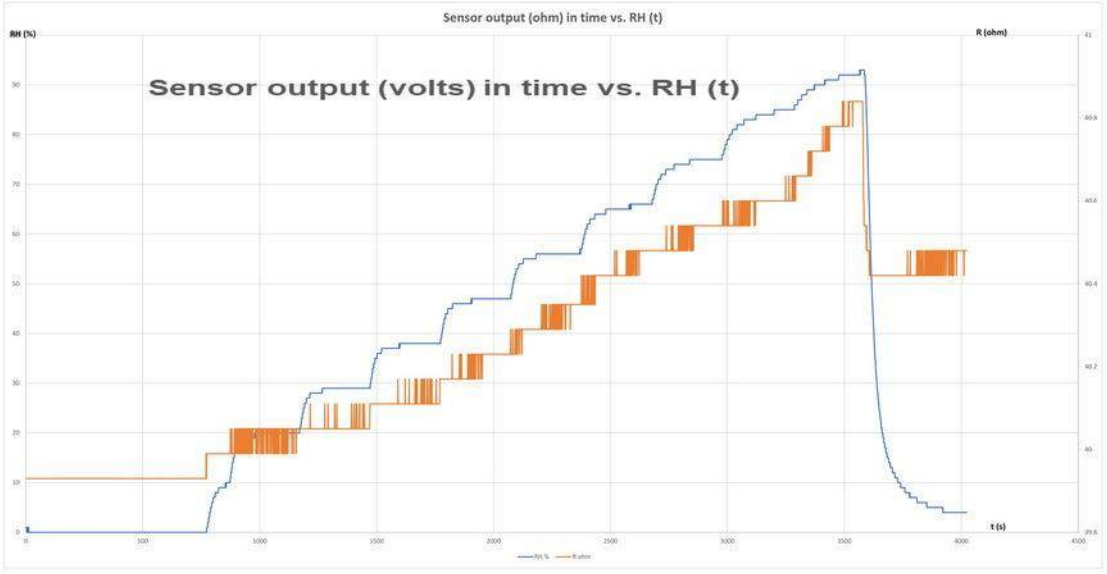
The electrical resistance of these layers will change proportional to the relative humidity level in the working environment. The use of the oxidised carbon nanohorns will provide a series of significant advantages and enhancements, in comparison with other chemoresistive humidity sensors:

a. a high ratio between specific surface and volume due to the presence of the oxidised carbon nanohorns, resulting in a higher affinity for the water molecules over the entire humidity range;
b. a very good detection over a wide range of temperature, due to the excellent thermal and chimical stability of the sensitive layer;
c. the hydrophillic character of the sensitive layer can be easily modulated based on the oxidation parameters specific to the method employed (plasma power, nitric acid concentration, reflux time, etc.)

RESEARCH

- The humidity sensor is based on oxidized carbon nanohorns as sensing layer deposited by drop casting method from ethanolic solution(1% w/w with respect to nanocarbonic material).
- The substrate of the sensor is manufactured by silicon (470 microns) covered with SiO_2(1 micron). Metal stripes have been made by successive deposition of Cr (10 nm) and Au (100 nm). The width of the electrodes is approx 200 microns, with a 6 mm separation between them.
- The humidity detection capability was investigated by applying a current between the two electrodes and measuring the voltage at different values of the relative humidity level at which the sensitive layer was exposed.

RESULTS



CONCLUSION

The resistance of carbonaceous sensing layer increases when RH increases (the response of the sensing layer is in red curve, blue curve being response of a commercial humidity sensor).

From the mechanism sensing point of view, oxidized carbon nanohorns are p-type semiconducting material and water molecules donates their electrons pair, decreasing the number of the holes. As a consequence, the conductivity of the sensing layer decreases.

Acknowledgment: 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

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TERNARY NANOCOMPOSITE FOR THE RELATIVE HUMIDITY RESISTIVE SENSOR AND METHODS OF ITS MANUFACTURE

ROMANIAN PATENT APPLICATION A/00585/23.09.2019

ASSIGNEE: IMT BUCHAREST

INVENTORS

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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. *We report on the RH sensing response of a resistive sensor employing a sensing layer based on a ternary nanocomposite comprising single wall oxidized carbon nanohorns (SWCNHs – Fig. 1) - graphene oxide – polyvinylpyrrolidone, at 1:1:1 w/w/w ratio.*

Materials and methods: 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 water of a nanocomposite comprising oxidized SWCNHs (Fig. 1) - graphene oxide - polyvinylpyrrolidone (at 1:1:1 w/w/w ratio) was deposited on the IDT structure using the drop casting method.

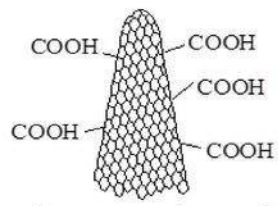

Fig. 1

A dispersion formed in water of a nanocomposite comprising oxidized SWCNHs - graphene oxide polyvinylpyrrolidone (at 1:1:1 w/w/w ratio) was deposited on the IDT structure using the drop casting method.

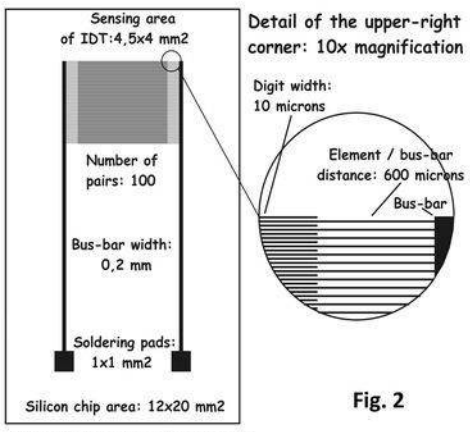

Fig. 2

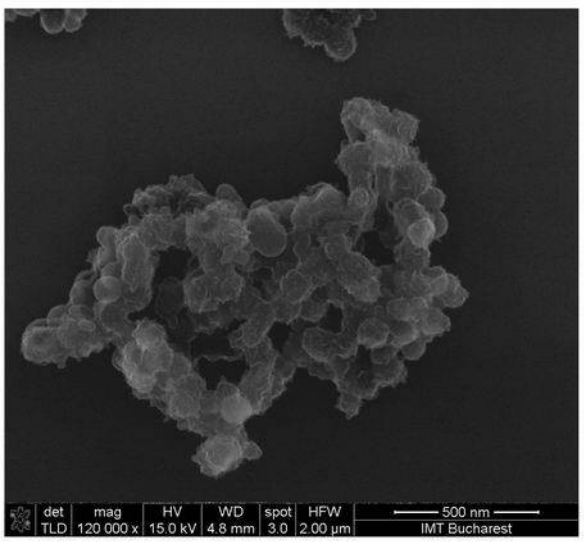

Fig. 3b – SEM image of the ternary nanocomposite

Sensing mechanism

The RH detection capability of the structure was investigated by applying a current between two electrodes and measuring the resistance of the IDT, at different RH levels. Since oxidized SWCNHs and graphene oxide are p-type semiconductor materials, the interaction of the sensing layer with water molecules reduces the number of holes in the sensing material, thus increasing the sensor resistance.

The performance of the sensor introduced by this work was compared with that of a commercially available Sensirion RH sensor, which was placed in the same humid nitrogen environment (Fig. 6).

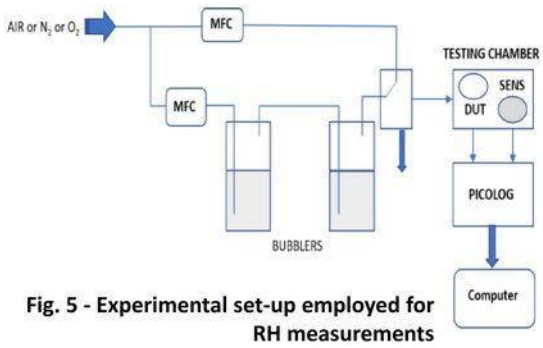

Fig. 5 - Experimental set-up employed for RH measurements

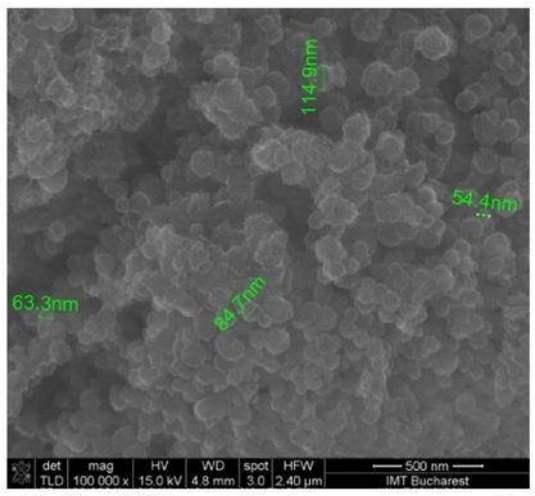

Fig. 3a – SEM image of the ternary nanocomposite

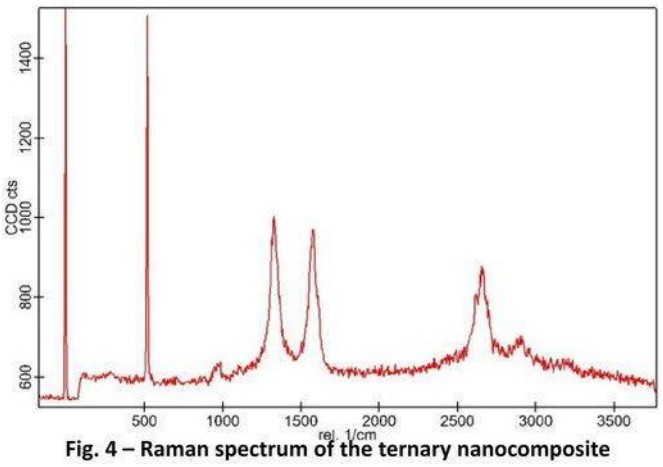

Fig. 4 – Raman spectrum of the ternary nanocomposite

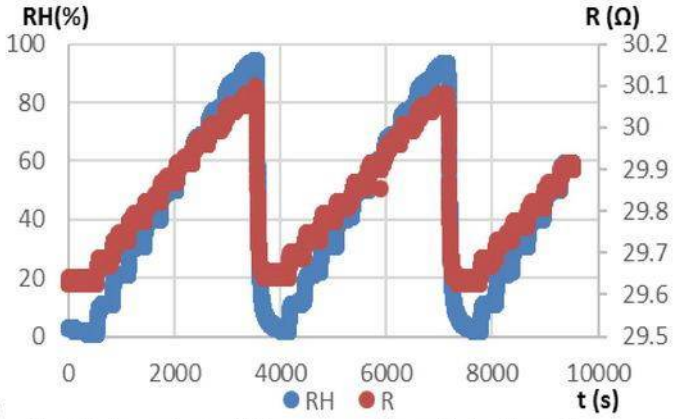

Fig. 6 The output of the sensor (in red), in time; blue curve shows RH variation, as measured by a commercial, industrial sensor

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 N_2 environment. The sensor response time and stability are comparable to that exhibited by a commercially available Sensirion RH sensor.

Acknowledgment: 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

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RESISTIVE SENSOR FOR MONITORING THE RELATIVE HUMIDITY AND PROCESS FOR MANUFACTURING IT

ROMANIAN PATENT APPLICATION A/00517/28.08.2019

ASSIGNEE: IMT BUCHAREST

INVENTORS

BOGDAN-CATALIN SERBAN, OCTAVIAN BUIU, CORNEL COBIANU , VIOREL AVRAMESCU, NICOLAE DUMBRAVESCU, ROXANA MARINESCU

National Institute for Research and Development in Microtechnologies, IMT-Bucharest, 126 A Str. Erou Iancu Nicolae, 077190, ROMANIA

This patent application addresses the development of sensitive layers to be used for the development of new, relative humidity resistive sensors. The sensitive layers proposed in this patent application are based on *oxidized carbon nanohorns* (**Fig. 1**), *fullerenol* (**Fig. 2**), and *Poly(acrylamide-co-acrylic acid) partial sodium salt*- **Fig. 3** (M_w= 520,000).

Synthesis route for the sensing layer

For the synthesis of the oxidized carbon nanohorns/fullerenol/poly(acrylamide-*co*-acrylic acid) partial sodium salt nanocomposites-based sensing layers the following synthesis routes were performed:

(a) 0.1 g of poly(acrylamide-*co*-acrylic acid) partial sodium salt were dispersed in 25 mL deionized water and subjected to magnetic stirring for one hours at room temperature.

(b)0.1 g of fullerenol were dispersed in the first dispersion and subjected to magnetic stirring for two hours at room temperature.

(c)0.8 g of oxidized carbon nanohorns were dispersed in the second dispersion and subjected to magnetic stirring for two hours at room temperature.

(d) the resulted dispersion was deposited by the "drop casting" method on the sensing structure described below (after previously masking the contact area).

(e) the sensing layer was subjected to heat treatment at 70° C, for one hour, under vacuum.

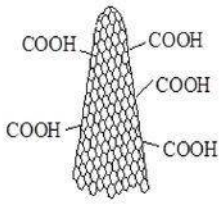


Fig. 1 - The structure of oxidized SWCNHs.

Fig. 2 The structure of fullerenol

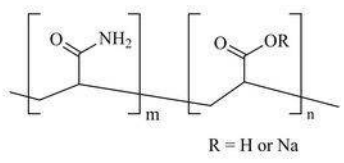
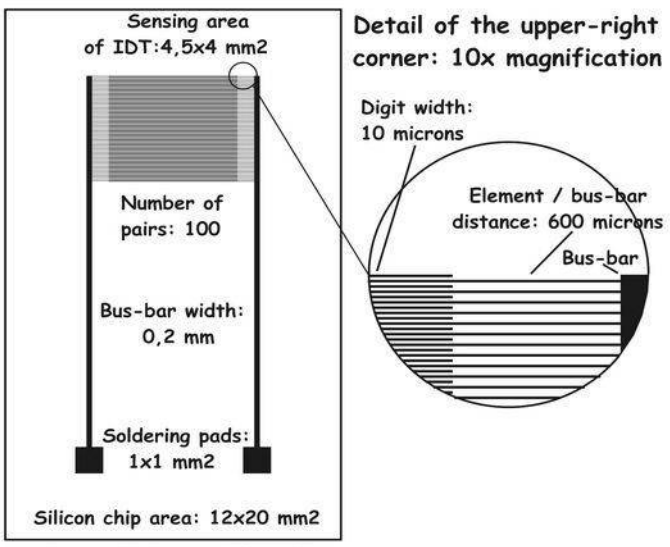


Fig.3 Poly(acrylamide-*co*-acrylic acid) partial sodium salt (M_w= 520,000).



- Interdigitated (IDT) structure, manufactured on Si (470 microns) covered with SiO_2 (1 micron).
- IDT's metal stripes have been made by successive deposition of Cr (10 nm) and Au (100 nm).
- The width of the electrodes is approx. 200 microns, with a 6 mm separation between them.

The use of the ternary nanocompozite oxidised carbon nanohorns/fullerenol/ poly(acrylamide-*co*-acrylic acid) partial sodium salt will provide a series of significant advantages and enhancements, in comparison with other chemoresistive humidity sensors:

- a high ratio between specific surface and volume;
- a very good detection over a wide range of temperature;
- the hydrophilic character of the sensitive layer can be easily modulated based on the oxidation parameters specific to the method employed (plasma power, nitric acid concentration, reflux time, etc.);
- Fullerenol has a pronounced antioxidant character, hydrophilic properties, good compatibility with oxidized carbon nanohorns
- Poly (acrylamide-co-acrylic acid) - partial sodium salt, is a hydrophilic polymer that ensures the cohesion of the two nanocarbon materials, being an excellent binder.

Acknowledgment: 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

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RELATIVE HUMIDITY SENSOR AND METHOD

EUROPEAN PATENT EP 3,211,408, B1, Issued May 10-04- 2019

ASSIGNEE: Honeywell International Inc. Morris Plains, NJ 07950 (USA)

INVENTORS

BOGDAN-CATALIN SERBAN, MIHAI BREZEANU, OCTAVIAN BUIU, CORNEL COBIANU

FIELD OF INVENTION

• Among the various RH sensing structures reported in literature, capacitive sensors are an attractive solution due to their highly linear response (Fig. 1).
• 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 cellulose acetate butyrate (Fig. 2)–based capacitive RH sensor: impregnating its polymeric sensing layer with hydrophobic fillers such as Viton,calcium carbonate, barium sulphate, talc, synthetic fluorine mica, and wollastonite.
• the number and size of the voids in the polymeric sensing film decreases

MATERIAL SYNTHESIS AND CHARACTERIZATION

The manufacturing process of the sensor includes the following steps:

a)A silicon wafer which is exposed to thermal oxidation to develop an about 1 µm thick layer of thermal SiO_2.

b)A thick layer of a Ti/Pt electrode is deposited over the Si/SiO_2 wafer.

c)One then prepares a cellulose acetate butyrate solution (10%) by dissolving cellulose acetate butyrate powder in ethyl alcohol. Wollastonite slurry (3%) was prepared from unmodified wollastonite and ethyl alcohol, ultrasonically stirred at room temperature, for 24 hours.

d)The wollastonite slurry is then mixed with the cellulose acetate butyrate solution and the mixture is ultrasonically stirred at room temperature, for 24 hours.

e) The cellulose acetate butyrate solution comprising the wollastonite suspended therein can be spin coated onto the lower electrode and placed in an oven to cure in air.

f)A porous platinum electrode is then deposited and patterned on top of the cured sensing layer.

g)A cellulose acetate butyrate film can be spin coated on the surface of upper electrode, which acts as a dust removal thin film.

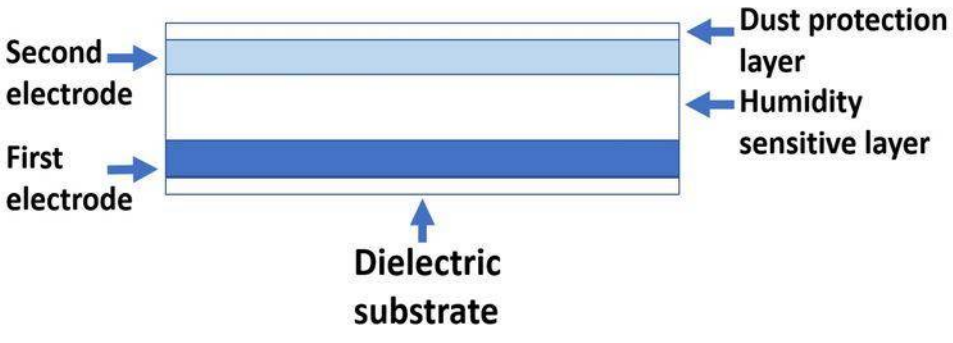

Fig. 1 – Cross section of a typical capacitive sensor.

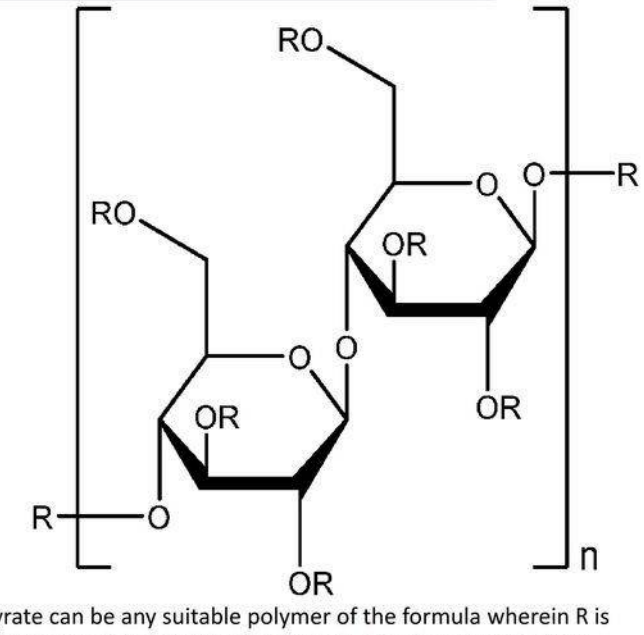

Fig. 2 The cellulose acetate butyrate can be any suitable polymer of the formula wherein R is hydrogen, acetate (-C(O)CH3) or butyrate (-C(O)CH2CH2CH3); and n is an integer such that the molecular weight of the cellulose acetate butyrate is from about 12,000 g/mol to about 70,000g/mol.

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BENZENE SENSOR AND ASSOCIATED METHODS

US PATENT 10,254,217 B2, Publication date: 09-04- 2019

ASSIGNEE: Honeywell International Inc. Morris Plains, NJ 07950 (USA)

INVENTORS

BOGDAN-CATALIN SERBAN, OCTAVIAN BUIU, MIHAI BREZEANU, CORNEL COBIANU, CAZIMIR BOSTAN, CRISTIAN DIACONU

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): $C_6H_6 + I_2 = C_6H_6...I_2$

• 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.

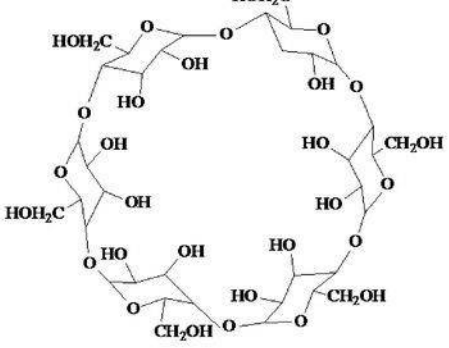

FIG 1 - The structure of α - cyclodextrine

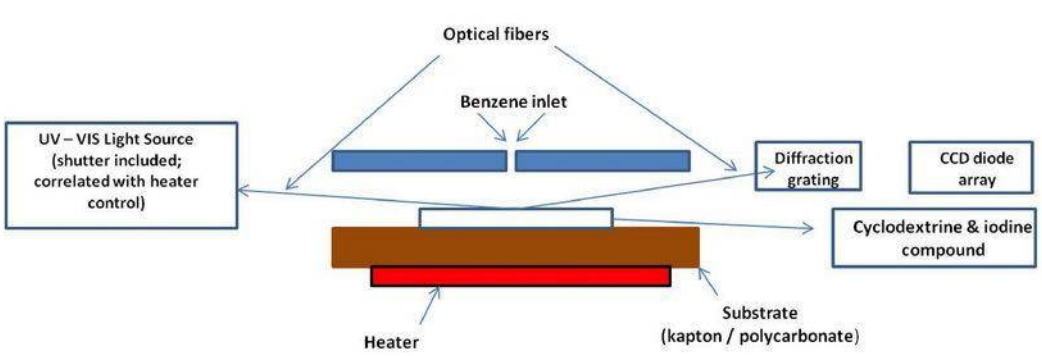

FIG 2 - Optical system for C_6H_6 detection based on the cyclodextrine – iodine complex

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 (see **Fig. 2**).

MATERIALS FOR MAKING DIFFERENT MODELS OF BIOFILM CARRIERS

Patent application No. A/00122/ 04.03.2020

Ioana Corina MOGA, Gabriel PETRESCU

GENERAL INFORMATION

Patent application No. A/00122/ 04.03.2020

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STATE OF THE ART

For wastewater treatment different technologies and processes are known worldwide. The biological treatment technologies based on different consortia of microorganisms are the most common processes applied especially for the removal of the organic compounds. The effectiveness of the activated sludge process was demonstrated for the municipal wastewaters, but for the industrial effluents these biological treatment processes are not sufficient since these polluted waters contain a significant concentration of other elements that are not reduced by common bacteria. In the case of the industrial wastewater treatments, other advanced technologies (ex. tertiary treatment processes mainly based on chemical-physical technologies) are applied.

In this context, the researchers aim to develop tertiary wastewater treatment technology dedicated to the biodegradation of some specific recalcitrant compounds, like cellulose, tannins or absorbable organic halides (AOXs), that are mainly found in papermill, tannery, textile etc. wastewaters. The cellulosic compounds are very difficult to be removed from the effluent by using only conventional biological treatments based on the catabolic capacity of bacteria (activated sludge).

The researched witin the FUNCELL project (Manunet Cofund III - 2017) propose a new treatment technology based on fungi-functionalized Moving Bed Biofilm Reactor (MBBR). Inside the conventional MBBRs the consortia of microorganisms form biofilms, that attaches to free solid-phase carriers also known as biomedia or biofilm carriers. The biofilm carriers are often realised from plastic materials that have a close-to-water density. High-density polyethylene (HDPE) or polyvinyl alcohol (PVA) are the most common materials from which the biomedia is made.

The biofilm developed on the carriers transform or accumulate pollutants. Common applications for MBBRs include nitrification, oxidation (organic carbon, iron- and sulfur-oxidation) and removal of heavy metals. The toxic chemicals can be also reduced when the biofilm carriers are taken out from the system and the biofilm is removed by washing.

During the last years, the MBBR technology for wastewater treatment has been intensively studied and developed, but not applied in combination with fungi (ex. White Root Fungi WRF) for wastewater treatment.

The technology proposed by the authors of the invention will lead to validation of an innovative MBBR designed for new bioactive fungal tools. The central element of this new technology is based on an innovative fungal carrier containing cellulose. Cellulose is the nutrient source for the proliferation of WRF. The fungi metabolism is used by the inventors, in the depletion of AOX, tannins and cellulose from the polluted waters. Currently, the removal of AOXs from wastewater is based on anaerobic dehalogenation processes. Fungi were already described as capable to deplete AOX from kraft pulp bleaching effluents at lab scale. The authors propose an innovative MBBR that will perform in a single step the removal of AOXs that conventionally requires the combination of two processes (both aerobic and anaerobic) when only bacteria are involved. Also, fungi were described as capable of biotransformation of tannins in wastewater. Tannins are known for growth inhibition of microorganisms. Despite the antimicrobial properties of tannins, fungi are resistant to tannins and can utilise them as carbon source. For these reasons, the researchers from the FUNCELL project propose fungi utilizations in MBBRs for AOX, tannin and cellulose removal.

The species of microorganisms in the white rot categories have been successfully used in the bioremediation of effluents from the textile industry, which are capable of producing various isolation forms of extracellular oxidases, including laccase, lignin peroxidase (LiP) and Mn peroxidase, enzymes involved in the degradation of lignin and lignocellulosic substrates, their lignylolytic system being directly involved in the degradation of various xenobiotic compounds, including textile dyes. Their bioremediation activity is based on the production of non-specific extracellular enzymes capable of degrading recalcitrant lignin polymers under the action of specific enzymes such as lignin peroxidase, manganese-dependent peroxidase, laccaza and peroxidase, similar mechanisms being involved in the complex degradation of synthetic dyes.

ORIGINALITY AND INNOVATION

During the last years, the MBBR technology for wastewater treatment has been intensively studied and developed, but not already applied in combination with WRF/ASC for wastewater treatment. The activities proposed by the inventors will lead to validation of an innovative MBBR designed for new bioactive-FUNGAL-tools. The new treatment technology will be developed and designed as self-sustaining by the exploitation of an innovative fungal carrier containing cellulose. In fact, cellulose is the nutrient source for the bioactive- FUNGAL-tool proliferation.

In this context, the inventors propose new materials for the realization of the biofilm carriers. This innovative material allows the adherence of fungi to the biofilm carriers. Some recipes of materials were made and tested. Also, several shapes for the biofilm carriers were analyzed. In particular, 12 types of carriers were tested – table 1 and figure 1.

Table 1. Size and composition of different carriers

Color	Composition	Size	Spokes	Abbreviation
White	100% HDPE	Big		BW
		Small	Regular	SW
			With Spokes	SSW
Yellow	3% cellulose, 5% talcum and 92% HDPE	Big		BY
		Small	Regular	SY
			With Spokes	SSY
Red	5% cellulose, 5% talcum and 90% HDPE	Big		BR
		Small	Regular	SR
			With Spokes	SSR
Brown	7% cellulose, 5% talcum and 88% HDPE	Big		BB
		Small	Regular	SB
			With Spokes	SSB

Figure 1. From left to right, first line: BB, BR, BY and BW.
Second line: SB, SR, SY and SW.
Third line: SSB, SSR, SSY and SSW.

RESULTS

Figure 2. Internalization

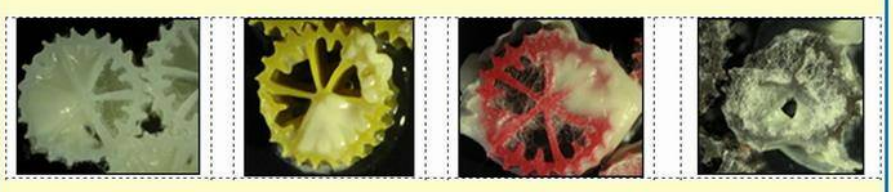

Figure 2. Internalization of biomass inside the MBBR

Figure 3. Pictures realized by the University of Florence and INDTP during the experimental researches on the improved biofilm carriers

ACKNOWLEDGMENTS
This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CCCDI – UEFISCDI, project number COFUND-MANUNET III-FUNCELL, within PNCDI III.

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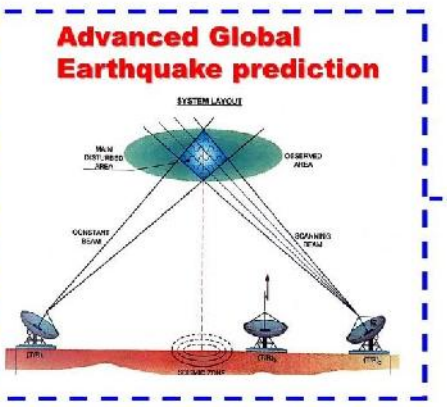

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COMPLEXUL MUZEAL NAȚIONAL MOLDOVA IAȘI

EQUIPMENT FOR TREATMENTS IN AFTERGLOW PLASMA

Patent application: A/00249/2019

Authors:
Dr. Ghiocel Ioanid [1], Dr. Lăcrămioara Stratulat [2], Dr. Dorina Rusu [2]

[1] "Petru Poni" Institute of Macromolecular Chemistry, Iasi, Romania
[2] "Moldova" National Complex of Museums, Iasi, Romania

EURO INVENT

IASI 2020

AIM: Decontamination and mild cleaning in afterglow plasma of fragile objects of complex geometry and volume up to 25x25x25 cm^3 belonging to mobile cultural heritage.

SOLUTION:

The equipment for treatments in cold HF plasma (Fig. 1) consists in a Pyrex cylindrical reaction vessel 1, sealed with two circular flanges – electrodes 2, 3. The reaction vessel is connected to a vacuum pump 11 and a manometer 12 is used to measure the vacuum. The lower flange is fitted with inlets 13 for air admission and evacuation. A needle valve 14 is used for pressure adjustment of the working gas (H_2, N_2, Ar), supplied by a cylinder 15, equipped with a reducing valve 16.

Inside the reaction vessel a detachable module M (Fig.2) is placed, composed of two rods 17, 18, mounted on the flange 20. A circular flange 19, fitted with holes for object 23 fastening, as well as two circular electrodes 24, 25, made of stainless steel mesh, can slide on the two rods, allowing the adjustment of the discharge intensity. The position of the mesh electrodes is established so that the distance between the electrodes 24 and 2 be equal with the distance between the electrodes 25 and 3 (Fig.1).

Two spaces b and c of active plasma discharge appear between the pairs of electrodes 24-2 and 25-3, connected to a HF generator 31 (υ = 3.5 MHz). By the superposition of effects of diffusion and directing of reactive particles produced in the active plasma, located diametrically opposite in the reaction vessel, an homogenous discharge of spatial afterglow plasma (d) is obtained between the mesh electrodes.

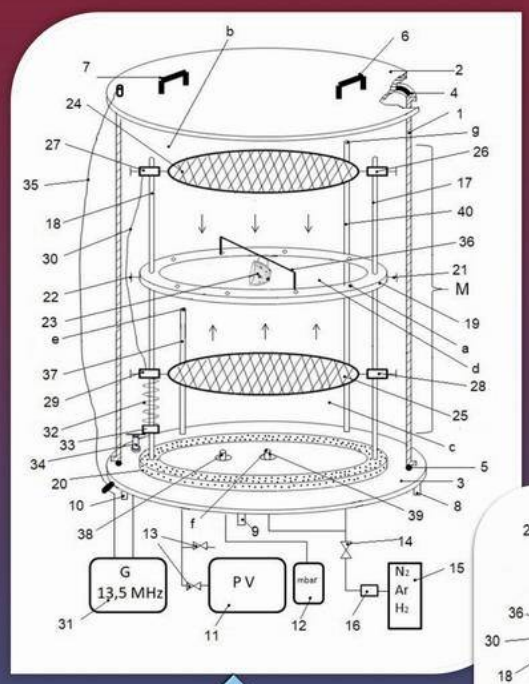


Fig.1 Equipment for afterglow plasma treatment

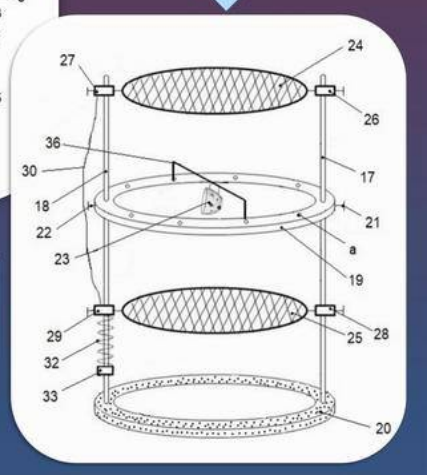


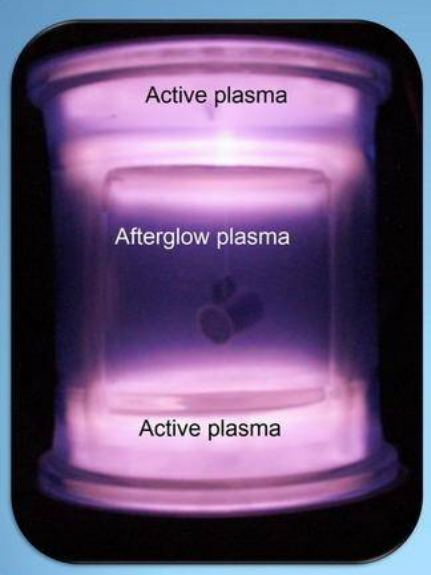
Fig. 2 Module M

APLICATIONS:

The equipment is designed for conservation treatments of organic or inorganic objects belonging to mobile cultural heritage.

ADVANTAGES:

- objects with complex geometry can be treated in a single stage
- homogenous plasma discharge on a large dimension space
- inactivation of a large number of microorganisms, concomitant with contaminants removal
- trained staff is not required
- the original, authentic aspect of the object is preserved



STAGE:

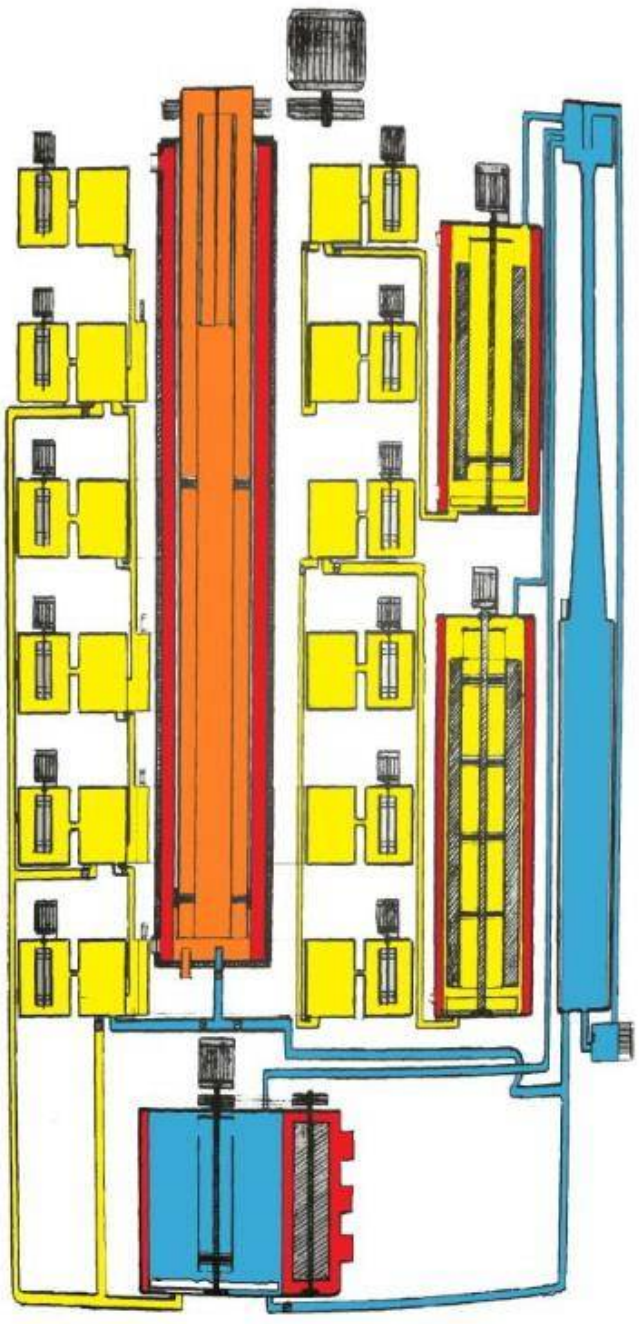
Equipment produced at "Petru Poni" Institute of Macromolecular Chemistry, Iasi, in use at "Moldova" National Museum Complex Iasi

Patent application domain: 5. Industrial and laboratory equipments

CHEMICAL REACTOR FOR REPROCESSING ISOTOPES OF NUCLEAR FUELS

Ion CRISTESCU

Patent RO 129854/2019



The invention refers to a chemical reactor for reprocessing isotopes of spent nuclear fluel CANDU ,obtaining plutonium isotopes and manufacturing a new generation driver fluel mixed-oxides (MOX)with more nuclear power.
The chemical reactor separates all fision products from spent fluel, Components of nuclear chemical reactor : module radiochemichemical reactor generator isotopics azotates U(VI),Pu(IV),in communication with modules extractor reactor complexes isotopics azotates with butylphosphates(TBP) washing scrubber with distilled water of complexes,reactor isotopics azotates Pu(III) in aqueous nitric solution and extractor complexes isotopics azotates U(VI) withTBP, reextractor reactor isotopics azotates U(VI) from organic phase in distilled water and crystallizer reactor for isotopics oxalates U(VI).
This reextractor reactor isotopics azotates Pu(III) is in communication with modules: extractor reactor complexes isotopics azotates Pu(IV) with octylamine (TOA), reextractor complexes isotopics azotates Pu(IV) with TOA in aqueous nitric solution 2M HNO_3 and crystallizer reactor for isotopics oxalates Pu(IV) .

These extractors reactors ,crystallizers and scrubber are in communication with a distiller with vaporizer water, nitric acid, condenser vapour and collector for salts radioactive waste.

Advantages:

- productivity more with 40% in comparison with aparates, plants well-known;
- the rates of radiochemical reaction more at reprocessing of spent nuclear fuel ;
- nuclear purity degree advanced of uranium,plutonium isotopes;
- the recycling of zirconium from spent elements nuclear fluel CANDU and manufacturing new tubes for elements fuel MOX;
- advanced degree of nuclear security.

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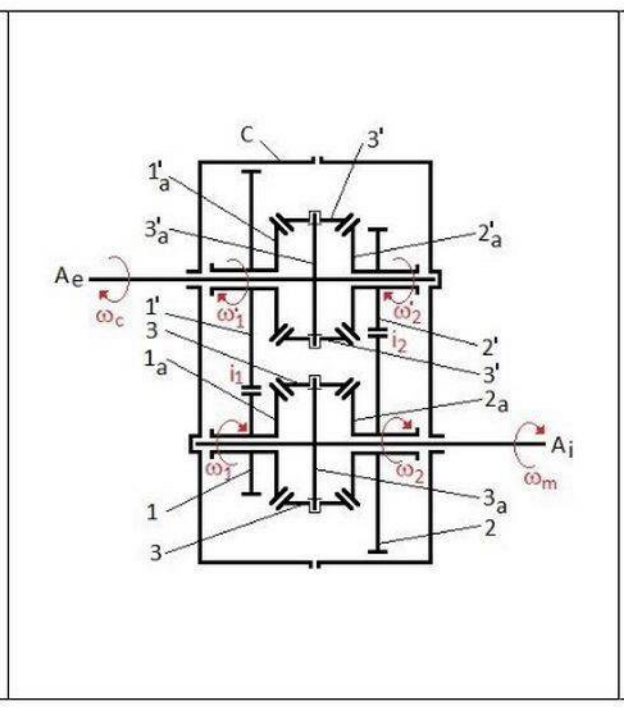
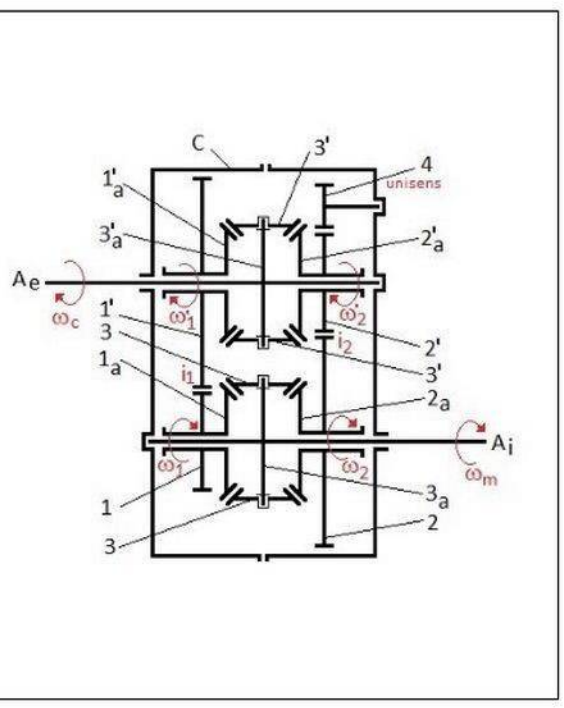
SELF-ADAPTIVE MECHANICAL REDUCER WITH VARIABLE GEAR RATIO

Authors:

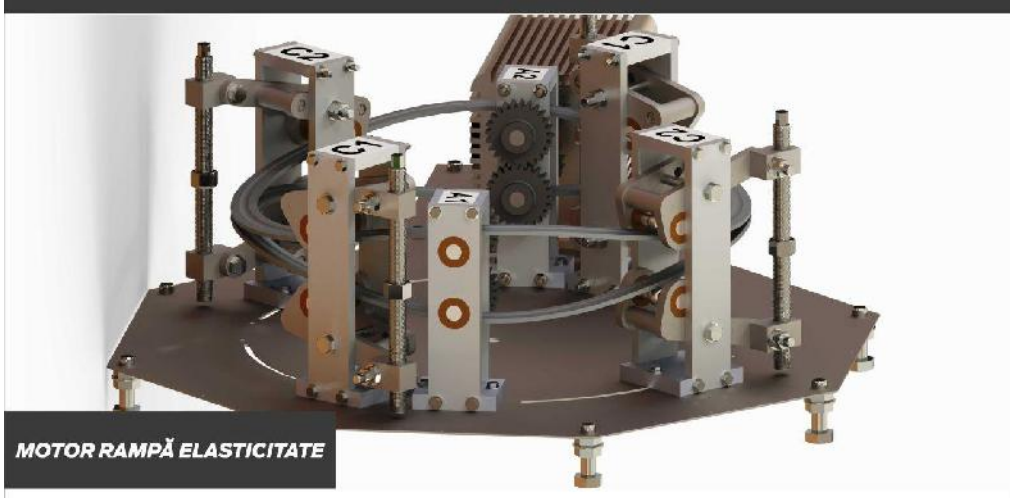
Romeo CĂTĂLINOIU, Sorin Aurel RAȚIU, Imre Zsolt MIKLOS





The invention relates to a mechanical reducer integrated in the transmission of a full electric car, in order to reduce the electricity consumption required by the motors, during running under real road conditions and to improve Dynamics. The reducer allows the continuous, self-adaptive variation of the total gear ratio, between two limit values, depending on the load torque, ensuring the operation of the motors on a restricted range of speeds and with minimum electricity consumption.

MOTOR RAMPĂ ELASTICITATE, FUNCȚIONÂND DUPĂ PRINCIPIILE FIZICII



GET IN TOUCH

0729 123 945

Motor Rampa Elasticitate + generator curent
Autor: Mircea Sangeorzan
Telefon: 0729123945
Mail: mircea_bn@yahoo.com

DISMANTABLE AND PORTABLE STOVE FOR SOLID FUEL

Decision to Grant
EP-016778475.0

Already Granted:
Utility model (RO)
U-2015-00044

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Inventor: **Alexandru SÎRB**, Romania
Contact phone: **+40 740 201 948**

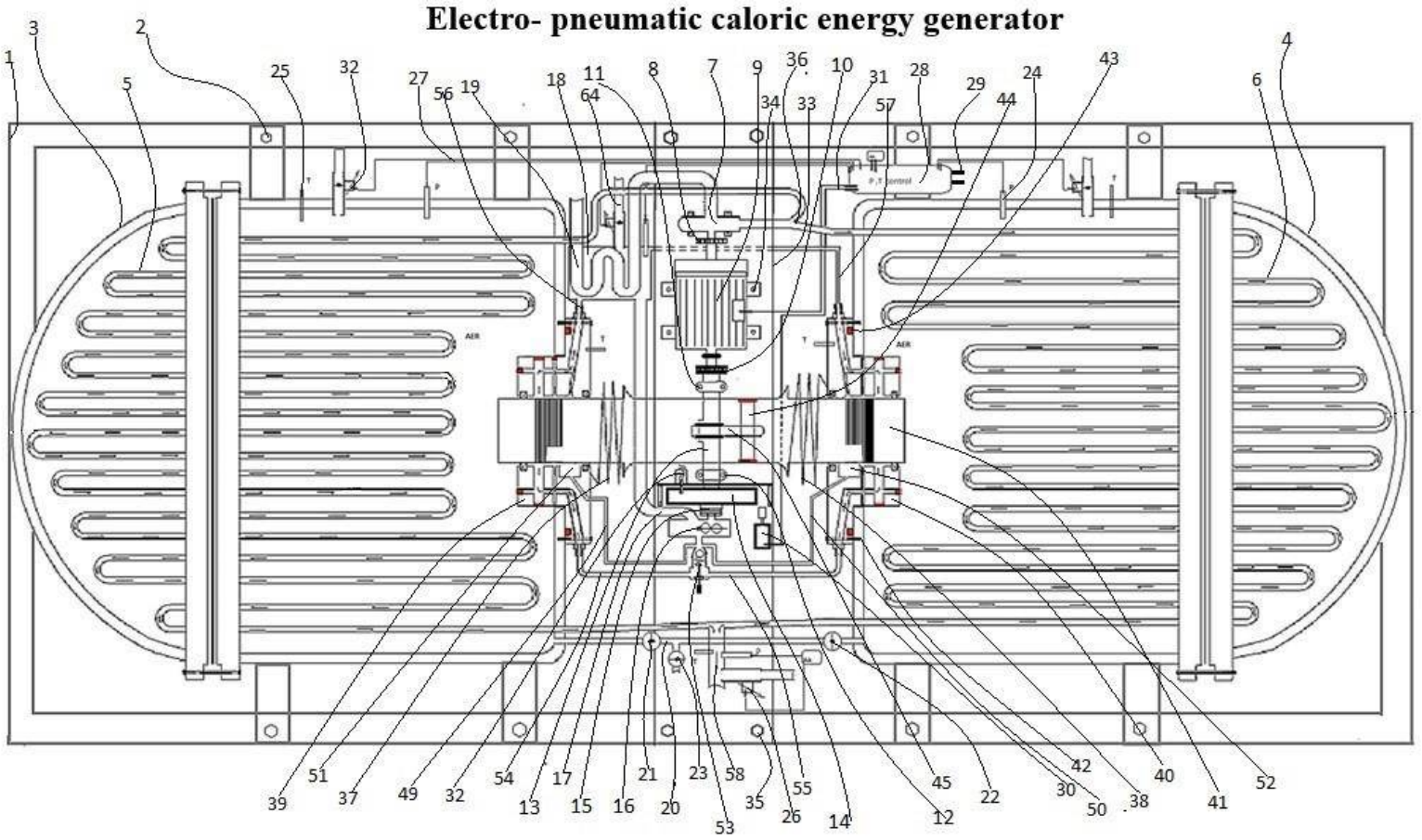
Technical PROBLEM SOLVED by invention: a solid fuel stove, **dismantable and portable**, which burns solid fuel in a **closed chamber**, able to **providing preparation of the food** both **through grilling and boiling**, just by **reversing the position of stove's body**.

Additional, yet (literally!) HOT IDEA is...

...the fuel tray is designed so that it can be effortlessly removed and then replaced in its position after **reversing the stove body**, while **not being necessary to remove the fuel from the tray, even if the solid fuel is still burning!!!**

MAIN ADVANTAGES provided by the invention:

- easy to assemble/disassemble **without tools**;
- might be carried by **one person**, in **one hand**;
- can be installed and used even on **unlevelled** surfaces or **sloping** ground;
- can be used both **outdoors and inside** buildings equipped with chimneys;
- **reduces consumption** of solid fuel required for outdoor cooking activities;
- advantageous solution for temporary **supplementing heating or cooking capacity** of a **household** or a **food business** operator.



by
Sclipcea Costel-Ciprian, Draghici Costel, Neagu Petre, Scintee Alexandra

Is a heating system that can be used in closed or open circuit for heating or preheating a circulation fluid. The project has 2 under pressure tanks (3),(4) disposed in the mirror (face to face), contains inside coils (5),(6) with circulation fluid.

The existent pressure from tanks is disturbed(in sens of increase or discrease) by a common plonjer (piston) (41), liniar acting drived by a low power electrical motor (9), all reported to the effiency of the system as on both sides of the piston acting the same force values.

During the translation of the piston, when is reaching one of the stroke end, kinetical energy is recovered by compression springs (37), (38) and balance value between the pressures in tanks(respectively when the pressure is released in one tank, in the other the pressure increase).

Also under the piston, each one of the heads(39)(40) are designed with a chamber (51)(52) under oil pressure creating a levitation of piston, reducing the friction.

With such a design, the energo-caloric energy efficiency it's very high, another cause is also that the all moving parts are driven by a single electric motor.