Book of Abstracts

EUROINVENT
ICIR 2023

International Conference on Innovative Research

May 11th to 12th, 2023
Iasi – Romania

Organized by:

- **Romanian Inventors Forum**
- **Faculty of Materials Science and Engineering, The "Gheorghe Asachi" Technical University of Iasi, Romania**
- **ARHEOINVEST Platform, Alexandru Ioan Cuza University of Iasi**
- **Centre of Excellence Geopolymer and Green Technology CEGeoGTech), Universiti Malaysia Perlis (UniMAP)**
- **Department of Physics, Czestochowa University of Technology, Częstochowa, Poland**

With support of:

- **Universiti Malaysia Terengganu**
- **International Federation of Inventors' Associations - IFIA**
- **World Invention Intellectual Property Associations – WIIPA**

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EUROPEAN EXHIBITION OF CREATIVITY AND INNOVATION

EUROINVENT

IAŞI – ROMANIA

XVth Edition, 11th - 13th May 2023

Euroinvent is a Festival of innovation, a joint event promoting creativity in European context, by displaying the contributions of consecrated schools from higher education and academic research and also of individual inventors & researchers.

Under the auspices of EUROINVENT we organize:

1. **Inventions and Research Exhibition**

   http://www.euroinvent.org/

2. **International Conference on Innovative Research**

   http://www.euroinvent.org/conference

3. **Technical-Scientifical, Artistic and Literary Book Salon**

   http://www.euroinvent.org/events-2/book-salon/

4. **European Visual Art Exhibition**

   http://www.euroinvent.org/events-2/art-expo/

Event purposes:

- Dissemination of research results;
- partnerships and agreements;
- Creating and developing new research ideas;
- Technology transfer;
- Implementation of inventions,
- Scientific recognition.

The exhibition welcomes you to display inventions (patented in the last 7 years or have patent application number). A special section is held for innovative projects.

EUROINVENT International Conference on Innovative Research (ICIR) will bring together leading researchers, engineers and scientists will present actual research results in the field of Materials Science and Engineering.

euroinvent@yahoo.com

Foreword

This volume contains the information of the ICIR Euroinvent 2023 Conference and the abstracts of selected peer-reviewed papers.

The ICIR Conference is organized under the auspices of EUROINVENT. Euroinvent is a joint event promoting creativity in a European context, by displaying the contributions of consecrated schools from higher education and academic research and also of individual inventors and researchers.

The EUROINVENT International Conference on Innovative Research (ICIR) brings together leading researchers, engineers and scientists who will present actual research results in the field of Materials Science and Engineering.

The conference aims to provide a high level international forum for researchers, engineers and scientists to present their new advances and research results in the field of materials science and engineering.

The volume covers all the aspects of materials science, from synthesis and characterization of materials to procedures and technologies for materials engineering, as well as materials application and their involvement in the life sciences.

All the papers have been reviewed by minimum two expert referees in their relevant topic disciplines. The papers selected for the volume depended on their quality and relevancy to the conference.

The editors hope that this volume will provide the reader a broad overview of the latest advances in the field of materials science and engineering, and that they will be a valuable references source for further research.

The editors would like to express their sincere appreciations and thanks to all the committee members of the ICIR 2023 for their tremendous efforts. Thanks also to the publishers for supporting the publication of the full articles.

Finally, the editors would like to thank all the authors for their contribution to this valuable volume.

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Program of EUROINVENT ICIR Conference
ORAL PRESENTATION

*Palace of Culture Iasi – **Voievozilor Hall***

DAY 1 – THURSDAY MAY 11	
9.00	Participants registration
11.00	**EUROINVENT Opening Ceremony**
12.00	**ICIR Opening Ceremony**
12.15	**Session 1** Chairman: Prof. Dr. Petrică VIZUREANU Prof. Dr. Mohd Mustafa Al Bakri ABDULLAH Prof. Dr. Ion SANDU
12.15	**Keynote Speaker – Yuval GOLAN** *Nanomaterials at Interfaces: Wet Chemical Routes for Size, Shape and Orientation Control*
12.45	**Keynote Speaker – Cătălin POPA** *Modelling of Elastic Modulus and Thermal Conductivity of Ceramic Composites Using 3D Representative Volume Elements*
13.15	***Snacks & Refreshments Break***
14.00	**Session 2** Chairman: Prof. Dr. Hanaa HACHIMI Prof. Dr. Andriana SURLEVA Prof. Dr. Catalin POPA Dr.P.Ts. Romisuhani Binti AHMAD
14.00	**Keynote Speaker – Gültekin GÖLLER** *The Effect of Dual Phase (FeNiCoCrMo) High Entropy Alloy Addition on B4C Based Ceramics Prepared by Spark Plasma Sintering Process*
14.30	**Keynote Speaker – Mohd Arif Anuar Mohd SALLEH** *Effects of Different Surface Finish to the Microstructure and Properties of Sn-Based Solder Joints*
15.00	**Iulian ANTONIAC** - *Potential of Biodegradable Magnesium Alloys as Trauma Implant Materials*
15.15	**Cristiana-Diana CÎRSTEA** - *Experimental Study of Phase Transformations by Dilatometric Analysis in Ni51.5Ti48.5 Materials Obtained by Spark Plasma Sintering*
15.30	**Ovidiu-Darius JUCAN** - *The Assessment of the Transversal Rupture Strength (TRS) and hardness of WC-Co specimens made via Additive Manufacturing and Sinter-HIP"*
15.45	**Suriani MAT JUSOH** - *Manufacturing Defects, Interfacial Adhesion, Impact and Water Absorption Properties of Hybrid Woven Kenaf/CSM Fibreglass Reinforced Polyester Composite in Boat Construction*
16.00	**Olga TIRON** - *Granular Activated Algae Technology for Wastewater Treatment and Resources Recovery – GRAAL Recovery Project*
16.15	**Rozyanty RAHMAN** - *A Review on the Effect of Extrusion Parameter on 3D Printing Filament Diameter*
16.30	**Mihai Andrei PLATON** - *Influence of Fiberglass Reinforcement on the Mechanical Behaviour of an ABS - PMMA Polymer - Fiberglass Composite*
16.45	**Cosmin-Andrei ALEXE** - *Liquid Crystals for Designing Smart Leather Surfaces*
17.00	**Dan Cristian CUCULEA** - *Enhancement of Wear Resistance of S700MC using Laser Cladding and Ni-Based Powder*
17.15	**Valentin Marian CALINESCU** - *Morphological Changes of Metal Oxides Through the Solar Physical Vapor Deposition Process*
17.30	**Iulian BOUNEGRU** - *Electrochemical Impedance Spectroscopy Study Of The Reactivity Response of Pure Titanium In Biological Solution With Reactive Oxygen Specie*
17.45	**George ACHITEI** - *State of Art and Future Trends of Thermoelectric Generation Systems in Automotive Industry*
18.00	**Madalina Simona BALTATU** - *Evaluating the Properties of a Ti-Mo-Zr-Mn System for Orthopedic Applications*
18.15	**Dumitru Doru BURDUHOS-NERGIS** - *Thermal Behaviour of Fly Ash Based Geopolymer Composite Reinforced with Recycled Glass Fibers*
18.30	**End of Conference Day**

Program of EUROINVENT ICIR Conference
ORAL PRESENTATION

*Palace of Culture Iasi –**Volevozilor Hall***

DAY 2 – FRIDAY MAY 12	
9.00	**Session 3** Chairman: Prof. Dr. Gültekin GOLLER Prof. Dr. Lidia BENEA Prof. Dr. Julia MIRZA ROSCA Prof. Dr. Iulian ANTONIAC
9.00	**Invited Speaker – Hanaa HACHIMI** *Demand-Side Management Strategy in a Smart Home Using Electric Vehicle and Hybrid Renewable Energy System*
9.30	**Invited Speaker – Romisuhani Binti AHMAD** *Geopolymer Route To Ceramic Materials*
10.00	**Invited Speaker – Mohd Remy Rozainy Mohd Arif ZAINOL** *How Universiti Sains Malaysia (USM) Pioneering the Green Drainage System in Malaysia?*
10.30	**Aura Catalina MOCANU** - *The Synthesis of PLA/HA Composite Filaments for Biomedical Applications*
10.45	**Andriana SURLEVA** - *Characterization of Bulgarian Cooper Mine Tailing as a Precursor for Geopolymer Obtaining*
11.00	**Irina GRADINARU** - *Preliminary Study Concerning the Adaptation of a Periodontal Dressing Material to the Inclusion of Therapeutic Agents*
11.15	**Alexandra CSAPAI** - *Selective Bacterial Growth in 3D Printed Microfluidic Bioreactors: From Simulated Conditions to Experiment*
11.30	**Cornelia BAERA** - *Opportunities Regarding the Innovative Conservation of the Romanian Vernacular Urbanistic Heritage*
11.45	**Cristina Ileana COVALIU-MIERLĂ** - *Acetaminophen Drug Removal from Wastewater Using Carbon Nanotubes Nanomaterials*
12.00	**Victor TOSA** - *Development of a Polymer Fiber based System for Hemostasis in Open Surgery Procedures using Cyanoacrylate Tissue Adhesive*
12.15	**Adrian BOGORIN-PREDESCU, Aurel-Mihail TITU** - *Data Acquisition System for a Hydroelectric Turbine with Deformable Blades*
12.30	**Doriana FORNA** - *Interdisciplinary Management in Complex Systemic and Oral Rehabilitation*
12.45	**Nur Izzati Muhammad NADZRI** - *Phase Evolution and Corrosion Resistance of CoCrFeMnNi HEA under Influence of Aluminium*
13.00	**Diana MOCANU** - *Corrosion of 316L Stainless Steel Orthodontic Structures In Salivary Solutions in the Presence Of Lactic Acid*
13.15	**Aurel-Mihail TITU, Alina Bianca POP** - *Measurement System Evaluation for Aircraft Seat Track Hole Diameter: A Gage R&R Study*
13.30	**Veaceslav NEAGA** - *The Effects of the Electrochemical Oxidation Parameters Of The Zr2.5Nb Alloy On Some Implants Properties*
13.45	**Adrian MAZILU** - *Monitoring and Evaluation of the Corrosion Behavior in Seawater of the Low-Alloy Steels BVDH36 and LRAH36*
14.00	**Awards Ceremony and Conference Closure**
18.00	**Cocktail dinner - Restaurant – HOTEL CIRIC**

Program of EUROINVENT ICIR Conference

POSTER PRESENTATION

*Palace of Culture Iasi - **Voievozilor Hall***

DAY 1 – THURSDAY MAY 11	
	Poster Session Chairman: Prof. Dr. Mohd Arif Anuar MOHD SALLEH Prof. Dr. Alexandru PASCU Prof. Dr. Mihail Aurel TITU
P1.	I. AGAPE et al. -Impact of the new tram depot on GHG emissions. Estimating GHG emissions of the cars in the area of study
P2.	L. MARDARE et al.-The Corrosion Behavior of SPCE Steel Used in The Automotive Industry and Laser-Welded Joints Without Filler Material
P3.	P. VIZUREANU et al.-Mechanical Performance of Mine Tailings Blended Geopolymer Designed by Taguchi Method
P4.	I.C. ROATA et al.-Surface properties of Ni-Cr-Al Materials Fabricated via Powder Metallurgy
P5.	C. MUNTEANU et al.-Corrosion behaviour of cold spray coated AISI 1018 carbon steel using NiCrC powder
P6.	O. MOLODID et al.-Condition Survey And Recommendations Regarding The Repair Of The Facades Of The Historical Building In The Besarabskyi Quarter In Kyiv
P7.	D.O. CÎRJAN et al.-Research on the implementation of modern technologies in treating water polluted with hydrocarbons
P8.	S.N. NOAPTEȘ (ANGHEL) et al.-Physico-Chemical Characterization of Chitosan Membranes with Mistletoe Extracts
P9.	V.TONIȚĂ et al.-Behavior of Hyperbaric Underwater Butt Welding Using MAG-M Mechanized Dry Ecological Tubular Wire With Seawater Immersion.
P10.	A. PAWŁOWSKA et al.-Problems of Expositions and Protection of Banksy's Murals in Ukraine
P11.	S.N.S.H. NOOR et al. - The Use of Coal Waste Materials as Sustainable Additives for Enhancing Concrete Properties: A Review
P12.	K. SOBCZYNSKA et al.-Problems Of Supplementing The Formed Historic Development With New Objects (On The Example Of Poznań)
P13.	A. NADOLNY et al.-In-fill development architecture, as element of post second war reconstruction of city of poznan. Case study of joseph stübben's extension plan of the city from years 1902-1918
P14.	T. RADOYKOVA et al.-Investigating The Possibilities of Using Of Mine Tailing And Coal Fly Ash From Bulgaria As Raw Materials In Geopolymer's Production
P15.	S. KETKAEW -Disinfection System By Pulse Corona Hybrid Technology
P16.	E.I. CHERECHES et al.-Studies on 1-butyl-3-methylimidazolium tetrafluoroborate ionic liquid and its nanocolloids behavior in heating operations: experimental approach
P17.	Y. IVASHKO et al.-Problems of plants revitalization in the East of Ukraine after the war
P18.	M. ORLENKO et al.-Reproduction and restoration of iconostases of Ukrainian churches
P19.	F. RAHMAN et al. - Physical Properties Characterization of Ceramic Waste Particles Used as Filler in Boat Hull Production: A Proposed Study
P20.	O. MOLODID et al.-Research for Banksy mural 'Judoki' in Borodyanka
P21.	Y. DING et al.-Specificity of the construction of historical temples of Shaanxi Province as the basis of their preservation and restoration
P22.	E. STEFANOV et al.-Speciation Analysis of Arsenic in Soil Samples by Liquid-Liquid Extraction and Electrochemical Detection with Gold micro-wire electrode
P23.	P. PETROV et al.-Potential for phytomining of rare earth elements by naturally occurring plants in reclaimed tailing ponds. A case study: Madjarovo reclaimed tailing ponds
P24.	K. GARTSIYANOVA et al.-Local Conservation of Nature Heritage as an Important Component in the Water-Energy-Food Nexus Approach - a Case Study of Srebarna Lake, Bulgaria
P25.	C. CIUBOTARU et al.-Investigation of a bronze harness object from the Roman era discovered in Romania
P26.	A. HEGYI et al.-Study on the Possibilities of Developing Cementitious or Geopolymer Composite Materials with Specific Performances by Exploiting the Photocatalytic Properties of TiO2 Nanoparticles
P27.	T.P. TOADER et al.-Thermal insulation of buildings using innovative materials based on nanoparticles
P28.	A. PAWŁOWSKA et al.-Friendly City. Making Architectural Heritage Accessible
P29.	N. BOGATU et al.-Improving the Fertile Properties of Lands with Risk of Desertification in Order to Conserve Agricultural Areas
P30.	V. BOCANCEA et al.-Subjective perception evaluation of digital protective materials
P31.	O. CHISELIȚA et al.-Study of the biochemical composition of the pigmented ethanolic extracts obtained from the residual biomass of Arthrospira platensis
P32.	I.E. MARIN et al.-The influence of zero waste sewing patterns upon the apparel's CO2 footprint
P33.	D.N. AVRAM et al.-Evaluation of Microstructure, Microhardness and Corrosion Behavior of NiCr(Ti) Laser Cladding
P34.	I. HULKA et al.-Influence of NaOH treatment on the corrosion resistance of Ti and Ti15Zr5Nb biomaterials

Program of EUROINVENT ICIR Conference

POSTER PRESENTATION

*Palace of Culture Iasi - **Volevozilor Hall***

DAY 2 – FRIDAY MAY 12	
	Poster Session Chairman: Prof. Dr. Mihail Aurel TITU Prof. Dr. Alexandru PASCU Prof. Dr. Mohd Arif Anuar MOHD SALLEH
P35.	S. BRITO GARCIA et al.-There are no limits to the miracle of alloys: high entropy alloys
P36.	C. JIMÉNEZ MARCOS et al.-Analysis of novel Ti15Mo7ZrxSi titanium alloys experimentally developed as potential materials for medical uses
P37.	G. BUICĂ et al.-The influence of chemical agents on the technical characteristics and safety of protective equipment against electric shock
P38.	I. HULKA et al.-Influence of laser cladding power on the microstructure and corrosion resistance of Co-based coatings
P39.	L. MARDARE et al.-Evaluation of The Marine Corrosion Behavior of S275JR Steel Coated With Polymeric Films
P40.	A.M. SCRIPCARIU et al.-Solar energy for Nitinol powders heating
P41.	E.R. MOLDOVAN et al.-Surface Roughness Analysis of Laser Surface Texturing Effect on AISI 430 Stainless Steel
P42.	G.D. TANASIEVICI et al.-Wear-Corrosion Analysis of Stainless Steel Nets Used in Food Industry
P43.	P. LAZAR et al.-Microstructural Analysis of Phosphate Layers Deposited on Steel Rebars for Construction
P44.	C. IATAN et al.-High-Corrosion Resistance of Ni and Cu based Laser Cladding
P45.	C. OSOEANU et al.-Wear-Analysis of different brake pads used in commercial vehicles
P46.	I. ADOMNIȚEI et al.-Corrosion resistance of Inconel 718 in solutions with various pH
P47.	L.M. NICULA et al.-Investigations Related to the Opportunity of Using Furnace Slag in the Composition of Road Cement Concrete
P48.	M.C. PERJU et al.-Evaluation of physico-mechanical proprieties of carboxymethyl cellulose quenching environment depending on the thermal degradation
P49.	A. ȘTEFAN et al.-Cold Spray Coatings Morphology
P50.	V.D. GHERMAN et al.-Nitrogen buget simulator for the management of recirculated aquaculture systems with plant biofilters
P51.	D.P. BURDUHOS-NERGIS et al.-Tribological characterization of phosphate coatings deposited on Ti6Al4V
P52.	S.R. ABDILA - Influence of Liquid and Plastic Limits on the effect of Solid-to-liquid ratio and molarity of Sodium Hydroxide for Soil based Geopolymer with Addition of Fly Ash
P53.	D.P. BURDUHOS-NERGIS et al.-Phosphate conversion coatings for biomaterials: A bibliometric analysis
P54.	M. TOFAN et al.-Research and Development of Novel Advanced Titanium Alloys for Medical Use
P55.	M.A. MAZILU et al.-Heat treatments on metallic biomaterials for medical devices
P56.	M. MARIN et al.-Neural Network Modeling to Predict the Properties of Sintered-Iron Based Powder Metallurgy Materials
P57.	G. POPESCU et al.-New environmentally friendly materials for making bricks
P58.	D. AGOP-FORNA et al.- Interdisciplinary Management In Complex Systemic and Oral Rehabilitation
P59.	N. FORNA et al.- Classic And Minimal Invasive Surgical Implications In Oral Implant-Prosthetic Rehabilitation Of Edentulous Patients
P60.	D. FACHIKOVA et al.-Comparison of corrosion behavior of two stainless steels for medical applications
P61.	O. MIRCEA et al.-The Study And Restoration Of A Batch Of Coins Discovered At The Church Of Saint George In Roman
P62.	M. MEDIĆ et al.-Functional poly(alkyl methacrylate) additives for improvement of wear reduction properties of lubricating oils
P63.	M. AXINTE et al.-The Influence of Processing Pararneters on the Mechanical Properties of PLA 3D Printed Parts
P64.	D. CRISTIȘOR et al.-Influence of TiO2 Alloying Percentage on the Morphology of APS-deposited Coatings from Cr2O3 Powders
P65.	S.L. TOMA et al.-Expanding the Applications of Copper-based Alloys by Thermal Arc Spraying
P66.	R. MUSTAPHA et al. - Hybrid Fiber Reinforced Vegetable Oil-Based Composites: A Short Review

THE „GHEORGHE ASACHI" TECHNICAL UNIVERSITY OF IASI
Faculty of Materials Science and Engineering

The "Gheorghe Asachi" University of Iasi is an excellent choice for the highschool graduates, who wish to embrace a carrier in the attractive field of engineering. The eleven faculties of the university are well equipped and have renowned specialists.

The Faculty of Materials Science and Engineering at the "Gheorghe Asachi" Technical University of Iasi has the mission to train specialists for the materials engineering, mechanical engineering and industrial engineering fields, through a 4-year programme (B.Sc.), Master Courses and Ph.D. Programmes. Also, our faculty is involved in the scientific research programmes, as well as in life-long education programmes for professionals that wish to extend their expertise. Besides the formative activity, research in various fields, focused to multi-disciplinary national and international co-operation is highly valued.

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ROMANIAN INVENTORS FORUM

Romanian Inventors Forum (FIR), as a professional association of dialog and representation, has the purpose to support, stimulate, develop and valorize the scientifically, technically and artistically creativity. Under the aegis of FIR, Romanian Inventors have participated at more than 50 World Invention Exhibitions, where their creations have been awarded with orders, prizes and medals. The performance of Romanian inventics is renowned in the whole world, that is the reason why FIR became member in different international clubs, associations and federations, with special contributions.

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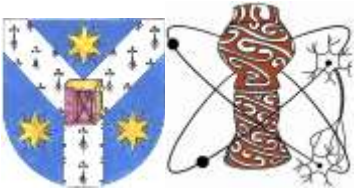
Universiti Malaysia Perlis (UniMAP) is Malaysia's 17th public institution of higher learning. It was approved by the Malaysian Cabinet on May 2001. Originally known as Kolej Universiti Kejuruteraa Utara Malaysia (KUKUM), or Northern Malaysia University College of Engineering, it was renamed as Universiti Malaysia Perlis (UniMAP) in February 2007. The first intake consisted of 116 engineering students who started classes on June 2002. Currently, UniMAP has approximately 15,000 students and a workforce of more than 1,900 academic and non-academic staff members. It offers 21 undergraduate programs that lead to Bachelor in Engineering, one undergraduate programs that leads to an Engineering Technology degree and two undergraduate programs that lead to a Bachelor in Business. We also offer six Diploma in Engineering programs and 13 postgraduate programs that lead to the Master of Science in Engineering and PhD degrees.

Center of Excellence Geopolymer & Green Technology (CEGeoGTech) lead by Vice Chancellor Universiti Malaysia Perlis (UniMAP), Professor. Dr. Kamarudin Hussin. CEGeoGTech located at the School of Materials Engineering, Kompleks Pusat Pengajian Jejawi 2, Taman Muhibbah, 02600 Arau, Perlis. CEGeoGTech has been established on July 2011 with the intention to induce innovation in green material technology among researchers in Universiti Malaysia Perlis. CEGeoGTech are able combining their expertise and skills in various fields to support the academic structure in the generation of human capital that contributes to the development of high quality research. This center also can become a pillar of academic activities, especially regarding research, development and innovation. CEGeoGTech have 8 fields of research includes:

- Geopolymer
- Polymer Recycling
- Electronic Materials
- Ceramic
- Electrochemistry Materials & Metallurgy
- Environmental
- Manufacturing and Design
- Green ICT

ARHEOINVEST Platform, Alexandru Ioan Cuza University of Iasi
„Alexandru Ioan Cuza" UNIVERSITY OF IASI

The Alexandru Ioan Cuza University of Iași is the oldest higher education institution in Romania. Since 1860, the university has been carrying on a tradition of excellence and innovation in the fields of education and research. With over 38.000 students and 800 academic staff, the university enjoys a high prestige at national and international level and cooperates with over 250 universities world-wide. The Alexandru Ioan Cuza University became the first student-centered university in Romania, once the Bologna Process was put into practice. Research at our university is top level. For the second year in a row, the University is placed first in the national research ranking. Striving for excellence, the university takes unique initiatives to stimulate research quality, to encourage dynamic and creative education and to attract the best students to academic life.



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Czestochowa University of Technology, Częstochowa, Poland
Department of Physics

Czestochowa University of Technology (CUT) is the largest state university in the region funded in the 40's last century. It is also the only one having full academic rights, i.e. it has the right to confer the title of doctor and university professor (habilitated doctor). During its scientific and educational activities, it has become an inherent part of Poland's history and tradition, of Czestochowa region and the city itself. In nationwide rankings of the state institutions of higher education, we are among the top universities in Poland of a similar profile.

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Częstochowska

CUT has a reputation for being a modern and well-equipped school which offers a wide range of courses and a high level of education. The excellent quality of our teaching and research and the unrivalled academic knowledge and experience of our academic staff make studying at CUT a stimulating and invaluable experience. The University also prides itself on having good student infrastructure, a wide range of high-standard laboratories and lecture rooms to support research and teaching as well as three halls of residence, its own publisher and a modern main library and faculty libraries.

All accepted papers, after the peer review, from EUROINVENT 2023 International Conference on Innovative Research will be published in:

Springer Proceedings in Materials (Indexed by SCOPUS and sent for index in Web of Science)

Archives of Metallurgy and Materials (Indexed by Web of Science – ISI and Elsevier SCOPUS, **IF 0.586**)

Materials, Coatings, Micromachines, Applied Sciences, Magnetochemistry (MDPI Publisher – Indexed by Web of Science – ISI and Elsevier SCOPUS)

European Journal of Materials Science and Engineering (Indexed by DOAJ, Chemical Abstracts, CiteFactor)

International Journal of Conservation Science (Indexed by Web of Science – ISI and Elsevier SCOPUS)

Keynote Speaker

Yuval GOLAN, PhD

Professor Eng.
Department of Materials Engineering,
Faculty of Engineering Sciences, Ben-Gurion University of the Negev, Israel

Professor Yuval Golan obtained his PhD in the Department of Materials and Interfaces, the Weizmann Institute of Science in 1996. He then spent 3.5 years as a postgraduate researcher at the Materials Research Laboratory, University of California, Santa Barbara. In 1999 he joined the Department of Materials Engineering at Ben-Gurion University of the Negev and in 2010 he was promoted to full professor and appointed Director of the Ilse Katz Institute for Nanoscale Science and Technology at BGU. His research interests are in the area of Nanomaterials at Interfaces and include surfactant assisted synthesis of nanomaterials and chemical epitaxy of semiconductor thin films. Prof. Golan has published over 150 research papers in peer-reviewed scientific international journals and supervised some 40 junior researchers. Since 2016 Prof. Golan has been Chairman of the Synchrotron Committee of the Israeli Academy of Science. In 2020 Golan was appointed deputy vice-president and dean for research & development at Ben-Gurion University of the Negev.

NANOMATERIALS AT INTERFACES: WET CHEMICAL ROUTES FOR SIZE, SHAPE AND ORIENTATION CONTROL

Wet chemical routes for synthesis of semiconductor nanostructures and thin films are straightforward, cost-effective and can result in high quality nanomaterials with precise size and shape control. Two synthetic methods will be presented, both in which interfacial processes play a major role. The first method, chemical solution deposition, offers a simple and versatile route for producing high quality semiconductor thin films directly onto single crystal substrates without the use of organic ligand molecules. A wide range of microstructures is obtained, from nanocrystalline films to 'chemical epitaxy' – monocrystalline thin films with a well-defined orientation with respect to the substrate. The second part will present the synthesis of highly uniform nanoparticles capped with alkylamine surfactants, focusing on the role of 'beneficial impurities' for controlling their shape and phase.

Keynote Speaker

Gültekin GÖLLER, PhD

Professor Eng.
Department of Metallurgical and
Material Engineering,
Faculty of Chemistry-Metallurgy,
Istanbul Technical University, Turkey

Gültekin Göller is a Professor in the Department of Metallurgical and Material Engineering at the Istanbul Technical University, Turkey. Co-author of 111 scientific articles, 3 book chapters with over 2109 citations reported by WoS (H-index 25). In addition, he is member of the scientific committee of different meetings, head of the organizing committee for different international conferences, member of the International Editorial Board of some journals, and reviewer for different journals. As a date of February 23th, 2023. His research interests are in the field of metallurgical & material engineering especially ceramic based composite materials, high entropy alloys, and refractory materials for the processing of materials for extreme conditions. His main activities are focused on the spark plasma sintering of ceramics, ceramic based composite materials, and thermal barrier coatings by plasma spraying processes.

THE EFFECT OF DUAL PHASE (FeNiCoCrMo) HIGH ENTROPY ALLOY ADDITION ON B4C BASED CERAMICS PREPARED BY SPARK PLASMA SINTERING PROCESS

As one of the most crucial structural ceramics, boron carbide (B4C) is characterized by a combination of high hardness (30 GPa), low density (2.52 g/cm3), and high elastic modulus (20 GPa). However, difficulties in the densification process and the low fracture toughness of B4C limit the use of these ceramics. Several studies have been conducted to improve the aforementioned limitations of B4C ceramics by incorporating them into metallic or ceramic sintering aids. In the current study, in order to enhance the mechanical properties and densification behavior of B4C ceramic, FeNiCoCrMo dual-phase high entropy alloys (HEAs) were incorporated into (100-x) B4C (vol.%) powder with x = 0, 0.5, 1, 2, and 3 vol.% content. The resulting powder mixtures were sintered via spark plasma sintering (SPS) at 1600 °C under 40 MPa pressure with a 5 min holding time. The sintered samples were then characterized in terms of densification behavior, mechanical properties, phase analysis, and microstructural evaluation. In addition to these evaluations, B4C-HEA ceramics were examined against thermal neutrons, and lattice parameters, unit cells, and swelling percentages were calculated for initial and irradiated samples. Improvement in densification and fracture toughness due to liquid phase sintering, depletion of BCC phase after high-temperature reaction between B4C-HEA, and enhancement in radiation shielding behavior thanks to boron-rich B4C-HEA ceramic formation will be discussed in this presentation.

Keynote Speaker

Cătălin POPA, PhD

Professor Eng.
Department of Materials Science and Engineering,
Faculty of Materials and Environmental Engineering,
Technical University of Cluj-Napoca, ROMANIA

Dr. Cătălin Popa is a Professor in the Department of Materials Science and Engineering, Dean of the Faculty of Materials and Environmental Engineering, Head of the Biomaterials Research Group in the Technical University of Cluj-Napoca (TUCN). He is an Engineer since 1986 and, after working as a design engineer for several companies, he has become a member of the academic staff of TUCN since 1990. From the very early stages of his career, he worked in the field of Biomaterials and, later, he created the Biomaterials Research Group. Doctor of Engineering since 1997, Professor Popa was awarded a NATO / Royal Society Fellowship in the University of Nottingham (2000). He was a recognized researcher in numerous research projects in the UK, in the IRC in Biomedical Materials, Queen Mary, University of London and Rutherford Appleton Laboratory, STFC, as well as director in 29 research grants awarded by Romanian public funding bodies. The Biomaterials Research Group he leads focuses on optimisation of medical implants / devices, Tissue Engineering applications, drug delivery systems and Medical Microfluidics.

NOVEL BIOMEDICAL APPLICATIONS OF MICROFLUIDIC FLOW EFFECTS

Medical Microfluidics experience a period of accelerated development, as an effect of the pandemic, as well as of the advances in Manufacturing Engineering and Materials Science. The new applications refer either to diagnostic or theragnostic methods, using the selective actuation of biologic particles / cells, in vitro culturing of cells / bacteria in microfluidic bioreactors, smart wound dressing or biosensing using paper microfluidic devices, etc. The presentation focuses on some of the results in this domain of The Biomaterials Research Group in producing medical devices with integrated electrodes for the direct selective actuation of polarizable particles / live cells through field – flow techniques, microfluidic bioreactors, paper – based microfluidic systems for medical purposes, electric field – induced patterning of endosseous titanium implants, etc. The manufacturing route, with emphasis on Additive Manufacturing, is also shown, in relation with a critical analysis of the technical limitations.

Keynote Speaker

Mohd Arif Anuar Mohd SALLEH, PhD

Associate Professor Ir. Dr.
Centre of Excellence Geopolymer and Green Technology,
Faculty of Chemical Engineering & Technology
Universiti Malaysia Perlis (UniMAP), Malaysia

Dr Mohd Arif Anuar Mohd Salleh is an Associate Professor under the Materials Engineering Programme at the Faculty of Chemical Engineering Technology, Universiti Malaysia Perlis. He was graduated with B.Eng with honours in Mechanical Engineering (2006) followed by M.Eng in Mechanical Engineering majoring in Materials (2007) at the Universiti Tun Hussein Onn Malaysia. He received his PhD in 2016 from the University of Queensland, Australia in the field of Materials Engineering specifically in the development of advance solder materials. He is also a Professional Engineer and registered as a corporate member of the Institute Engineers Malaysia (IEM). He is currently the President of Tin Solder Technology Research Malaysia under the Tin Industry Board (Research and Development), Malaysia. He has experience working and lecturing in the electronic packaging materials field for more than 13 years. Before joining Universiti Malaysia Perlis he was a Failure Analysis Engineer at Intel Malaysia. He also worked as part time research officer for a few research projects on solder materials development at the University of Queensland Australia (2013-2015) and at Imperial College London (2015). He has published more than 200 publications including proceedings, journals, books and modules as the main author and co-author with H-index 18. He was conferred the Top Research Scientist Malaysia award in 2020 by Academy Science Malaysia and was one of the recipient of National Academic Awards Malaysia 2022. In addition, his passion in research has enable him to secure almost 3 million worth of research grants.

EFFECTS OF DIFFERENT SURFACE FINISH TO THE MICROSTRUCTURE AND PROPERTIES OF SN-BASED SOLDER JOINTS

The growth and formations of primary intermetallics formed in Sn-3.5Ag soldered on Cu-OSP and ENIG surface finish after multiple reflowed were systematically investigated. Real-time synchrotron imaging was used to investigate the microstructure, focussing on the in-situ growth behavior of primary intermetallics during the solid-liquid-solid interactions. In the case of Sn-3.5Ag/Cu-OSP solder joint, the well-known Cu6Sn5 intermetallic compound (IMC) was observed in each reflows where the size and amount of IMC increase as the increasing number of reflows due to the copper diffusion from the substrate. While for the Sn-3.5Ag/ENIG solder joints, the Ni3Sn4 were formed first followed up with the (Cu,Ni)6Sn5 IMC where formation was detected after the five cycles of reflow. The results obtained shows that the Ni layer from ENIG surface finish possessed excellent barrier to suppressed and control the Cu dissolution from the substrates up to four cycles of reflow. Hence, resulting in thinner and smaller size of primary IMC also producing a stronger solder joint strength for Sn-3.5Ag/ENIG even after repeated reflow process relative to the Sn-3.5Ag/Cu-OSP joints.

Invited Speaker

Hanaa HACHIMI, PhD

Associate Professor PhD
Department of Mathematics and Computer Sciences
Affiliation, Systems Engineering Laboratory LGS Director,
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Morocco

Prof. Dr. Hanaa Hachimi, Ph.D in Applied Mathematics & Computer Science and a Ph.D in Mechanics & Systems Reliability, Secretary General of Sultan Moulay Slimane University in Beni Mellal. Cothors of 61 articles, 4 books, 6 book chapters on WOS and Scopus (H-index 9) with 200 citations. President of the Moroccan Society of Engineering Sciences and Technology (MSEST). I am Associate Professor at the Sultan Moulay Slimane University (USMS) of Beni Mellal, Morocco. I am the Editor in Chief of "The International Journal on Optimization and Applications" (IJOA). I am Director of the Systems Engineering Laboratory (LGS) and IEEE Senior Member, precisely I am affiliated at the Big Data, Optimization, Service and Security (BOSS) team at USMS. I am Lecture and Keynote Speaker of the courses: Optimization & Operational Research, Graph Theory, Statistics, Probability, Reliability and Scientific Computing. I am Member of the Moroccan Society of Applied Mathematics (SM2A). I'm the General Chair of "The International Conference on Optimization and Applications" (ICOA) & the International Competition of Innovation (Let's Challenge). Previously Associate Professor at Ibn Tofail University, National School of Applied Sciences of Kenitra, Morocco. Lions Club Member and UNESCO UIT-Chair Member.

DEMAND-SIDE MANAGEMENT STRATEGY IN A SMART HOME USING ELECTRIC VEHICLE AND HYBRID RENEWABLE ENERGY SYSTEM

The residential area represents a sector that consumes more electricity especially with the rapid urban growth and the transition towards the automation and electrification of several daily activities of human beings, namely: urban mobility and the residents' indoor comfort. As a result, meeting this increased demand requires a proportional rise in fuel use to generate energy. This type of conventional power production has significant impacts on the environment. The eco-friendly alternative is the use of renewable energies in its distributed form on buildings. However, this solution gives rise to some issues related to energy management especially with the penetration of a new domestic device, namely: the plug-in electric vehicle. For this purpose, we propose a management system for a future household equipped with controllable electric loads and an electric vehicle equipped with a PV–Wind–Battery hybrid renewable system connected to the national grid. The proposed management system is based on a linear programming model with non-linear constraints solved with MATLAB toolboxes. The simulation is based on a database of meteorological conditions resulting from TRNSYS and processed to achieve a frequency of one hour. The system decisions provide switch control states of the connection architecture as well as the variation according to the V2H (vehicle to home), H2V (home to vehicle) and involved G2V (grid to vehicle) scenarios when grid comes into play during H2V mode.

Invited Speaker

Romisuhani Binti AHMAD, PhD

PhD. Professional Technologist
Center of Excellence Geopolymer and Green Technology (CeGeoGTech), Universiti Malaysia Perlis, Malaysia

Romisuhani Binti Ahmad was born in 1986 in Perlis, Malaysia. She received her B.Sc with Honours in Industrial Chemistry at Universiti Putra Malaysia (UPM) and completed her MSc in Materials Engineering from Universiti Malaysia Perlis (UniMAP). Her PhD study is in Material Engineering at Universiti Malaysia Perlis (UniMAP). Her research interests include geopolymer, green technology, ceramics and construction material and focusing on development of Geopolymer Ceramics with addition of binder for lightweight application. Additionally, she is one of the researchers under the Center of Excellence Geopolymer and Green Technology (CeGeoGTech), UniMAP and a senior lecturer at Faculty of Mechanical Engineering and Technology, UniMAP with 69 publications and h-index of 10 based on Scopus database.

GEOPOLYMER ROUTE TO CERAMIC MATERIALS

The diverse applications for advanced ceramic have been developed to continue growing at a reasonable rate with the processing and economical tolerance. To feature the required properties, the fabrication of conventional ceramics needs a long heat treatment up to 10 hours with the high sintering temperature up to 1800 °C. The use of geopolymer method is an alternate way in producing ceramic materials since the amorphous to semi-crystalline behaviour of geopolymer will transforms into crystalline (nepheline) phases upon sintering. The unique composition of the geopolymer system with the help of geopolymerization reaction will improve the crystallization process as well as reducing the sintering temperature required. The homogeneous of the geopolymer system will influence the structural rearrangement during the phase change hence promote the nucleation and densification of the geopolymer. Besides, the higher content of silica oxide deviating from nepheline ($NaAlSiO_4$) compositions will also facilitate the densification process and provide the system with self-fluxing properties.

Invited Speaker

Mohd Remy Rozainy Mohd Arif ZAINOL, PhD

Associate Professor, PhD
School of Civil Engineering,
Universiti Sains Malaysia (USM), Malaysia

Mohd Remy Rozainy Mohd Arif Zainol obtained his first degree in Bachelor of Science (Civil Engineering) in 2004 from Universiti Sains Malaysia. He later pursued his postgraduate studies at the same university and received his MSc degree in Urban Drainage Engineering in 2007. He was awarded with a PhD degree from Kyoto University, Japan in 2012 specializing in Water Resources Engineering. Mohd Remy works as a lecturer at the School of Civil Engineering, Universiti Sains Malaysia (USM), Engineering Campus since March 2012 and is now an Associate Professor. Dr. Mohd Remy currently holds the position as Deputy Director, River Engineering and Urban Drainage Centre (REDAC). His H-index is 14 and main research interests are Water Resources Engineering, Hydraulic Physical Model, Environmental and Geopolymer and Numerical Simulation Model

HOW UNIVERSITI SAINS MALAYSIA (USM) PIONEERING THE GREEN DRAINAGE SYSTEM IN MALAYSIA?

River Engineering and Urban Drainage Research Center (REDAC) is the first research centre at the USM Engineering Campus which was accorded the Higher Institution Centre of Excellence or HICoE for service on 9th October 2014 with a niche area on Sustainable Urban Stormwater Management. REDAC has been active in research and consultancy projects on Sustainable Urban Stormwater Management since 1997. Among the project sponsors are Ministry of Science, Technology and Innovation (MOSTI), Ministry of Education (MoE), Ministry of Natural Resources and Environment (NRE), Ministry of Agriculture and Agro-Based Industry (MoA), Department of Irrigation and Drainage (JPS), Prime Minister's Economic Planning Unit (EPU), Seberang Perai Municipal Council (MPSP) and Public Works Department (JKR). REDAC has received more than RM 20 million for the last ten years to conduct research and innovation. A green sustainable urban stormwater management system known as Bio-Ecological Drainage Systems (BIOECODS) was designed by REDAC and subsequently constructed at the USM Engineering Campus, Penang in 2002. BIOECODS attempts to solve three major problems commonly encountered in Malaysia namely flash floods, river pollution and water scarcity. By implementing BIOECODS, it will help preserve the natural characteristics of the existing river ecosystem. A presentation on BIOECODS was made at the 11th International Conference on Urban Drainage, Edinburgh, United Kingdom (UK) in September 2008. The national pilot project on sustainable urban drainage system (SUDS) namely Bio-Ecological Drainage System (BIOECODS) has continuously received visitors from national and also international.


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SECTION 1

SYNTHESIS AND CHARACTERIZATION OF MATERIALS

Characterization of Bulgarian Cooper Mine Tailing as a Precursor for Geopolymer Obtaining

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Abstract. Valorization of high-volume industrial residues, such as: mine tailings and coal combustion by-products, could be achieved by development of new geopolymers with low CO_2 footprint. Materials rich in aluminum and silicon with appropriate solubility in alkaline medium can be used to obtain a geopolymer. This paper presents a study of mine tailings from Bulgaria as precursors for geopolymers. The heavy metals content and their mobility are studied by leaching tests. Sequential extraction was applied to determine geochemical phase distribution of heavy metals. The studied samples were characterized by high alkalinity which could favor the geopolymerization process. The water soluble sulphates were less than 4%. The Si/Al ratio in mine tailing was 3.2. The alkaline reactivity depended stronger on the time of extraction, than on the molarity of NaOH solution. The most abundant heavy metals in the studied samples were Cu, Zn, Ni and Pb. The obtained results revealed that studied tailings are suitable precursors for geopolymerisation. The main part of heavy metals was found in the residual fraction. It could be expected that in high alkaline medium during geopolymerisation process they will stay fixed. Thus, the obtained geopolymers could be expected to have low environmental impact.

Keywords: cooper mine tailings, geopolymers, alkaline reactivy, characterization, sequention extraction.

Acknowledgement:
This study is funded by the Bulgarian National Science Fund under the contract KP-06-DO02/5 "RecMine – Environmental footprint reduction through eco-friendly technologies of mine tailings recycling" in the frame of ERA-MIN3 program, Horizon Europe.

Factors Affecting Thermal Stability in Functional Organic Coatings: A Review

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Abstract. As process chemistry advances in the use of functional organic coatings, there has been a shift in research toward polymer product quality. This change has morphed into using polymer product designs to target desirable properties for a specific application. Also, the emphasis is moving from petroleum to renewable resources because of concern for environmental degradation and volatile organic contents (VOC). Consumers and regulators are becoming more aware of the implications of their activities on the environment and seeking sustainable solutions to halt the environmental degradation caused by their actions. The search for solutions to these challenges has led to the development of functional renewable organic coatings from renewable materials as alternatives to the continuous use of petroleum resources to meet worldwide demand for coatings, especially in the fight against thermal instability. And one major way of measuring the effectiveness of an organic coating is its durability, which to a large extent, is a measure of its thermal stability. This paper reviews factors that affect the thermal stability of organic coatings and also peep into the future application of thermal stability in various industries.

Keywords: thermal stability, functional organic coating, environmental degradation, renewable materials.

Liquid Crystals for Designing Smart Leather Surfaces

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Abstract. The aim of the presentation is related to the synthesis of cholesteric liquid crystals with thermochromic properties for designing new leather surface coatings. The synthesis of cholesteric liquids was performed by reaction of 5,6 g cholesteril peralgonat with 3,4 g oleil cholesterol carbonate when cholesterol benzoate was obtained with transition temperature of 35-38^{0}C. The synthesized cholesteric liquid crystals were incorporated into Norland Optical Adhesive 65 (NOA 65), a liquid prepolymer that facilitates the formation of photopolymer upon UV irradiation, in the presence of dichloromethane under slow stirring, in the dark. After adding polyvinyl alcohol, the solution was subjected to heating to remove the solvent and then to photopolymerization in the presence of UV radiation at λ= 365 nm. Distilled and heated water was added to the obtained product. The new film forming polymer was dried and analysed by ATR-FTIR when specific peaks of cholesteric liquid crystals were highlighted. The new compound was used for leather and cardboards coating in view of thermochromism effects generation. The research paves the way for new sensory surfaces designing on the materials for consumer goods in daily life use with smart aesthetic or alarming functions.

Keywords: liquid crystals, leather surface, photopolymerization, thermochromism, smart coating.

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Studies on 1-butyl-3-methylimidazolium Tetrafluoroborate Ionic Liquid and Its Nanocolloids Behavior in Heating Operations: Experimental Approach

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Abstract. Nanocolloids have a complex system based on adding of different type of nanoparticles in various ionic liquids. In order to accomplish nanocolloids and study their behavior in heating operations, it's necessary to analyze the structure for pure ionic liquid. In the present study, structural analyzes of the ionic liquid 1-butyl-3-methylimidazolium tetrafluoroborate ([C_4mim][BF_4]) were carried out, regarding Fourier Transform Infrared (FTIR) and Nuclear Magnetic Resonance (NMR) spectroscopy, Thermogravimetric Analysis (TG) and Differential Scanning Calorimetry analysis (DSC). Also, the specific heat of the nanocolloids was tested, and results were compared to theoretical specific heat measurements. In the preparation of the nanocolloids several suspensions of Al_2O_3 nanoparticles were used. Experimental specific heat data were collected at room temperature and in the temperature range 283.15 - 333.15 K with a Mettler Toledo Differential Scanning Calorimeter, DSC 1, (USA) instrument. In conclusion, the characteristics of the ionic liquid are consistent with the existing data in the specialized literature, and the high purity and low water content of the compound proposed in this study was demonstrated.

Keywords: ionic liquids, nanocolloids, properties, heat capacity.

Acknowledgments:
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Thermal Behaviour of Fly Ash Based Geopolymer Composite Reinforced with Recycled Glass Fibers

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Abstract. Geopolymerization is the most suitable method for the valorization of mineral wastes with high contents of Si and Al oxides. Compared to Ordinary Portland Cement (OPC) materials, the geopolymers exhibit better compressive strength and thermal stability, but their flexural strength is also limited by their brittle matrix. The aim of this study is to study the thermal behavior of ambient-cured fly ash-based geopolymers reinforced with recycled glass fibers in order to estimate the possibility of manufacturing precast concrete products. The thermogravimetric analysis (TA) showed a significant weight loss up to 200 °C, followed by a much lower decrease in the 200°C–500 °C temperature range. The TA curves follow closely the trend of the Differential Thermodynamic Analysis (DTA) curves, which confirm a highly endothermic reaction in the 20°C–200°C temperature range due to the removal of free or physically bound water. Above this temperature, small peaks corresponding to the dihydroxylation of -FeOOH or transformation of $Ca(OH)_2$ to $CaCO_3$ can be observed. The thermal behavior of both samples is similar, confirming that the presence of glass fibers doesn't influence the thermal behavior of fly ash-based geopolymers.

Keywords: recycled glass fibers, microstructural analysis, thermal behaviour, eco-friendly, fly ash, geopolymer composite.

Acknowledgment:
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Mechanical Performance of Mine Tailings Blended Geopolymer Designed by Taguchi Method

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Abstract. Geopolymers are emerging as an eco-friendly alternative to conventional building materials. These materials exhibit enormous potential as a substitute for traditional technologies like concrete, but more applied studies are needed to evaluate their practicality on an industrial scale. Moreover, each type of raw material needs to be optimized in terms of parameters that influence the properties of the final product. In order to optimize geopolymers in terms of mechanical performance, the obtaining parameters and the possibilities offered by the Taguchi method were considered to desing a series of geopolymers suitable for civil engineering applications. The optimization was conducted considering: (i) three blends comprising a different percentage of fly ash (FA), fly ash with S (FS) and red mud (RM), (ii) three different liquids: solid ratios (0.70, 0.75 and 0.80), (iii) three different Na_2SiO_3/NaOH ratios (1.0, 1.25 and 1.5) and (iv) three different molar concentrations of NaOH solution (3, 6.5 and 10). The mechanical strength tests showed that the mixture with the best compressive strength is the one consisting of 35 %wt. FA, 15 %wt. FS and 50 %wt. RM, with liquid: solid 0.7, Na_2SiO_3: NaOH 1.5 and NaOH 10 M, respectively. In terms of flexural strength, the mixture with the same amounts of raw materials, but the following parameters exhibited the highest value after 28 days of curing: liquid: solid 0.75, Na_2SiO_3: NaOH 1 and NaOH 7 M.

Keywords: mine tailings, circular economy, geopolymers, Taguchi design.

Acknowledgment: This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS/CCCDI -UEFISCDI, project number COFUND-ERAMIN-3-RecMine, contract no. 307/2022, within PNCDI III.

The Effects of The Electrochemical Oxidation Parameters of The Zr2.5Nb Alloy on Some Implants Properties

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Abstract. The work evaluates the surfaces of the electrochemically modified Zr2.5Nb alloy in the sulfuric acid environment as well as in the orthophosphoric acid environment, from the point of view of mechanical and physico-chemical properties. The method offers us the possibility of developing porous surfaces up to the field of nanostructuring in order to improve adhesion and binding to bone with subsequent biological applications. Thus, after the experimental step with the preset parameters of the two studyed electrolytes, it was possible to highlight the prevalence of sulfuric acid in creating surfaces with multiple and uniformly distributed pores. The physico-chemical and mechanical analyzes performed on the surfaces after anodization, by scanning electron microscopy, roughness, microhardness and contact angle showed significantly improved properties compared to the untreated alloy, through its electrochemical oxidation in sulfuric acid. Thus, the subsequent increase in roughness has the effect of a better in-situ anchoring of the implant, thus preventing the micro-movements of the medical device and ensuring a superior stability of the bone.

Keywords: Zr2.5Nb alloy, porous surfaces, electrochemical oxidation

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Corrosion of 316l Stainless Steel Orthodontic Structures in Salivary Solutions in The Presence of Lactic Acid

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Abstract. In the healthcare field, stainless steel is an ideal material for equipment such as prosthetic devices, bone fixation equipment, artificial heart valves and prostheses. Stainless steel is also used in dentistry, including equipment, dental crowns for pediatric patients, materials for brackets and orthodontic arches. Lactic acid, a metabolite of pyruvic acid, is generated during the reduction of pyruvic acid by the enzyme lactate dehydrogenase in the context of anaerobic glucose metabolism. This process involves the conversion of glucose to pyruvate, which is subsequently reduced to lactic acid by the enzyme lactate dehydrogenase. This metabolic route is executed by a variety of human tissues, including skeletal muscle, as a means of providing an energy source when oxygen is limited. The pH of saliva usually ranges between 6.2 and 7.6, but the consumption of foods and drinks rich in sugars or acids can drop significantly below 5.5, creating a favorable environment for the growth of lactic acid-producing bacteria. The results show a decrease in polarization resistance with increasing lactic acid concentration in saliva solution.

Keywords: electrochemical impedance spectroscopy, corrosion, saliva

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Electrochemical Impedance Spectroscopy Study of The Reactivity Response of Pure Titanium in Biological Solution with Reactive Oxygen Specie

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Abstract. Pure titanium (Ti) is investigated in a preclinical study in biological solution Hank using the electrochemical methods as open circuit potential and electrochemical impedance spectroscopy in order to highlight the time effect and extreme body conditions as inflammatory diseases on degradability due to corrosion processes occurring on the titanium implant. EIS data are presented as Nyquist and Bode plots The results show the increasing reactivity of titanium implant in the presence of hydrogen peroxide, as oxygen reactive specie describing inflammatory conditions. The polarization resistance, resulted from electrochemical impedance spectroscopy measurements, decreases drastically from the highest value registered in Hank solution to smaller values registered in all solutions with different concentration of hydrogen peroxide tested. The EIS analyses yielded information about in vitro corrosion of the titanium as implant biomaterial that cannot be obtained from potentiodynamic polarization testing.

Keywords: titanium implant, electrochemical impedance spectroscopy

References:

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Study on the Possibilities of Developing Cementitious or Geopolymer Composite Materials with Specific Performances by Exploiting the Photocatalytic Properties of TiO_2 Nanoparticles

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Abstract. Starting from the context of the principles of Sustainable Development and Circular Economy concepts, the paper presents a synthesis of research in the field of the development of materials of interest, such as cementitious composites or alkali-activated geopolymers. Based on the reviewed literature, the influence of compositional or technological factors on the physical-mechanical performance, self-healing capacity and biocidal capacity obtained was analysed. The inclusion of TiO_2 nanoparticles in the matrix increase the perfomances of cementitious composites, producing a self-cleaning capacity and an anti-microbial biocidal mechanism. As an alternative, the self-cleaning capacity can be achived through geopolymerisation which provide a similar biocidal mechanism. The results of the research carried out indicate the real and growing interest for the development of these materials but also the existence of some elements still controversial or insufficiently analysed, therefore concluding the need for further research in these areas.

Keywords: self-cleaning cementitious composites, geopolymer, TiO_2 nanoparticles, physical-mechanical performance, microorganism resistance.

Morphological Changes of Metal Oxides Through the Solar Physical Vapor Deposition Process

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Abstract. The paper brings to the attention of researchers the morphological changes of metal oxides, which appear as a result of the process of physical solar vapor deposition (SPVD). The SPVD process is an inoovative tool who has been developed in Odeillo-Font Romeu, France to synthesis nanoparticles. Through the controlled process of vaporization followed by condensation directed on a nanoporous filter, nanoparticles are obtained. After the analysis of the morphology, the change of shape can be observed depending on the type of oxide and the process parameters.

Keywords: metal oxide nanoparticles, solar physical vapor deposition

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Acknowledgement:
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Corrosion Behaviour of Cold Spray Coated AISI 1018 Carbon Steel Using NiCrC Powder

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Abstract. Carbon steels, and therefore AISI 1018 steel, are used in many fields of activity, but their susceptibility to corrosion can lead to premature degradation or defects in mechanical systems that are made of this material. Studying and researching a predictive model can help in understanding and estimating the lifetime of a mechanical system and its equipment. Degradation rate, chemical composition, and interaction between chemical elements are statistically significant, and the degradation rate has the greatest influence, accelerating the corrosion process. Microstructural examination of materials subjected to corrosion tests indicates the degree of deterioration. For this study, samples of AISI 1018 standardized carbon steel and samples that were coated by the cold spray process with NiCrC powder in the ARL laboratory - Northeastern University in Boston, USA, were used. After the cold spraying process with NiCrC WIP C1 powder on AISI 1018 standard steel, it can be observed that the corrosion resistance of the material has significantly improved, showing superior behavior in terms of corrosion resistance.

Keywords: Corrosion resistance, Cold spray, Cold spray NiCrC, Surface Morphology, AISI 1018 corrosion, AISI 1018.

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Influence of Fiberglass Reinforcement on the Mechanical Behaviour of an ABS - PMMA Polymer - Fiberglass Composite

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Abstract. The present paper approaches the difficult problem of recycling fiberglass waste mixed with polymers. Preliminary studies have shown that thermoforming is the most suitable method. The study focuses on the recycling of thermoforming waste from bathtub manufacturing process. A superior and circular method (from an economic perspective) to traditional recycling options. Correia et al. argues that landfilling this type of waste is the least preferable option and that countries such as Germany have already banned the landfilling of composite waste [1]. This is a sustainable method, but it is at an early stage of study and further studies are needed. The article details how to control the mechanical behavior of the resulting products to adapt to different uses. The novelty of the work consists in the recycling method, actually upcycling – where the output is a superior material than the input (studied waste) but even more the successful method for reinforcing the plates. Further studies will be focused on determining, analyzing, and controlling the internal interactions between matrix and the reinforcement in order to obtain a more superior, and predictable in mechanical behavior, composite material.

Keywords: polymers, recycling, sustainability, waste.

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The Influence of Zero Waste Sewing Patterns Upon the Apparel's CO_2 Footprint

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Abstract. The hazardous effects that the textile industry has on the environment have become a real concern [1,2]. The objective of the study is to determine the impact on the CO_2 emissions throughout the life cycle of garment products, by using zero waste patterns.
Meaningful results were obtained by simulating the carbon footprint of two apparel prototypes. The first prototype was simulated using regular-shaped pattern pieces, while the second was assembled using zero waste patterns, developed as part of a previous study. The fabric rating, as well as the amount of pre-consumer textile waste (unused fabric scraps) that will be generate during the cutting process were measured by using Gemini Nest Expert software. An important aspect to consider is that by using the zero waste patterns, fabric usage was improved by 32.5% compared to the first scenario. Using the Mobius LCA software, it was possible to create life cycle stages for both garments, and to perform a comparative analysis.
The results show that the amount of pre-consumer fabric waste has a major influence upon the CO_2 footprint of a garment item. Thus, this issue can be addressed and rectified by the use of zero waste pattern pieces for apparel mass production.

Keywords: apparel, CO_2 footprint, efficient fabric consumption, pattern pieces, zero waste

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Evaluation of Microstructure, Microhardness and Corrosion Behavior of NiCr(Ti) Laser Cladding

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Abstract. Ni-based alloys have excellent properties such as thermal stability and oxidation resistance and are typically used in a wide range of applications, where high-temperature operation is required. Several examples include heat exchangers, supercritical steam generators, nuclear or pressurized water reactors etc. However, in extreme aggressive environments the surface of this superalloy is susceptible to wear and corrosion [1]. In this research, we attempted to improve the corrosion resistance of the substrate by using a NiCr(Ti) alloyed powder with various Titanium content. The NiCr(Ti) coatings were deposited on mild steel substrates through laser cladding technology. Cross-sectioned laser cladded samples were analyzed using SEM and EDX techniques. Microhardness tests were carried out in order to observe the influence of Ti addition on the mechanical properties of the studied coatings. Measurements were performed in cross-section from the top of the coating to the heat-affected zone (HAZ) and substrate. The corrosion behavior of the laser cladded samples was analyzed using the potentiodynamic polarization technique.

Keywords: laser cladding, coatings, titanium addition, advanced materials.

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Influence of NaOH Treatment on the Corrosion Resistance of Ti and Ti15Zr5Nb Biomaterials

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Abstract. In the design of biomaterials, enhanced osteo-compatibility, low toxicity, and the biological activity are essential properties [1]. Thus, in the present study, Ti15Zr5Nb was manufactured through a vacuum melting technique as a non-toxic alloy, investigated, and compared to CP Ti from microstructural points of view. Moreover, to enhance the osteo-compatibility and biological activity, a surface alkali treatment functionalization was performed using 10 M NaOH. The microstructure of the developed films after functionalization was investigated by scanning electron microscopy (SEM), Energy-dispersive X-ray spectroscopy (EDS) and Fourier-transformed infrared spectroscopy (FT-IR). The analysis revealed the formation of sodium titanate along with other oxides. Additionally, the samples were immersed in simulated body fluid. The EDS analysis revealed the presence of P and Ca on the surface of the newly developed films, indicating the formation of apatite. The results showed that the functionalization changed the surface properties of the Ti15Zr5Nb alloy which possess promising osteogenic functions for potential application as a biomaterial.

Keywords: titanium, Ti15Zr5Nb, biomaterials, corrosion, alkali treatment.

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There Are No Limits to the Miracle of Alloys: High Entropy Alloys

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Abstract. The history of metallic alloys dates back to ancient times when humans first learned to extract and work with metals such as copper, tin, and bronze. The earliest known alloy, bronze, was created around 4000 BC by mixing copper with small amounts of tin. Over time, people discovered that by mixing one metal with small quantities of other, they could create alloys with improved properties (iron with small amounts of carbon to create steel).. In the Middle Ages, blacksmiths and metallurgists continued to experiment with different alloys, and many new ones were discovered. In the 18th and 19th centuries, the Industrial Revolution brought about significant advances in metallurgy, and many new alloys were developed. HEAs were first developed in the early 2000s, and they have attracted significant attention from materials scientists and engineers due to their unique properties. Unlike traditional alloys, HEAs have no dominant metal and are instead made up of a mix of multiple metals. This random mixture of metals in HEAs leads to a number of interesting properties, including high strength, high hardness, and good corrosion resistance. HEAs are also highly resistant to deformation and have good thermal stability.

Keywords: high entropy alloys, fabrication, microstructure, corrosion.

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Influence of Laser Cladding Power on the Microstructure and Corrosion Resistance of Co-Based Coatings

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Abstract. To improve the corrosion resistance of low carbon steel, composite coatings are usually deposited on its surface by different deposition processes [1]. Laser cladding has many advantages to produce such protective coatings with fine microstructure and enhanced properties. In the present study, Co-based (MetcoClad 6F) coatings were deposited on low carbon substrate by using a Ni-Cr buffer layer. To optimize the process, various laser powers were used for the top layer. In previous studies was demonstrated that the presence of a buffer layer reduces the overall cracking susceptibility of top coating by reducing the internal stresses, thus ensuring a more uniform heat distribution [2]. This study addresses to obtaining of dense and defect-free Co-based coatings with enhanced corrosion resistance by using a buffer layer.

Keywords: laser cladding, composite coating, corrosion resistance.

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Evaluation of The Marine Corrosion Behavior of S275JR Steel Coated with Polymeric Films

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Abstract. The aim of this work is to evaluate the behavior of S275 JR steel in marine corrosion. The S275 JR steel was coated with polymeric films of anticorrosive protection, which were improved by adding micro-particles of zirconium Kreutzonit to the polymer matrix. The electrochemical investigation methods used for corrosion evaluation were monitoring the evolution of open circuit potential (OCP), polarization resistance (Rp), and potentiodynamic curves (PD). The electrochemical tests were conducted using natural seawater collected from the Black Sea basin. These methods allowed for the evaluation of the effectiveness of the polymeric films in preventing corrosion and identifying vulnerable areas of the coated surfaces. The results showed an improvement in performance regarding the behavior of S275 JR steel coated with polymeric films of anticorrosive protection in marine corrosion.

Keywords: Marine corrosion, zirconium Kreutzonit dispersed particles, electrochemical methods, polymeric coatings, corrosion, structural steel.

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Solar Energy for Nitinol Powders Heating

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Abstract. Main idea of the study is to obtain shape memory elements using solar heat for melting, heat treatment or sintering Nitinol powders. Solar radiation represents a green and very important solution for many heat required systems. Collected right can reach very high temperatures in a large time window of the day. The temperatures can reach 1500-2000°C in matter of seconds and high quantities of materials can be heated in short periods. Solar radiation collected with a complex large metallic mirror, assisted by a heliostat, and focused with a concentrator was used to heat and melt NiTi powders at PROMES (PROcédés Matériaux et Energie Solaire) Solar energy facility from Font Romeu, France. The heating system was completed with a trolley equipped with a support cooled by water that sustain the crucible with NiTi powders.

Keywords: solar flux, NiTi powders, concentrator.

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Surface Roughness Analysis of Laser Surface Texturing Effect on AISI 430 Stainless Steel

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Abstract. In Materials Engineering there are different ways to add new functionality to a particular part. The easy case is to change, before the design, the material to a better one, but usually also involves an increase in the complexity of the production process, that increases the product's price. Laser surface texturing (LST) is a useful method of generating patterns on the surface of materials to make microstructures and for: improving tribological performances, wetting behavior, surface treatment and increasing adhesion [1]. Fine-tuning the roughness of stainless-steel finds applicability in the industry. The microtextured design type A can be easily applied in joining dissimilar materials due to an irregular surface and an increased contact area. In tribological applications, recast material can be an impediment, but in the joining of dissimilar materials, this increasing of the contact area is required. The recast material and the crevice depth of the pattern have a marked influence on the contact angle as well. Roughness increases due to the surface texturing and the contact angle with values ranging from 30 to 195% higher than for the neat substrate, thereby increasing hydrophobicity The pattern design type C is suitable mainly for tribological applications since the recast material is missing.

Keywords: laser surface texturing, ferritic stainless steel, contact angle.

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Physico-Chemical Characterization of Chitosan Membranes with Mistletoe Extracts

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Abstract. Chitosan is a polymer with technical and biological properties that are useful in various modern fields such as biomedicine for requires worldwide antimicrobial and anti-inflammatory capabilities. Our paper aims at the physico-chemical characterization of chitosan membranes incorporated with mistletoe extracts. 1% alcoholic extracts (1 g of powder per 100 mL of 80% ethyl alcohol) of linden mistletoe and poplar mistletoe were used. There are obtained two types of membranes: the first type consists of chitosan and mistletoe extract in a 1:1 ratio (mass/volume) and the second type contains 50 mL of extract evaporated to dryness over which 25 g of chitosan was added. The samples were characterized for structure by Fourier Transform Infrared Spectroscopy (FTIR), morphology by Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X-ray analysis (EDX, to provide elemental and quantitative compositional information. The swelling percentage was estimated based on weight of membranes before and after swelling.

Keywords: chitosan, mistletoe extracts membranes, characterization.

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High-Corrosion Resistance of Ni and Cu based Laser Cladding

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Abstract. The achievements in laser industrial application is ongoing through constantly improving. Preoccupation of researchers brings new design and provides improvement on parameters and methods over the philosophy and methodology of laser utilization. In this context, laser cladding represents a proven technique for obtaining well-bonded coatings with consistent productivity and high-quality outcome [1]. S235 structural steel has a wide presence in various industrial aplications due to it`s good characteristics of weldability and plasticity. However, when used in marine environment, S235 material is prone to shortcomings such as corrosion. In this study, Coherent F1000 continous wave laser and the Precitec WC 50 cladding module are used in order to determine optimal parameters for corrosive resistant coating deposition on S235 steel, by using Cu and Ni alloy-based powders. The influence of laser power, process speed and interpass distance have a crucial consequence over the geometrical appearance of the coating. The results shows that laser cladding represents a feasible method for obtaneing wear and corrosion-resistant coatings suitable for enhancing or reconditioning naval components exposed to marine conditions.

Keywords: laser cladding, corrosion, copper coatings.

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Effect of Sintering Mechanism in Crystallization Kinetics of Geopolymer Based Ceramics

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Abstract. The uprising demand of ceramics in industrial manufacturing sector, metallurgical, energy production, and biomedical had attracted worldwide interest. However, the conventional method of fabricating ceramics demands a high temperature, up to 1600°C, a lengthy heating period, and it also has issues with agglomeration, irregular grain growth, and furnace contamination. Therefore, geopolymerization is used as a substitute method to produce ceramics with high mechanical strength. This research aims to study the effects of sintering mechanism on the crystallization kinetic when the geopolymer is sintered at different temperature; 200°C, 400°C, 600°C, 800°C, 1000°C, and 1200°C with the heating rate of 5°C/min. The geopolymer made up of kaolin and sodium silicate as the precursor and alkali activator respectively. Characterization of the nepheline produced was carried out using XRF and XRD.

Keywords: Geopolymer, Geopolymer Based Ceramics, Ceramics, Sintering

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Phase Evolution and Corrosion Resistance of CoCrFeMnNi HEA under Influence of Aluminium

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Abstract. The Cantor alloy has become one of the most promising alloy systems in the last ten years, making it unique as a high-entropy alloy (HEA) due to its superior ductility and fracture toughness. In this study, a series of six-components $CoCrFeMnNiAl_x$ (x = 0, 0.07, 0.3, 0.6, 1.0, 1.3) and an equiatomic CoCrFeMnNi HEA and were designed to investigate the influence of Al as the alloying element in the structure. The HEAs are manufactured by powder metallurgy process and compacted at 520 MPa with the uniaxial press then sintered at 595°C in a tube furnace under argon atmosphere. The microstructure and phase composition were identified by scanning electron microscope (SEM). The result shows that there are phase evolution in addition of Al in the equiatomic cantor alloys where the crystralline structure changes from FCC in x = 0 and 0.07, to duplex FCC + BCC when x = 0.3 and 0.6 and lastly to single BCC phasefor x = 1.0 and 1.3. Element analysis was done using X-Ray Diffraction (XRD) to elucidate the main peaks after addition of Al into HEA.

Keywords: High entropy alloys, powder metallurgy, microstructure, Al addition

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Recent Progress in The Utilization of Silver Nanoparticles and Its Derivatives as Photocatalyst: A Mini Bibliometric Study

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Abstract. Silver nanostructures and its derivatives have distinguished photocatalytic efficiency as a consequence of their narrow bandgaps, which make silver-based photocatalyst suitable to be directly utilized on solar energy. For understanding the growth, research gap, and trends in research on silver-based photocatalyst, this review analyzes the scope of study on silver nanoparticles within photocatalysis using a bibliometric investigation and scientific landscape visualization method. Research data was harvested from the 1,094 published literatures in the Web of Science (WoS) Core Collection database between 2003 and 2023. The search was done using a search engine: Publish or Perish (PoP), that consists of data on all related journal articles. The investigation was established on topic area with titles, abstracts, keywords, and terms co-occurence in the study of silver-based photocatalyst.

Keywords: bibliometric study, VOSviewer, silver nanoparticles

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Enhancement of Wear Resistance of S700MC using Laser Cladding and Ni-Based Powder

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Abstract. The laser cladding process is a technological process in which the laser radiation is utilised as thermal source and a metallic powder is melted and forms a layer for improvement of the surface of base material or creating a new surface [1]. The present research aims at improving surface layer wearability properties of S700MC steel by depositioning a new layer of Ni-based powder on. The substrate chosen is S700MC steel because of its wide range of industrial applicability: steel frames, load bearing beams and pipework. The samples are analysed within this research by referring to the life span of the cladded material and to the costs of manufacturing it versus using Ni plates or S700MC steel. The experimental tests were carried out using the Trumpf TruPulse 556 milisecond pulsed laser generator and the Precitec WC 50 cladding module. The test results has shown that the laser coating represents a superior option in terms of wear resistance and life span of workpiece.

Keywords: laser cladding, Ni-based powder, S700MC, pulsed laser, wear resistance

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Corrosion Resistance of Inconel 718 in Solutions with Various pH

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Abstract. Inconel 718 is a nickel-based superalloy that is suitable for applications requiring high strength in temperature ranges from cryogenic to 760 °C or sometimes more. Inconel 718 also exhibits excellent tensile and impact strength at room temperature and high temperatures (like 1000 °C). Tests on corrosion and electro-corrosion resistance of this material were realized using Inconel cylinders with 10 mm diameter and 1 mm thickness. Tests were realized by immersion in four different solutions (first with pH smaller than 3, second with the pH around 7, third with pH bigger than 9 and fourth : $Fe_2(SO_4)_3$-H_2SO_4 as standard electro-corrosion resistance testing of Inconel superalloys). The electro-corrosion was realized in a three-electrodes cell with a working electrode (surface 20 mm^2), a Calumel saturated electrode and a Pt electrode. Open circuit potential (OCP), linear and cyclic potentiometry were registered and compared to each other.

Keywords: Inconel, electro-corrosion, immersion tests, SEM, AFM, EDS

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Preliminary Study Concerning the Adaptation of a Periodontal Dressing Material to the Inclusion of Therapeutic Agents

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Abstract. Dental materials and technologies are evolving now faster than ever thanks to the digital era we are living through, but even with these developments the dental medical field, not unlike other medical fields, requires patient-oriented services. The physical and mechanical characteristics of periodontal dressings have been assessed in a limited number of trials [1], their clinical application being favorable in some cases, as the surgical periodontal treatment result is thought to be significantly influenced by a variety of factors, one of which is the periodontal dressing [2]. In this work we aim to analyze how a periodontal dressing material adapts to the addition of therapeutic agents, especially in terms of its mechanical properties, as these improvements would be very beneficial for those patients going through the healing process.

Keywords: dental materials, periodontal dressing, mechanical properties assessment.

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Experimental Study of Phase Transformations by Dilatometric Analysis in $Ni_{51.5}Ti_{48.5}$ Materials Obtained by Spark Plasma Sintering

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Abstract. The research work aims the study of phase transformations in NiTi shape memory materials usind the dilatometry technique. The results of volume change due to phase transformation lead to an observable dilatation different from the thermal expansion effect. Also, the thermodynamic analyses performed using the MatCalc software package were compared with volume change observed from dilatometry tests. The NiTi samples were obtained by spark plasma sintering at 850ºC and 900ºC from very pure and fine Ni and Ti powders. In order to increase the alloy homogeneity, the NiTi samples were subjected to post heat treatment at 450ºC in protective atmosphere. The results obtained demonstrate several interesting features of the NiTi materials and may serve as a quantitative reference for the design of these in the future.

Keywords: NiTi shape memory, phase transformation, thermodynamic computation, spark plasma sintering.

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Evaluation of Physico-Mechanical Proprieties of Carboxymethyl Cellulose Quenching Environment Depending on the Thermal Degradation

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Abstract. Among the synthetic media used in the industry the most advantageous are the substances resulting as secondary products from the wood or paper processing industry, as carboxymethyl cellulose. Carboxymethyl cellulose dissolved in water is a synthetic quenching environment used in large tempering basin. Due to the dimensions of the quenching basins, the quenching medium is used repeatedly, which leads to its thermal degradation. In this paper was studied the degree of modification of the cooling properties in the thermal range 800-50^{o} C of carboxymethyl cellulose solutions in water and also its corrosion characteristics. It was analyzed the changes in the physico-chemical properties such as density, pH, specific heat, diffusivity which have a major influence in determining the cooling characteristics during tempering. This study gives indications about the maintenance of specific cooling characteristics that of a tempering medium after repeated uses.

Keywords: carboxymethyl cellulose, pitting corrosion, heat transfer

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Cold Spray Coatings Morphology

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Abstract. Cold spraying (CS) is a relatively recent thermal spraying technique that belongs to a broader range of thermal spraying processes, with differently named approaches including: Cold Gas Dynamic Spray, Kinetic Spray, High Velocity Particle Consolidation (HVPC), High Velocity Powder Deposition, and Supersonic Particle/Powder Deposition (SPD). In this process, powder particles are accelerated by supersonic gas jets to a temperature that is always below the melting point of the material, resulting in a solid particle coating and thus eliminating the process of powder melting and solidifying as in conventional thermal spraying. In this paper, the morphology of a Ni/CrC cold spray coating is studied, based on the identification of the particle's characteristic at various magnifications, both on cross-section and on the surface of the samples. The size of the particles on the surface has a diameter between 15-65 microns with a relatively uniform distribution, highlighting two phases. In comparison with other thermal spray techniques, in the case of the cold spray coating a flattened particle structure was observed, while in the plasma spray coating case, the "splat" type structures are specific, due to the high temperatures developed during the process.

Keywords: cold spray coatings, microstructure, morphology, flattened particle's structure.

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Tribological Characterization of Phosphate Coatings Deposited on Ti6Al4V

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Abstract. In recent years, improving the surface of titanium implants is increasingly being studied, to reduce their rejection rate. Thus, there are several methods by which the properties of the base material, the titanium alloy, can be improved, such as anodizing, micro-arc oxidation, plasma spraying, ion implantation, biomimetic deposition, chemical conversion deposition etc. Regarding the deposition process by chemical conversion, phosphating presents a multitude of advantages, including good adhesion to the substrate and the capacity of improving cellular adhesion due to the porosity of the layer. Therefore, the paper aims to study the tribological characteristics by evaluating the adhesion and friction coefficient of three types of phosphate layers deposited on the surface of the titanium alloy, Ti6Al4V, using a UMTR 2M-CTR Micro-tribometer and SEM.

Keywords: tribological characterization, scratch, phosphate layers, titanium.

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Phosphate Conversion Coatings for Biomaterials: A Bibliometric Analysis

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Abstract. The enhancement of the biological response of titanium alloy implants has started to be thoroughly researched, particularly by surface modification treatments, driven by the impending clinical demands and the advantageous commercial context. Because it has many benefits, the technology of deposition by chemical conversion (phosphating) should be researched and introduced among the ways to treat the surfaces of biomaterials. Due to the type of morphology, high adherence to the substrate and also high corrosion resistance, the phosphate coatings are suitable for improving the surface of biomaterials. Therefore, the paper aims to analyze the evolution of research in the field of coatings for metallic biomaterials, focusing on conversion coatings using bibliometric analysis.

Keywords: conversion coatings, phosphate, review, corrosion properties.

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Acknowledgement:
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Effect of Different Foaming Temperature on Properties of $NaHCO_3$ – Natural Rubber Latex Foam

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Abstract. Natural rubber latex foam (NRLF) was prepared via the Dunlop process using sodium bicarbonate, $NaHCO_3$ as the blowing agent. The influence of different foaming temperatures (140 °C, 150 °C, 160 °C, 170 °C, and 180 °C) on relative foam density, average cell size, cell size distribution frequency and compression stress-strain of NRLF were studied. The average cell sizes were related to the relative foam density of NRLF. As the temperature increased, the relative foam density increased, and eventually the average cell size decreased due to high amount of gas generated by blowing agents simultaneously. Meanwhile, smaller cell sizes were distributed as the temperature increased. It was found that the optimum temperature for NRLF was 150 °C due to the lowest relative foam density and significantly larger uniform cell size were produced. Thus, the lowest compression stress up to 60 % of strain was found at 150 °C and increased with increasing temperature. The mechanical properties were correlated with the morphology and physical properties of the NRLF, respectively.

Keywords: natural rubber latex, foams, sodium bicarbonate, foaming temperature, compressive.

Influence of Liquid and Plastic Limits on the effect of Solid-to-liquid ratio and molarity of Sodium Hydroxide for Soil based Geopolymer with Addition of Fly Ash

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Abstract. In road construction, soil condition was one of the major factors that will be considered especially in pavement design and selection of the pavement material. Plastic limits and liquid limits are important to classify the types of soil and other engineering purposed where plastic limits and liquid limits can provide basic information about the soil. Generally, soil laboratory test conducted are Atterberg limits, i.e. plastic and liquid limits. The British Standards (BS 1377-2: 1990) were used to determine the plastic and liquid limits. The effect of solid-to-liquid (1.0, 1.5, 2.0, 2.5, 3.0) and molarity of sodium hydroxide (8M, 10M, 12M) on soil based geopolymer with addition of fly ash were investigated based on liquid and plastic limits. The result shows that the addition of fly ash and the increment of the solid-to-liquid (S/L) to soil can increase the plastic limits and reduces the liquid limits of soil.

Keywords: soil stabilization, geopolymer, fly ash, liquid and plastic limit.

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Surface Properties of Ni-Cr-Al Materials Fabricated via Powder Metallurgy

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Abstract. The objective of this research is to investigate the morphology, surface properties, and corrosion resistance of two different materials derived from a mechanically blended Ni-Cr-Al powder. The first material is a coating deposited on S273JR construction steel using thermal spraying, while the second is a sintered bulk material produced using concentrated solar energy as a heat source. The coatings exhibit typical thermal spray morphology, consisting of partially fused and plastically deformed powder particles, with oxides present at the fused particle margins. The sintered materials show good fusion under the working conditions used in the concentrated solar furnace (sintering temperature of 900 °C and a duration of 10 minutes). Both the coatings and sintered materials exhibit hydrophilic properties due to the presence of oxides. The corrosion rate and mechanism of the materials were determined in a 3.5% wt. aqueous NaCl solution through linear polarization and electrochemical impedance spectroscopy. It was found that the corrosion mechanism is influenced by the material morphology, and the corrosion rates range from 0.02 to 0.15 mm/year, which is significantly lower than the substrate steel in the case of the coatings.

Keywords: coatings, sintering, concentrated solar energy, corrosion, surface properties.

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Influence of alloy additives on the structure and microstructure of massive amorphous alloys

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Abstract. The properties of metallic amorphous materials depend mainly on their chemical composition and the degree of relaxation of the structure. This paper presents the results of tests carried out on the group of alloys: Fe64Co10Y4Me2B20 (where: Me = Mo, Nb, Ni), obtained by a injection-casting method. The bulk amorphous samples were obtained in the form of rod. The structure and microstructure in the as-quenched and after-annealing states, were studied using: X-ray diffractometry, Mossbauer spectroscopy, scanning and transmission electron microscopy. The combination of microscopy and X-ray studies allowed for the observation of diffusion effects occurring in the material.

Keywords: X-ray diffraction, structure, properties

The influence of heat treatment on the structure and magnetization process in the bulk amorphous alloys

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Abstract. The paper presents studies of annealing effect on the magnetic properties of the bulk amorphous alloy in the form of rods. The thermal treatment was performed at the temperature well below the crystallization temperature. Structure, revealed by X-ray diffraction and Mössbauer spectroscopy and magnetic properties in high magnetic fields in investigated alloy in the as-quenched state and after the annealing were studied. From Mössbauer spectroscopy and X-ray diffraction it have stated that the samples in the as-quenched state and after annealing are fully amorphous. Using a vibrating sample magnetometer the magnetization in high magnetic fields was studied. For the sample after solidification the magnetization process is affected by quasidislocation dipoles . However, in the case of a sample after heat treatment, the free volumes affect the magnetization process. The heat treatment improved the magnetic properties and increased the packing density of atoms.

Keywords: X-ray diffraction, magnetic properties, annealing effect

Research and Development of Novel Advanced Titanium Alloys for Medical Use

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Abstract. Nowadays, biomaterials are a unique class of materials that are essential to improving the standard of human life and extending it. In order to restore the shape and functions of a portion of a tissue that has been damaged by disease or trauma, biomaterials are often intended for implantation in a living organism. The work studies a system of Ti15Mo7Zr15TaxSi (0, 0.5, 0.75, 1 wt%) for potential use in medical applications in agreement with the development of biomaterials containing non-toxic elements. The paper contains structural tests on the alloys, some mechanical properties and their evaluation in simulated environments such as Ringer's solution. The results showed that the alloys are biocompatible, have a very good resistance in the simulated environment and the mechanical properties are close to those of the human body, being able to be used successfully in future applications.

Keywords: new biomaterials, characterization, othopedic implants, microstructures, corrosion resistance.

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The Assessment of the Transversal Rupture Strength (trs) and Hardness of WC-Co Specimens Made via Additive Maunfacturing and Sinter-HIP

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Abstract. A study was carried out to assess the mechanical properties of indirect SLS 3D printed (SLS) and sintered of WC-Co samples. The as-printed specimens were debinded, vacuum sintered, and sinter-HIPed at 1400°C, using 50 bar Ar, where samples have attained relative densities up to 66 %. Optical images show a microstructure comprised of WC medium grain size in the range of 1.4 – 2.0 µm with isolated large grains, in a well-distributed Co matrix. Although the volume shrinkage was up to 42 %, no significant shape distortion had occured. The printing direction of the TRS specimens has a great influence upon the quality of the parts. However, low bending strength up to 612 MPa have been obtained regardless of the printing direction. The hardness test together with SEM image of the fracture surface of the TRS specimens show the presence of defects in the internal structure which is the cause behind the low bending strength values. The obtained results provide an overview of the mechanical properties of WC-Co made by SLS.

Keywords: additive manufacturing, cemented carbides, selective laser sintering, hardness test, transversal rupture strength

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Functional Poly (alkyl methacrylate) Additives for Improvement of Wear Reduction Properties of Lubricating Oils

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Abstract. The new chemistries of poly (alkyl methacrylate) based additives containing different nitrogen or oxygen functional groups were developed for reduction of wear and friction of lubricanting oils. The additives were synthesized by radical copolymerization in solution of mineral, synthetic and vegetable oils. Wear reduction capacity of the additives was determined according to the standard test method EN ISO 12156-1 for 0.5 wt. % solutions of polymers in lubricating mineral base oil. The coefficient of friction was measured using the 4-ball geometry of the TA Discovery HR30 rheometer at different sliding speeds to simulate different applications and at different temperatures from -20°C to 150°C. The base oil solution of polymethacrylate additive with the hydoxyl functional group showed the smallest diameter of the wear scar and the lowest coefficient of friction.

Keywords: poly (alkyl methacrylate), functionalization, lubricating oil, wear reduction, coefficient of friction.

The Influence of Processing Parameters on the Mechanical Properties of PLA 3D Printed Parts

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Abstract. PLA (Polylactic acid) has become one of the most popular biodegradable materials, being used for a wide range of applications, from packaging to components in the automotive, electronics and prosthetics industries [1]. With the development of 3D printing technologies and especially FDM (Fused Deposition Method) technology, the applications of PLA have expanded. The quality of the produced parts can be ensured by a better choice of processing parameters, the best-known being layer height, build orientation, filling percentage, infill pattern, raster direction, printing temperature, porosity, printing speed and overflow [2]. In this paper, the effect of varying the values of two of the process parameters on the mechanical properties of some specimens made by FDM was studied. A commercially available PLA filament (produced by Prusa) was used as raw material, from which several sets of specimens were produced, the parameters varied being the printing angle relative to the longitudinal axis of the specimen and the overflow (OF). Thus, three printing angles were chosen, 0°, 22.5° and 45°, each set of specimens being made with an OF of 95% and 100% respectively. The printed layer was chosen with a standard thickness of 0.2 mm.

Keywords: 3D print process, processing parameters, mechanical properties.

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Influence of TiO_2 Alloying Percentage on the Morphology of APS-deposited Coatings from Cr_2O_3 Powders

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Abstract. Thermal spray coatings produced from Cr_2O_3 powders are used for a wide range of applications that require abrasive and sliding wear resistance, including: papermaking rolls and blades, hydraulic seal joints, pump parts, shaft sleeves, seals, valves, components for high-speed automatic machinery such as packaging and food processing machinery [1]. Although these coatings show very good corrosion and abrasion resistance properties and satisfactory hardness values, their applicability is limited by their brittleness [2]. For this reason, various materials have been investigated which, when added to the base material, improve the ductility and compactness of the coating, one of them being TiO_2 powder. In this paper we studied how alloying with different percentages of TiO_2 influences the microstructure of Cr_2O_3 base matrix coatings deposited by plasma spray (APS). Thus, five different types of coatings were made, in which the percentage of TiO_2 varied as 0%, 10%, 20%, 30% and 40%. The samples were analysed morphologically both on the surface and in cross-section using optical (OM) and electronic microscopy (SEM).

Keywords: Cr_2O_3 – TiO_2 coatings, APS, microstructure morphology.

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Expanding the Applications of Copper-based Alloys by Thermal Arc Spraying

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Abstract. Copper is the oldest material used by mankind, its first application being dated to about 10,000 years ago. Its use has evolved over time, being still one of the materials with extensive applications due to its excellent properties of thermal and electrical conductivity, corrosion resistance, good strength and fatigue resistance. Pure copper is widely used to make rods, wires and electrical contacts, and its alloys are used to produce radiators, heat exchangers, domestic and industrial heaters, panels for solar energy capture, pipes, valves, fittings for drinking water systems or for the circulation of other fluids. However, there are also less desirable aspects of using copper, one of which is heating at high temperatures in the presence of air. This process involves a chemical oxidation reaction of copper, with the formation of Cu2O and CuO oxides, the destructive process increasing exponentially with increasing temperature. Extending high temperature applications without the risk of oxidation that leads to both material destruction and increased toxicity of the working environment as a result of the formation and release of copper oxides, can be achieved by coating the exposed surfaces with compact layers using the thermal spraying method. In this article the case of depositing a Ni-based alloy layer by thermal arc spraying on a copper alloy substrate with cylindrical geometry over its entire surface is presented.

Keywords: Ni coating, copper-based heating elements, oxidation resistance.

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The Use of Coal Waste Materials as Sustainable Additives for Enhancing Concrete Properties: A Review

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Abstract. The use of coal additives in concrete has gained attention in recent years due to their potential benefits in improving the performance of the material. One of the most significant advantages is their ability to mitigate the risk of Alkali-Silica Reaction (ASR), a chemical reaction that can cause the concrete to expand and potentially fail. This literature review focuses on the effect of coal additives, specifically coal fly ash and bottom ash, on concrete performance with a particular emphasis on their ability to mitigate ASR. The review examines several studies that investigate the properties of coal additive concrete, including compressive strength, durability, and resistance towards chemical penetration. The results indicate that the use of coal additives in concrete can improve its properties, resulting in better performance and durability. Furthermore, the use of coal additives has been found to reduce the risk of ASR in concrete by reducing the alkali content.

Keywords: concrete design mix, ash, sustainable material

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Physical Properties Characterization of Ceramic Waste Particles Used as Filler in Boat Hull Production: A Proposed Study

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Abstract. Various types of composite materials were being used in boat manufacturing especially for hull production as a main part. Natural composite materials such as teak sawdust, wood ash and silica particles have been utilized in boat hull making from previous researchers. This paper revised mechanical properties impact on several composite materials mixed with epoxy resin matrix by using hand lay-up method. Other than that, the main focused in this study is on the application of ceramic particles waste as a composite material. Instead of being used as land-filling, ceramic particles waste can be reused in becoming value-added composite materials in specific area which brings benefits to environment and enhance the properties for other materials in terms of physical and mechanical. This study also presents an assembled and up-to-date review of physical, mechanical, durability and other durable potential abilities of ceramic fine aggregate which have huge ability usage in concrete production, soil stabilization, bricks block and road pavement structure. The percentage of particles usage from previous studies were from 2% up to 20% and the findings indicate that usage of ceramic waste particles improves flexural, durability, compressive, geotechnical and mechanical strength properties compare to standard materials usage. Thus, a new application area will be explored from this study on the usage of ceramic particles waste to the resin on the interface between the composite materials and core materials used in production of boat hull.

Keywords: ceramic waste aggregate, boat manufacturing, composite, mechanical strength, boat hull

Hybrid Fiber Reinforced Vegetable Oil-Based Composites: A Short Review

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Abstract. The development of fiber-reinforced vegetable oil composites has gained significant attention in recent years due to their eco-friendly nature and potential to replace synthetic composites. Vegetable oil composites can be reinforced with either natural or synthetic fibers, leading to partially or fully green composites. However, synthetic fibers have the disadvantage of being non-renewable and unsustainable due to their production from petroleum-based sources. To address this limitation, there is a growing trend toward hybridizing two or more types of fibers as a hybrid reinforcement system, which can improve the supporting properties of the composites. Therefore, this review article specifically focuses on the use of hybrid fibers in vegetable oil-based composites, including the various types of hybrid fibers, vegetable oils used, and the manufacturing methods employed. Additionally, the mechanical and thermal properties of these composites are also examined.

Keywords: hybrid fiber, composites, vegetable oil, mechanical properties, thermal properties.

Potential of Biodegradable Magnesium Alloys as Trauma Implant Materials

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Abstract. The research work aims to present the potential of biodegradable magnesium alloys to be used as trauma implant materials. Due to some limitations of current biodegradable magnesium alloys for their use as implant materials, various solutions like alloying, processing and surface modifications were tested in order to increase their biofunctional properties [1]. The aim of the current study is to evaluate the performance of different bioceramic, polymeric and composite coatings on biodegradable magnesium alloy. Coatings with calcium phosphates or bioactive glasses present many advantages, among which one can find the reduction of the corrosion rate under “in vivo” or “in vitro” conditions and the promotion of calcium phosphate deposition [2]. Also, doping calcium phosphates with trace elements in various couple combinations may impart implants also with antimicrobial properties. Our study reveals that bioceramic and polymer-based composite coatings could act in a beneficial way to improve the biofunctional properties required for the magnesium alloys to be used as biomaterials for manufacturing orthopedic implants used for bone fracture fixation.

Keywords: magnesium alloys, coatings, corrosion, implants.

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Acknowledgements:
This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS-UEFISCDI, project number PN-III-P4-ID-PCE-2020-2591, within PNCDI III.

Structural Modifications through Heat Treatments in Al-Si Alloys

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Abstract. The paper presents aspects about the structural modifications induced through annealing, quenching and ageing heat treatments for 2 aluminium alloys. The samples for the experiments were obtained through casting and have the dimensions: 100 mm length and 8 mm diameter. The heat treatments were made in an electric furnace and are respected all the technological parameters imposed by the aluminium alloys.

Keywords: aluminium alloys, hardness, structure, paramters

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Acknowledgements:
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The Improvement of Hardness Properties through Thin Layers Depositions

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Abstract. The paper presents technological aspects of some research which aim to replace the heat treatment operations of quenching and tempering by deposition of thin layers. The deposited thin layers were obtained by the pulsed electric discharge method. The support material comes from a dynamic cutter of a plant for shredding plastic waste.

Keywords: cutters, electrode, hardness, treatments, thin layers depositions

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Acknowledgements:
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Hydroabrasive Wear Testing of Thin Surfaces Made with Ni-Based Powders

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Abstract. The spectacular development of the requirements regarding the production of electricity from non-polluting sources has led to a significant increase in the requirements regarding the production of new materials resistant to hydroabrasion used to make Francis turbine blades. In the last decade there has been an increase in the production of powders used to obtain thin layers of high morphological and structural quality. These deposited materials represent major advantages in terms of technology and operational properties as well as low costs compared to the special materials used until now to make turbine blades. By making thin layers using the plasma jet spraying method with Ni-based powders, an easy method of making and rectification of hydraulic turbine blades leading to hardening is attempted. The samples were also analyzed from the point of view of chemical composition with the help of the EDX, but also structurally with the help of the optical and electronic microscope SEM. These hydraulic turbine blades work in corrosive environments and are subject to some mechanical stresses from cavitation and hydroabrasive wear.

Keywords: hidroabrazive, wear, characterization SEM, Ni powders, chemical composition

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SECTION 2

PROCEDURES AND TECHNOLOGIES FOR MATERIALS ENGINEERING

Investigating the Possibilities of Using of Mine Tailing and Coal Fly Ash from Bulgaria as Raw Materials in Geopolymer's Production

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Abstract. The investigations in recent years evidence that geopolymers possess mechanical and chemical properties comparable to those of OPC-based materials. The two important ingredients for production of geopolymers are the initial raw materials and alkaline fluids. The most used raw materials for producing geopolymers with low CO2 footprint are metakaolin, fly ash and granulated blast furnace slag. The geochemical composition of those raw materials is crucial for the structure and physical properties of the newly synthesized material. The use of waste materials from manufacturing processes or by-products as raw materials solves important ecological problems. Since these wastes are stored in landfills, they can be easily spread by wind and hence contaminate water or soil by the elements which they contain. The aim of this article is to evaluate potential application of mine tailings and fly ash from Bulgaria as a raw material for the preparation of geopolymers. An open aqua regia digestion method of mine tailings and fly ashes followed by ICP-OES measurement was validated and used for determination of As, Cd, Cr, Cu, Pb, Ni, Zn, etc. The aqua regia digestion is not total digestion technique but is powerful method for digestion of all environmentally available elements with exception of that bounded in silicate structures, which are considered non-mobile in the environmental conditions. This method could be applied not only for fast assessment of the toxicity of mine tailings and the geopolymers on its base, but also for evaluation of the degree of encapsulation of hazardous materials.

Keywords: mine tailing, fly ash, geopolymers.

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The Synthesis of PLA/HA Composite Filaments for Biomedical Applications

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Abstract. Currently, various biomaterials and their beneficial combination are employed for the development of new customized 3D products for bone reconstruction. In this study, a method for enhancing the surface and mechanical features of the poly(lactic acid) matrix by incorporation of bovine bone-derived hydroxyapatite (HA), was proposed for composite fialments extrusion. A tunable technological protocol aimed for the modulation of both the HA particles size (<40 µm, <100 µm and >125 µm) and ratio (0–50%) during the ad-mixing into the polymeric matrix, without binders or surface modifiers. The obtained PLA/HA cast mixtures and the extruded filaments were subjected to complementary surface–volume characterization techniques. Hence, the uniform internal distribution and arrangement of the HA particles, along with an adequate adhesion at the PLA/HA interface, were exposed by SEM/EDS and micro-CT investigations. The crystallinity degree of the composite mixtures was computed from the DSC curves. The advantages and viability of uniformly mixing the natural PLA/HA materials were further demonstrated by an improved wettability and progressive mechanical takeover once the HA ratio increased, irrespective of the particles size. The proposed technological route allowed the selection of optimal parameters for composite filaments synthesis destined for future additive manufacturing and clinical applications.

Keywords: PLA/HA printable filaments; HA-particle size; HA-ratio influence.

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Monitoring and Evaluation of the Corrosion Behavior in Seawater of the Low-Alloy Steels BVDH36 and LRAH36

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Abstract. In the construction of ship hulls and offshore structures, the main materials used are metallic materials, especially carbon steels and alloyed steels. The steel intended for the construction of the ship's hull must fulfill a series of conditions imposed by the rules of the classification registers that is to ensure the possibility of manufacturing ship constructions under normal technological conditions and safe in operation. However, corrosion is a major limitation with metallic materials as they react with the environment of use. Thus, the evaluation of the corrosion resistance of different types of materials remains a major priority in several industries to prevent catastrophic failures and accidents. The purpose of this research work is to evaluate the corrosion resistance in natural sea water (Black Sea) of two types of low alloyed steels BVDH36 and LRAH36 by electrochemical methods. The electrochemical methods used were: evolution of the free potential (OCP) and electrochemical impedance spectroscopy (EIS). The studies were completed by ex-situ characterization analyzes of the studied surfaces before and after corrosion such as: optical microscopy and roughness. The results of the study show us that the polarization resistance of low-alloyed steel LRAH36 is a little bit higher compared to the polarization resistance of low-alloyed carbon steel BVDH36.

Keywords: corrosion, sea environement, electrochemical impedance spectroscopy, polarization resistance, low-alloyed steels.

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Measurement System Evaluation for Aircraft Seat Track Hole Diameter: A Gage R&R Study

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Abstract. This study set out to evaluate the hole diameter measuring method used in aircraft seat tracks. The Gage R&R study's conclusions point to the measuring system's accuracy and dependability, with the measuring tool serving as the main source of variance. The measurement method works well for production and quality control applications, but regular calibration and maintenance are needed to ensure accurate and consistent results. To reduce any potential operator-introduced variation, regular operator training and assessment are also required. To guarantee the security and effectiveness of the seat track assembly, it is essential to measure the hole diameter of the airplane seat track properly. The study's findings show that the measuring system can generate precise measurements that are helpful for production and quality management. To establish the precision of the measurement technique, however, more investigation with a greater variety of components is required. To improve the repeatability and reproducibility of the measurement system, the sources of variance should be investigated, and remedial actions should be taken. To make sure the system stays within the permissible range of fluctuation, it is also advised to monitor it throughout time. In conclusion, it is critical to select the proper materials, put them through rigorous testing and certification processes, and constantly inventing and upgrading them to assure the safety and effectiveness of aircraft seat tracks. The seat track hole diameter measurement system is dependable and precise, but to keep it that way, ongoing testing, and evaluation are required.

Keywords: seat track, Gage study, aerospace industry, measurement system evaluation, hole diameter.

Analysis Of Novel Ti15Mo7ZrxSi Titanium Alloys Experimentally Developed as Potential Materials for Medical Uses

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Abstract. The aim of this study is to examine the biocompatibility and mechanical properties of two innovative titanium alloys, Ti15Mo7ZrxSi (x = 0, 0.5, 0.75, 1). These samples have been previously prepared by chipping, cutting, grinding and polishing [1]. Electrochemical, metallographic and three-point bending tests were carried out to determine the corrosion behaviour, microstructure and Young's modulus of the samples studied. The first set of analyses indicated the biphasic and dendritic structures of both samples, elastic modulus that are approximately 20 GPa away from the maximum and minimum values obtained, and positive behaviour in contact with physiological fluids at room temperature. The study samples Ti15Mo7Zr0.5Si and Ti15Mo7Zr0.75Si have shown high corrosion potentials, lower corrosion rates and thus higher corrosion resistance, as well as modulus of elasticity values similar and closer to those of human bone. In conclusion, the evidence from this study suggests that both alloys show good corrosion behaviour, high biocompatibility and modulus of elasticity values lower than those of commercial alloys used in biomedical implants.

Keywords: biomaterial, titanium alloy, biocompatibility, microstructure, corrosion resistance, modulus of elasticity.

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Microstructural Analysis of Phosphate Layers Deposited on Steel Rebars for Construction

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Abstract. The paper aims to carry out a complex and multidisciplinary study in the field of materials science and engineering of the thin superficial layers deposited on the surface of OB37 steel rebars used for construction. The research aims to study a solution regarding the improvement of OB37 steel surface and chemical properties by depositing phosphate layers through the chemical conversion process. In order to analyse the best possibility, the steel surface was coated with three different phosphate layers (based on Mg, Zn and Mn). The deposition process fallow subsequently the next steps: gridding, degreasing, pickling, phosphating and drying. Between all these steps the samples were rinsed with cold water. In this paper, the phosphate layers obtained were studied from the chemical and structural point of view by SEM, EDS and XRD. From these analyses was observed that the phosphate layers were uniformly deposited and the specific compounds were formed.

Keywords: phosphate layers, steel rebars, EDS, SEM, XRD.

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Wear-Analysis of Different Brake Pads Used in Commercial Vehicles

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Abstract. The pollution of the environment and the health concerns related to particulate matter (PM) released by the usage of vehicles have shown increasing attention in past years. The emissions caused by vehicles, from sources other than exhaust systems, that can be either particles from brake systems, clutches, tires, suspension, the road itself, or material deposited on the road surface that is getting airborne due to traffic induced turbulence, account for almost half of the total emissions in the urban environment, for which the vehicles are responsible. From this category, the brake pad emissions gather 55% of the total PM released in the atmosphere. The purpose of the article will be to assess the different types of the brake pads, that are currently on the market. For the research purposes, two different types of brake pads will be analyzed. The first set of brake pads are non-asbestos organic (NAO), and the second are ceramic. The NAO brake pads materials usually consist of a resin matrix, various types of fibers, filler components, as well as friction and wear modifiers. The ceramic brake pads include in addition ceramic matrix composites. Scanning electron microscopy and light microscopy will be used for structural characterization and insigths on chemical composition will be taken with a Energy dispersive spectrometer (EDS). After the wear cycle, the dust resulted in the testing can be analyzed both from a physical perspective (mass, etc.), as well as from the perspective of the chemical composition. The most important chemical components found in brake wear emissions are Fe, Cu, Pb, Zn. The effect on the disk brake wear can also be quantified from a physical perspective, analyzing the brake disk wear on an electronic microscope in the search of threads and micro cracks on the disk surface. Limiting and regulating the brake pad emissions will have an important benefit in protecting the health of the population and lowering the impact on the environment.

Keywords: brake pad, emission, pollution, health, NAO.

Investigations Related to the Opportunity of Using Furnace Slag in the Composition of Road Cement Concrete

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Abstract. A rational design of road concrete composition requires knowledge of the physical-mechanical properties of BSF with favourable and unfavourable impact on the durability of road concrete. Aspects of the impact of the quality of GGBS granulated and ground blast furnace slag as well as the properties of ACBFS air-cooled blast furnace slag crushed aggregates were analysed in this article. Although all the physical-mechanical properties books are suitable for the slag powders inclusion in the road concretes composition, the high content of CaO-free and C_3A limits the substitution of cement with GGBS to prevent the occurrence of degradation during the exploitation period. ACBFS aggregates have been proven to be non-reactive to alkalis in cement, thus being suitable for inclusion in road cement concrete compositions. The increased values of the water absorption coefficient, respectively of the fineness modulus of the ACBFS type aggregates compared to natural sand, the reduction of the profitability of the road concrete and the increase of the water/binder ratio. Finally, for the design of road concrete compositions with slag, preliminary tests were carried out on three series of mixtures, in which Portland cement was replaced by 15% GGBS and natural sand by 25% and 50% ACBFS respectively. The optimal slag road concrete recipe was established based on: increased workability, a low water/binder ratio and a 7-day compressive strength close to the control sample.

Keywords: road concrete with slag, the oxide composition, activity index, mortar microstructure, workability, compression strength.

Development of a Polymer Fiber Based System for Hemostasis in Open Surgery Procedures Using Cyanoacrylate Tissue Adhesive

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Abstract. Tissue adhesives were used for wound closure on soldiers with severe injuries ever since the 1970s'. Over the years, these adhesives have been improved and diversified in order to eliminate the use of sutures during surgery, as well as the need for post-operatory removal procedures. This study presents the design of a polymer fiber based system used as smart bandage with dual function: maintaining the adhesive in active state, as well as producing rapid hemostasis. Paper microfluidics was chosen as a principle solution for this approach, considering capillary forces in multiple fibrous structures to obtain this dual-functioning bandage. Hydrophobic barriers were drawn onto the substrates, designed to constrain the adhesive and to maintain the active state / shape of the adhesive droplets. The bandages' functionality was tested in relation to induced skin laceration on rats. The aim of the designed system is to achieve hemostasis in open surgery cases, in the first 20 seconds from applying it on the affected area, as well as to ensure the resorption of the bandage to prevent further medical interventions.

Keywords: paper microfluidics, tissue adhesive, fibrous structure, electrospinning, smart bandage.

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Heat Treatments on Metallic Biomaterials for Medical Devices

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Abstract. Titanium is recognized as the singular metal biomaterial that exhibits outstanding osteointegration and may potentially display bioactive characteristics. In this paper study development of new Ti-Mo-Zr-Ta alloys (3 recipes) and the improvement of properties through thermal treatments, in order to obtain mechanical properties and with a high biocompatibility that aims at biomedical applications especially orthopedic implants. The proposed alloys are composed of non-toxic elements and present specific mechanical/chemical properties (reduced modulus of elasticity, resistance to corrosion) as close as possible to those of the organ they are replacing, respectively they ensure complete durability during the respective prosthesis, ensuring patients a faster recovery, resulting in a reduced risk of carcinogenic effects. The alloys will be complexly characterized (chemical, structural, mechanical and surface), and the functionality of the model will be demonstrated under relevant operating conditions

Keywords: Heat treatments, biomaterials, titanium alloys.

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Neural Network Modeling to Predict the Properties of Sintered-Iron Based Powder Metallurgy Materials

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Abstract. Modeling using artificial neural networks can be a helpful tool used to predict complex processes with many variables. In this paper, a neural network model is used that has a backpropagation learning algorithm to predict the properties of sintered-iron based obtained by powder metallurgy route. This type of neural network model gave the best results in the process of modeling. The pre-alloyed iron based powders produced by atomization (< 45, 45-63, 63-100, 100-150, >150μm) were the raw materials analyzed. The powders were compressed in a mold using uniaxial pressing at 400, 500 and 600 MPa with the disc dimensions of ϕ 8 × 6 mm. After pressing, the green compacts were sintered in a laboratory furnace. The sintering temperature was approximately 1.150 °C. The density in green and sintered state of iron-based alloys, porosity and the microhardness were evaluated. It is observed that the neural network predicted values are in good agreement with the experimental values obtained. The proposed model helps to reduce the number of experiments needed and also reduces the cost of each experiment by adjusting the process parameters.

Keywords: neural network, prediction, powder metallurgy.

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Materials and Technologies in Critical Situations of Bone Resorption and Complications of Edentation

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Abstract. The edentulous patients with severe alveolar bone resorption request an individualized selection of the techniques of alveolar reconstruction (bone augmentation, inlay/onlay bone blocks, guided tissue regeneration) and bone graft materials (autogenous bone, allografts, xenografts, alloplastic materials). Digital technologies applied in treatment of severe resorbed bone and extended edentations consists of digital expert systems in the pro-implant and implant stage for diagnostic and assessment of the bone-mucous support (CS9300, Planmeca Romexis3D), assisting of the surgical implant phase by 3D navigation systems (Robodent, X-Guide Implant Planning), as well as the use of software applications (DDS) for the design of the future fixed or removable implant-supported prosthesis. The procedures are as follows: virtual implant planning (to minimize implants' axial loading), static guided surgery and dynamic freehand navigation (to increase implants positioning accuracy), and accurate manufacturing of the implant-supported prosthetic restorations by CAD/CAM technologies. Using these technologies practitioners will optimize decrease significantly the rate of the postoperative complications and treatment failures.

Keywords: alveolar resorption, addition techniques, addition materials, digital implantology.

Interdisciplinary Management in Complex Systemic and Oral Rehabilitation

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Abstract. Local and loco-regional complications of extended partial edentulous patients vary from alveolar ridge resorption to reduced masticatory function, unhealthy diet, social disability, and poor quality of life. Most patients affected by severe loco-regional complications have also various systemic diseases (cardiovascular diseases, gastro-intestinal disorders, liver pathology), that can negatively influence the postoperative stage. In this context, implantologists and prosthetic specialists orientate the patients, wherever is possible, to implant-prosthetic rehabilitation. Interdisciplinary management of implant-prosthetic therapy is requested when implant-prosthetic rehabilitation involves the reconstruction of alveolar ridges in the pro-implant stage. The implantologist and oral surgeon need to agree the selection of the grafting materials and techniques in relation to systemic, loco-regional, local factors and the planned prosthetic solution. In this context, a practical guide for the management of the systemic pathology and the optimal surgical approach in the proimplant stage may be useful in order to optimize the aesthetic and functional results of the patient candidate to implant-prosthetic rehabilitation.

Keywords: edentation, complications, oral, systemic, rehabilitation.

Classic and Minimal Invasive Surgical Implications in Oral Implant-Prosthetic Rehabilitation of Edentulous Patients

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Abstract. Classical bone grafting techniques based on large incisions and flapping of soft tissues were associated discomfort and long postoperative time to allow alveolar bone regeneration before placement of the dental implant. Minimally invasive surgical techniques can replace classic pro-implant techniques with benefits as follows: ideal for high-risk patients with high-risk systemic diseases (hemostasis disorders, diabetes), less pain and discomfort, less anxiety. The pro-implant surgical stage must be planned according to systemic status, periodontal condition, status of mucosal and bone tissues, level of oral hygiene, cognitive skills, psychological state of the patients as well as the compliance of patients to the programmed check-up sessions. The pre-treatment computer guided planning assisted by specialized software is a requested tool for the minimal invasive approach. The implant-prosthetic rehabilitation assisted by lasers responds to the minimally invasive surgical approach, especially in the fields of implantology and oral surgery. The use of lasers increases both comfort and patients' compliance as well as minimally damage of hard and soft tissues, ensures faster healing after surgical procedures, and significantly decrease the post-operatory complications rate.

Keywords: edentulous, minimal invasive, oral surgery, implant, rehabilitation.

Acetaminophen Drug Removal from Wastewater Using Carbon Nanotubes Nanomaterials

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Abstract. The drugs removal from wastewater for preventing reaching into the environment is intensively studied [1,2]. The paper presents the removal of acetaminophen from wastewater using carbon nanotubes nanomaterials. The performances of the carbon nanotubes nanomaterials were systematically investigated from adsorption kinetics points of view. The SIPS isotherms model characterizes well the adsorption of acetaminophen on nanomaterials. The removal efficiency of acetaminophen was studied on three different pH (4, 6, 8) of tge wastewater and two dose of adsorbent (0.3 and 0.5 g). The highest removal efficiency (98.5 %) was obtained at the value of 6 pH of wastewater and 0.5 g og adsorbent. The results obtained for the carbon nanotubes demonstrate the possibility application of this adsorbent for the removal of acetaminophen from wastewater.

Keywords: acetaminophen, removal efficiency, carbon nanotubes (CNTs), wastewater treatment.

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Comparison of Corrosion Behavior of Two Stainless Steels for Medical Applications

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Abstract. Many different orthopedic materials are used in medicine and the main requirement is their biocompatibility, inclusive the corrosion resistant in the human body. In addition to destroying the implants, the products released during corrosion can also cause unwanted reactions in the human body. Therefore, corrosion testing of any new material proposed for implants, should be tested in a model or controlled environment close to human body medium. In this work, results obtained in the study of high-nitrogen stainless steel (HNS), as a material for the fabrication of implants, are presented and compared with the results obtained for analogous environments and conditions, for classical Cr-Ni stainless steel. The tests have been carried out in Hartmann's and Ringer's lactate infusion solutions, at different pH values and at 37° C. A three-electrode glass cell was used in open air conditions. The following electrochemical methods were used: cyclic potentiodynamic polarization method, open circuit potential (OCP) - time measurement and potentiostatic method. By optical and scanning electron microscopies were determined the character of the corrosion attack. The surface of the samples was examined and by EDX analysis in order to determine the nature of the corrosion products. From the obtained results, it can be concluded that high-nitrogen steel has better corrosion resistance, than chromium-nickel steel, in the studied infusion solutions.

Keywords: corrosion, stainless steels, hidh nitrogen steels, testing of implants, body fluids.

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Effects of Fine Particle Size on the Characteristics of Coal Bottom Ash as an Environmentally Friendly Material in Concrete Production

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Abstract. In the current era, concern about the responsible disposal of industrial waste and its reuse has increased in all societies from the industry. Therefore, the researchers' institution is focusing its efforts on developing more environmentally friendly products from recycled waste, particularly in the area of sustainable construction. For instance, one of recycled waste is Coal Bottom Ash (CBA), a by-product of coal combustion that is produced in large quantities from thermal power plants. The aims of this study to investigate the physical, chemical and element characteristics of CBA obtained from thermal power plant in Malaysia. Also, CBA compared with cement characteristics to be used as cement replacement in the concrete mixture. Therefore, numerous tests have been performed to investigate CBA's physical and chemical characteristics. For the physical characteristics such as specific gravity, particle size analysis, fineness modulus, bulk density, and loss of ignition. For the chemical characteristics such as x-ray fluorescence (XRF), X-Ray Diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and Thermogravimetric analysis (TGA) in the endeavor to obtain sustainable materials from thermal power plant wastes. Based on the findings in this study, it can be concluded that CBA can be utilized as cement substitute in the production of concrete mixtures.

Keywords: coal bottom ash, cement, concrete production, physical characteristics, chemical characteristics, high fineness.

Development of Waterborne Epoxy-Acrylate Core-Shell Emulsion for Wood Coating

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Abstract. Core-shell waterborne epoxy acrylate (WEA) polymers are a type of polymer that has gained significant interest in recent years due to their excellent dual morphology properties, good chemical resistance, and mechanical strength. Here, core-shell WEA emulsion was developed and evaluated as a potential binder and coating material for wood applications. Seeded emulsion polymerization was synthesized to produce the core-shell WEA polymers, and various techniques such as particle size, zeta potential, FTIR, TEM, DSC, TGA, and tensile were employed to characterize the emulsion. The analysis indicated that the emulsion had a stable and monodisperse (PDI~ 0.002) with particle size (~125 nm) and zeta potential values (-50 mV). FTIR spectra showed the successfully copolymerized epoxy-acrylate polymer. Furthermore, TEM and DSC analyses confirmed the successful synthesis of the core-shell particle morphology, resulting in a high-strength film with two Tg values (14 °C and 80 °C) for the core and shell layer, respectively. The performance of the coatings differed between the two-layer morphologies, with the core layer containing more epoxy exhibiting slightly better ductility behavior via stress-strain curves. TGA data indicated that thermal stability increased by 10% with increased epoxy contents (up to 40 wt.%) in the core layer. Conversely, the addition of the shell acrylate layer demonstrated better resistance to water and chemicals. Therefore, these findings provide promising strategies to design core-shell waterborne epoxy acrylate polymers for use in wood-related applications.

Keywords: seeded emulsion polymerization; waterborne; core-shell; epoxy; acrylate; monodisperse.

Effect of Different Foaming Temperature on Properties of $NaHCO_3$ – Natural Rubber Latex Foam

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Abstract. Natural rubber latex foam (NRLF) was prepared via the Dunlop process using sodium bicarbonate, $NaHCO_3$ as the blowing agent. The influence of different foaming temperatures (140 ˚C, 150 ˚C, 160 ˚C, 170 ˚C, and 180 ˚C) on relative foam density, average cell size, cell size distribution frequency and compression stress-strain of NRLF were studied. The average cell sizes were related to the relative foam density of NRLF. As the temperature increased, the relative foam density increased, and eventually the average cell size decreased due to high amount of gas generated by blowing agents simultaneously. Meanwhile, smaller cell sizes were distributed as the temperature increased. It was found that the optimum temperature for NRLF was 150 ˚C due to the lowest relative foam density and significantly larger uniform cell size were produced. Thus, the lowest compression stress up to 60 % of strain was found at 150 ˚C and increased with increasing temperature. The mechanical properties were correlated with the morphology and physical properties of the NRLF, respectively.

Keywords: natural rubber latex, foams, sodium bicarbonate, foaming temperature, compressive.

Interlaboratory Comparison of High-Pressure CO_2 Sorption Isotherms: Reproducibility of Methane and Carbon Dioxide Sorption Productivity for Low Ranked Coals

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Abstract. For estimating the carbon sequestration potential of coal seams, sorption isotherms, which describe the gas storage ability of coal, are essential. Two laboratories measured the carbon dioxide isothermal measurements on moisture-balanced sub-bituminous coal samples was investigated (Indonesia and China coals). Two independent laboratories provided isothermal data at 27 °C and 55 °C and pressures up to 8 MPa on the four coal samples. At the higher pressures, the data among the laboratories diverged significantly for two of the laboratories and coincided reasonably well for four samples. Adsorption isotherms, which describe the coal's gas storage capacity, are important for estimating the carbon sequestration potential of coal seams. The differences among the data sets in this study appeared to be rank-dependent or specifically, the data indicated that the moisture content of these samples indicated better sorption for lower moisture content than for higher moisture content coal samples, depending on its hydration content. Several parameters such as sample size, equilibration time, and apparatus dimensions were examined to explain the rank effect, but no trend could be found that explained the differences. The variations among the data could be attributed to different basins and depth but the same precautional procedures for removing moisture to obtain the "dried" coal were determined.

Keywords: coalbed reservoir, CO_2 adsorption, Fushun Basin, low-rank coal, South Sumatera Basin

Study of Structural Materials 95X18SH in Conjunction with a Rubber Mixture of Group VI and Polyurethane Grade PU SKU-PFL-100 with Damping Properties

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Abstract. The research is aimed at improving the surface properties of high-carbon stainless steel 95X18SH valve rod borehole pump using composite layers of rubber compound 7B-14MA, obtained by matrix sintering under pressure with the content of polyurethane nanoparticles grade PU SKU-PFL-100. The durability of the valve ball and its viscosity is ensured by a fine-grained structure of the martensitic class with a needle structure, and damping properties are achieved through the implantation of saturated urethane rubber. The tightness of the valve to the seat during the hydrodynamic impact of oil is achieved by reducing the kinetic energy of shock vibrations of the ball with a polyurethane implant when the vibration amplitude is attenuated. The conditional tensile strength of polyurethane inclusions is 9.8 MPa. Tribo-corrosive properties of hybrid composite materials were investigated in real oil wells with high acidity and asphalt-resin paraffinization during friction and slip tests. During the test, hardness, mechanical pressure and friction were controlled, taking into account different vectors of shock load application and tangential moments of forces. The proposed combination of hybrid materials with different mechanical properties provides abrasive and corrosion resistance. In addition, with increased hardness values, products made of this material retain excellent elasticity. The achieved deformation limit is not less than 350%. These properties provide the impact strength of the inertial valve and the redistribution of the shock load over the entire contact area of the valve seat. The results of the computer simulation of the dynamic loads of the valve gate by numerical method in the APM FEM software package and experimental studies confirmed the correctness of the choice of the method for improving the valve assembly – with the same number of loading cycles, the use of a rubberized ball (gumming metal fittings with a rubber mixture) increases the fatigue strength margin of the valve seat by more than 20%.

Keywords: composite polyurethane, martensitic steels, structural materials, durability, tribocorrosion resistance

Magnetocaloric Effect in Ribbons Obtained by Melt Spinning

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Abstract. This paper presents the results of influence of annealing temperature on the microstructure and magnetocaloric effect for ribbons in the as-quenched and partially crystalline state. The microstructure was investigated using Mössbauer spectroscopy. From these measurments it has found that the samples in the as-quenched state are fully amorphous and after annealing are partially crystallized. The magnetocaloric effect was observed as a change in the magnetic entropy, which was calculated from isothermal magnetization curves. Fully amorphous ribbons exhibit a Curie temperature equal to (325±5) K. For this material in the as-quenched state, the changes in maximum magnetic entropy occur near the Curie points and are equal to 0.93 J/(kg K). The maximum magnetic entropy changes decrease after partial crystallization.

Keywords: melt spinning, magnetocaloric effect, Mössbauer spectroscopy, microstructure, magnetic entropy

A Review on the Effect of Extrusion Parameter on 3D Printing Filament Diameter

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Abstract. Over the years, extrusion has captured the attention of polymer industries by effectively meeting the demand for polymer processing and fabrication of final products. Extrusion is a continuous process that has a lot of potential in the continuously increasing polymer sector, especially in the three-dimensional (3D) printing sector. 3D printing is popular due to the feedstock filament form is easily accessible and produce able. Regardless of the FDM parameters, the printed part qualities are influenced by the properties of the filament used. The purpose of this study is to provide information on how extrusion parameters affect the diameter of extruded filament. This study reviews previous studies that investigated the effect of varied extrusion settings on filament diameter. The review will serve as a resource for researchers in the 3D printing sector who are interested in fabricating filament on their own for 3D printing. Overall, this paper will provide solutions to overcome existing issues in obtaining optimal filament diameter for future research projects.

Keywords: extruder, extrusion, filament, barrel temperature, extrusion speed, diameter

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The Effects of Foaming Agent and Surfactant on Alkali Activated Materials As An Adsorbent for Lead Ions Adsorption

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Abstract. Lead has been utilized in a variety of applications, either pure or in alloys with other metals. It is commonly recognized as the most extensively dispersed dangerous metal in environmental media. The objective of this research is to study the effect of mix design of foaming agent and surfactants content on the physical properties of metakaolin based alkali activator materials. Besides, it is to examine the effectiveness of lead ions adsorption through metakaolin based AAM adsorbent. The parameter used in this research are, 1 wt.%, 1.25 wt.% and 1.5 wt.% for foaming agent, while 1 wt.%, 3 wt.% and 5 wt.% are used for the surfactant. Water absorption, density and porosity test will be used to evaluate the physical properties of the metakaolin based alkali activated adsorbent. The physical and the morphological of the geopolymer adsorbent will be conducted to investigate the effects of surfactants on their pore morphology, water absorption, porosity, and density. Scanning Electron Microscopy (SEM) was used to study the microstructure of the adsorbent. In addition, the adsorption test will be used to determine the lead ion removal in the metakaolin based on the AAM. The ion's removal performance of metakaolin based AAM will be evaluated based on different amount of foaming agent and surfactant. A solution of lead (II) in distilled water was prepared, which was then used in the adsorption test. Adsorption test carried out to determine the effectiveness of AAM with foaming agent and surfactant which showed that it can suited in many harsh conditions. In the investigation, the AAM adsorbent with the best adsorption of lead ions contains a 1.25 wt.% of foaming agent, whereas 3 wt.% of surfactants.

Keywords: alkali activated material, waste water treatment, foaning agent, heavy metal removal.

Physical, Mechanical and Microstructure Properties of Metakaolin based Porous Alkali Activated Materials As An Adsorbent for Cu (II) Ion Removal

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Abstract. This study is to investigate the effects of surfactants on the Alkali Activated Material adsorbent and the adsorption efficiency based on different adsorbent amount and pH value of ions solution. The physical and the mechanical testing of the Alkali Activated Material adsorbent were investigating the effects of surfactants on their pore morphology, water absorption, porosity, and density. The adsorption test has been used to determine the copper ion removal in the metakaolin based on the alkali activated material. Different adsorbent amounts and pH value from wastewater treatment can be used to evaluate the metakaolin geopolymer adsorbent's ion removal effectiveness. The purpose of this research is to assess the metakaolin geopolymer's potency as an adsorbent for use in future industries and wastewater treatment. The copper has higher removal efficiency in the terms of pH value, and adsorbent dosage. From the result that can been seen from the analysis that the optimum of removal efficiency and adsorbent amount Cu(II) ions are 10M with the value of 3 wt% of surfactant amount, 1.25 wt% of foaming agent, and at pH5.

Keywords: alkali activated material, waste water treatment, surfactants, heavy metal removal, properties.

SECTION 3

MATERIALS APPLICATION

Speciation Analysis of Arsenic in Soil Samples by Liquid-Liquid Extraction and Electrochemical Detection with Gold Micro-wire Electrode

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Abstract. Soil collected from random areas of non-ferrous mines and smelters was studied in order to develop a low-cost but effective method for quantifying arsenic (III), arsenic (V), and total arsenic in contaminated soil. Hydrochloric acid microwave extractions have been used as a method to digest arsenic from soil in a form of solution suitable for speciation. Arsenic (lll) is selectively extracted into benzene as arsenic trichloride from a highly concentrated hydrochloric acid solution. This was followed by the arsenic being extracted back into water. The total inorganic content of arsenic (V) can be directly determined by anodic oxidation of a gold screen-printed electrode using electrochemical detection. The amount of available Arsenic (lll) in the sample is determined by pre-oxidation with $KMnO_4$ directly added to the electrochemical cell or by directly increasing the pH of the medium. ICP-MS was used to confirm all analyses for the various arsenic species as well as the discovery of total arsenic in the soil. It was discovered that the electrochemical method used allows for the cheap, quick, and selective determination of micro amounts of arsenic forms in contaminated soils.

Keywords: arsenic species, soil, voltammetry, scTrace electrod, extraction.

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Data Acquisition System for a Hydroelectric Turbine with Deformable Blades

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Abstract. The scientific paper proposes a remote data transmission and acquisition system, for the analysis of the electrical parameters of a portable hydroelectric turbine with deformable blades placed on the stream. The major objective proposed by the authors is to monitor the transformation of the kinetic energy of water into electricity. Due to the impossibility of directly measuring the turbine elements as a whole, remote data transmission was chosen. This information is collected from the generator of the hydroelectric turbine through transducer elements into digital signals, is encoded and transmitted wirelessly to the receiver located on the shore, decoded and then processed in real time and displayed on the monitor screen of a computer system in order to make decisions when the situation requires it. Data transmission is carried out in both directions (half duplex) through an efficient request/response communication protocol. Considering that the turbine is located in a hard-to-reach place, on the river, it was imposed to supply with reserve electric energy, autonomous from batteries, for the electronic part that is responsible for acquiring data from the hydroelectric generator. In this way, the monitoring circuit works permanently regardless of the turbine's operating mode: normal or fault. The authors also present in detail the research methodology, the research results, the final conclusions resulting from the experimental data as well as the original contributions made through this applied research.

Keywords: acquisition system, modeling and experimental optimization, transducers and digital signals, scientific research, communication protocols.

Disinfection System by Pulse Corona Hybrid Technology

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Abstract. This article offers the design and construction of a bacterial treatment system using hybrid corona pulse technology. The principle of corona discharge, combined with negative charge and variable cycle technology, maintains switching frequency. The IC#TL494 is a pulse generator that adjusts 8%, 16%, 33%, and 41%, and adjust the switching frequency to 20 kHz to drive the IRFP460 power MOSFET, control the operation of high-voltage switching transformers to obtain high voltages of 1.0 kV, 2.9 kV, and 3.2 kV. And 4.9 kV, by using the load as the electrode cell (Corona cell for producing ozone gas and a negative electric charge cell). will increase the high voltage by increasing the amount of ozone gas and the amount of negative electric charge Which, when tested at 8% duty cycle, will get 1.28 ppm ozone gas voltage, electric charge -1.2 kV, at 16% duty cycle will get 1.56 ozone gas voltage. ppm electric charge -2.6 kV, at 33% duty cycle will get 2.35 ppm ozone gas voltage, electric charge -3.8 kV and at 41% duty cycle will be strong Voltage of 2.61 ppm of ozone gas, electric charge of -4.5 kV and at 41% duty cycle, the amount of ozone gas is 2.61 ppm, electric charge of -4.5 kV can be used to eliminate microorganisms in the air to reduce the amount and tested in the computer room Faculty of Engineering Ramkhamhaeng University with a room area of 100 square meters. The result of the test is the disinfection system with hybrid corona pulse technology. Conducted electromagnetic compatibility testing (EMC Testing), Power Consumption Testing, and Electrical Leakage Safety Standard Testing (IEC60335-1). Therefore, this research project received research funding from the national budget. Science, Research and Innovation Promotion Fund, Fund for Science, Fundamental Fund, Fiscal Year 2023, Ramkhamhaeng University and can be further developed into commercial innovations in the future.

Keywords: disinfection, corona, hybrid.

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Hybrid Corona Air Purifier

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Abstract. This article offers a hybrid corona air purifier consisting of 3 parts Part 1, corona electric field cell with corona discharge process for trapping small dust get rid of bad smell removes ammonia and carbon dioxide by using the technique of adjusting the switching frequency to control high voltage. Part 2, a set of pre-filter and HEPA high-efficiency air filter and part 3, a set of electric charge generator for eliminating microorganisms in the air. Part 1 is a high-voltage switching power supply circuit by adopting the flyback converter principle, it consists of a high-frequency pulse generator using IC No. TL494 for adjusting high-voltage of 1.36 kV, 2.58 kV and 3.24 kV under the switching frequency of 7 kHz, 14 kHz and 21 kHz, respectively, and the IC is used as a ground isolator and amplification for Power MOSFET No. IRFP460 that controls the operation of the flyback transformer, to produce high voltage For supplying electric power to the corona electric field cell set. The test results in part 1, when measuring ozone gas, it was found that at a high voltage of 1.36 kV, ozone gas could be produced at 0.005 ppm, at a high voltage of 2.58 kV, it could produce ozone gas. 0.009 ppm and at a high voltage of 3.24 kV, it can produce 0.015 ppm of ozone gas by testing with a room with an area of 300 square meters in 60 minutes. Ozone gas 0.015 ppm will result in ammonia and carbon dioxide emissions being reduced. Part 2 HEPA high-efficiency air filters can trap PM1.0 and PM2.5 dust particles with the same dust trapping efficiency. 97.23 percent measured from a standard dust meter and part 3, an electric charge generator used for eliminating microorganisms in the air, the result is that it can reduce the number of microorganisms in the air as well. Which this air purifier has passed the standard of electromagnetic compatibility (EMC Testing), combined power consumption analysis test and the leakage current analysis test is completed, at the testing room of the Electrical and Electronic Products Testing Center (NSTDA), so this research has been funded for research and innovation from the National Research Council of Thailand (NRCT) for the fiscal year 2022 and can be used to develop a Thai innovation account and extend it into commercial innovation in the future.

Keywords: air purifier, corona, hybrid, particle, ion.

Thermal Insulation of Buildings Using Innovative Materials Based on Nanoparticles

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Abstract. GWR Nano Insulation is a liquid-consistency, colourable, paint-like thermal insulation material with many other beneficial properties in addition to insulation. It is a material that can be used both indoors and outdoors in industrial, civil and other types of constructions. Compared to conventional insulation materials, this photocatalytic system is beneficial for internal and external air purification and uses nanotechnology with Titanium Dioxide effective for preventing viruses, bacteria, cleaning polluted air from toxins, removing odors, stopping molds and fungi, purifying water and more benefits. Among the essential features we list: Heat reflection by at least 60-70%, which reduces heat costs by at least 30%; Reduces the noise level by 0.6 mm up to 2 dB; its composition does not contain harmful or poisonous components; protects the coated surface against weather conditions and corrosion; retains its properties in extreme conditions for a long time; it has a lifespan of over 10 years; with implementation guarantee; with a side cover, the quality of incoming cold air is reduced by at least 30%, with both sides covered by at least 55%; 78% water absorption and high vapor permeability are excellent for the interior comfort; is non-combustible: does not fuel the combustion, helps to slow down the speed of the flame; simple and quick use with a sprayer.

Keywords: thermal insulation, nanoparticles, nanotechnology, innovative materials.

Subjective Perception Evaluation of Digital Protective Materials

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Abstract. The research aims to evaluate the level of perception tactile and visual characteristics of digital protective textiles materials compared with the same materials in physical format. A number of 6 protective textile materials used for waterproofing technical clothing that comply with the ISO EN 343 standard. In the first stage, the materials were scanned using the TAC7 system (marketed by X-Rite company) [1] and their appearance was captured in a unique digital format. In the second stage, the digital materials were processed using the Keyshot rendering software and a number of three different digital evaluation scenarios for were defined: S1-image, S2-video animation and S3-3D object, where it is possible to rotate and enlarge/shrink the material, the forth evaluation scenario being represented by the physical materials. In the last stage, by appling a questionnaire based on a Likert rating scale from 1 to 7, data were collected from 24 subjects regarding the levels of perception of tactile and visual characteristics (subjective perception) of digital and physical materials, in each of the four mentioned scenarios. Boxplot diagrams were used to evaluate the subjects level of agreement on the perception of materials characteristics and Friedman test was applied to evaluate and compare the perceprion from the three digital scenarious with the perception of physical materials form the fourth scenario. The results show a lower degree of agreement for digital materials compared to the physical ones and highlighted glossines, colous and transparency having the highes level of agreement in all scenarious. Correlations between the materials attributes were high between softness, draping, elasticity and thermal sensation. Comparative analysis between scenarios highlights the difficulty of transposing tactile attributes into digital format compared with the visual attributes.

Keywords: protective materials, digitalization, scanning, rendering, subjective evaluation.

Selective Bacterial Growth in 3d Printed Microfluidic Bioreactors: from Simulated Conditions to Experiment

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Abstract. The objective of this study was to examine the impact of dielectrophoretic forces on the formation of bacterial biofilms for one of the most dangerous and resistant bacterial pathogens. In this experiment, a bacterial suspension containing Staphylococcus aureus ATCC 25923 (SA) was flowed through a microfluidic channel while various potential differences ranging from 10 to 60V were applied simultaneously. A COMSOL simulation was employed to simulate the distribution of the non-uniform electric field in the microfluidic channel. To determine the effects of the electric potential variations on the selective formation of the SA biofilm, an adjusted microtiter plate methodology was used, along with a qualitative approach and SEM images. The results indicate a positive dielectrophoretic behaviour of the SA cells, with an increased effect of the field between electric potentials of 40 and 50V, and a switch to electrophoretic forces above the value of 60V.

Keywords: protective materials, digitalization, scanning, rendering.

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The Influence of Chemical Agents on the Technical Characteristics and Safety of Protective Equipment Against Electric Shock

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Abstract. The research project's primary goals were to develop occupational risk management protocols for people who perform maintenance tasks on electrical installations and, in turn, to develop new work tools designed to protect workers in those installations. The research project's findings are presented in this paper. In order to check the behaviour of the safety characteristics of the protective equipment material under certain influence of professional risk factors, protective equipment materials was subject to tests. The components of in use or new electro-insulating equipment, were evaluated through sampling. Electro-insulating materials underwent dielectric, mechanical, attrition testing, and chemical agent application. The findings revealed the weakness of some electrical insulating materials whose declared duration of use exceeded five years after commissioning, necessitating the assessment of new technical standards for health and safety workplace.

Keywords: electro-insulating material, chemical agent, prototype.

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The Corrosion Behavior of SPCE Steel Used in The Automotive Industry and Laser-Welded Joints Without Filler Material

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Abstract. The purpose of this study is to evaluate the corrosion behavior of SPCE steel used in the automotive industry. SPCE steel was laser-welded without filler materials at various powers. The surfaces of the SPCE steel were investigated and comparatively analyzed by measuring roughness and microhardness. Electrochemical tests were conducted using both natural seawater collected from the Black Sea basin area and an H_2SO_4 solution as the electrolyte. The electrochemical methods used to investigate the interface/solution were open circuit potential (OCP) evolution, polarization resistance (Rp). These methods allowed the evaluation of the corrosion resistance of SPCE steel and the identification of vulnerable areas on the surfaces in the welded joint area and the heat-affected zone. The results obtained showed good corrosion behavior of SPCE steel and laser-welded joints at various powers.

Keywords: marine corrosion, zirconium Kreutzonit dispersed particles, electrochemical methods, polymeric coatings, corrosion, structural steel.

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Behavior of Hyperbaric Underwater Butt Welding Using MAG-M Mechanized Dry Ecological Tubular Wire with Seawater Immersion

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Abstract. The authors analyze in this paper the influence of seawater corrosion on hyperbaric underwater dry MAG-M butt welding with ecological tubular wire with metal powders. The welding was performed in the PF position, in the hyperbaric dry underwater welding simulator at overpressures of 2 bar and 4 bar. Test specimens were made of EH 36 naval steel with a thickness of 14 mm. The electric arc protection was provided by the Corgon 18 protective gas mixture. The corrosion properties of the EH36 steel and the filler material used for welding in seawater were studied using electrochemical methods such as open circuit potential (OCP), cyclic voltammetry (CV), and polarization resistance (RP).

Keywords: metal active gas welding, low fume metal-cored wire, gases mixture, electrochemical corrosion, marine corrosion.

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State-of-the-Art and Future Trends of Thermoelectric Generation Systems in Automotive Industry

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Abstract. Recovery of the energy contained within the waste heat from various processes represents an important concern in efficiency of energy utilization. This paper aims to present an overview of currently employed methods for waste heat energy recovery in automotive industry, with emphasis on processes within thermal combustion engines and recovery methods based on thermo-electric generators (TEG). While TEG technology is capable of direct convertion of heat into electricity, conversion efficiency is quite low. Efforts are made to optimize these systems (number, size, form, positioning, location etc.) in order to minimize the heat loss and maximize energy recovery. The review concluded that efficiency of TEG conversion might be improved by choosing appropriate characteristics for the recovery system for specific processes analysed, such as thermoelectric materials, geometry, location, type of cooling fluid.

Keywords: thermoelectric generator, thermal management, waste energy, automotive.

Wear-Corrosion Analysis of Stainless-Steel Nets Used in Food Industry

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Abstract. The present work aims to identify the types of stainless steels used in the food industry and implicitly in protective equipment in correlation with European and Romanian regulations and standards. The work is also a review of the studies related to the properties of stainless steels in correlation with the maintenance of protective functions against the risk factors that act on the human body. The limits of stainless steels in the design of individual protective equipment are identified so that they maintain their function as a physical obstacle between the danger and the performer, to protect the body depending on the directions on which the dangerous factor can act and to meet the ergonomic and condition maintenance requirements of health. A new and a used stainless-steel net from Food Industry field were analyzed by wear and corrosion point of view. Scanning electron microscopy (SEM) was applied for determination of the stainless-steel deformation degree in used net, the corrosion sites and wear stains. For corroded areas the compounds formed were identified based on energy dispersive spectroscopy (EDS) results.

Keywords: stainless steel, protection net, SEM, EDS.

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Evaluating the Properties of a Ti-Mo-Zr-Mn System for Orthopedic Applications

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Abstract. The objective of this paper is to examine the impact of alloying constituents on titanium alloys utilized in orthopedic procedures. The microstructure and mechanical properties of titanium alloys differ depending on the quantity of alloying elements present; therefore, investigating the influence of these elements on the alloying process is critical. Based on the existing literature, we have developed a new titanium alloy comprising non-toxic Mo, Zr, and Mn. The investigation focuses on the structural and mechanical properties of the new alloy in order to identify key characteristics that can be leveraged in the development of new alloys. The results indicate that the newly developed alloy has the potential to be a valuable contender in the medical industry and an encouraging biomaterial.

Keywords: non-toxic elements, elaboration, characterization.

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New Environmentally Friendly Materials for Making Bricks

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Abstract. One of the most important problems facing society today is the large amount of waste generated by agriculture, industry and constructions in the context of accelerated consumption, until depletion of natural resources. This article presents the results obtained by the authors regarding the reuse of some waste by obtaining new materials for making bricks. Materials proposed to be used in the elaboration of brick's recipes: mineral materials: cement, sand; mineral waste: wastewater treatment sludge; agricultural waste: from the local market. Referring to the quantities of the sludge generated by the wastewater treatment plants in Romania, but also those at European or world level, they have an increasing tendency, mainly caused by the population growth. In respect of the waste management, there are known, numerous processes of use / storage / disposal of the sludge from wastewater treatment plants, each process has both advantages and disadvantages. The sludge analyzed in the current research comes from an industrial wastewater treatment plant with aluminum sulfate and lime used during the technological treatment process. Agricultural waste has become increasingly used in construction due to the improved characteristics of the material obtained, mainly in terms of thermal and acoustic insulation, lower costs and environmental protection by reducing the use of conventional raw materials. In the present article, new material recipes for the manufacture of bricks are presented, with the presentation of the characteristics for the obtained bricks.

Keywords: brick, wastewater sludge, agricultural waste, pollutant, waste management.

Research on the Implementation of Modern Technologies in Treating Water Polluted with Hydrocarbons

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Abstract. The work aims at the realization of a complex installation for the superior treatment and capitalization of the water polluted with hydrocarbons. The separation of hydrocarbons from water is done through innovative, energy-efficient processes simultaneously with the separation of solids from water. The water discharged by solid particles and most of the hydrocarbons is processed by treatment with a reactive agent in the reaction tank. The reactive agent is composed of water with gaseous nano-bubbles. Reactive gases with an effect on hydrocarbons are ozone, oxygen and nitrogen. Oxygen and nitrogen are produced in a gas separation plant from atmospheric air with zeolites. Oxygen is converted into ozone by energizing in the high voltage elective field. The most reactive agent - ozone nanobubbles in water - generates OH- radicals in addition to ozone, attacks hydrocarbon molecules and spoils its chemical bonds, oxidizing carbon and resulting in CO2 and H2O. The same reagent is very active in destroying detergents, pesticides, fats, oxidizes salts and metals in polluted water, transforming them into solid materials - that are deposited - and gases - that are released -. If the waters are heavily charged with pollutants, the plant can be combined with ultrasonic installation, zeolite filtration, UV to increase the efficiency or speed of its treatment. The output of the installation is clean water for evacuation into the emissary or, by completing the process with additional levels – drinking water. Separate hydrocarbons can be recycled by pyrolysis, converted into a synthesis gas that can be used in cogeneration for the production of electricity and heat or for the production of hydrogen.

Keywords: nano-bubbles, ozone, oxygen, hydrocarbon polluted water treatment, detergent and pesticide polluted water treatment.

Manufacturing Defects, Interfacial Adhesion, Impact and Water Absorption Properties of Hybrid *Woven Kenaf/CSM Fibreglass* Reinforced Polyester Composite in Boat Construction

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Abstract. Today, the use of natural or green fibres has become a trend in boat construction and other equipment, due to their light weight; good relative mechanical properties more important factors, such as being eco-friendly and sustainable materials as well as lower cost, compared to fiberglass. The demand for boat from green hybrid materials has gone in striking. Greenl fibre composite, like any other composite components used in the industries, it went through the process of incorporating the reinforcement which is the natural fibre into composite or matrix. The manufacturing defects such as voids, regions where resin has poorly wetted the fibre and misaligned fibers have been determined using non-destructive technique (NDT) namely Infrared Thermal (IR) imaging technique. Then composite specimens had been observed via the Scanning Electron Microscopy (SEM). SEM micrograph had been validated the results of IR thermal imaging, impact test, tensile test and water absorption in accordance with ASTM D6110-10, ASTM D3039 and ASTM D570-98 respectively. As a conclusion, the specimens with less manufacturing defects, high mechanical properties (as tensile and impact) and water absorption had been proposed as composite materials for boat hull construction.

Keywords: Infrared Thermal Imaging, manufacturing defects, SEM.

Evaluation on the Potential of Geopolymer as Tunnel Repairing Materials

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Abstract. Repairing tunnels is an essential part of infrastructure upkeep that guarantees commuter safety and the durability of the tunnels. A variety of materials, including cement-based ones like concrete, shotcrete, and mortar, are needed for tunnel repairs. Yet, the hunt for substitute materials has been sparked by the negative environmental effect of cement manufacturing and the accompanying expenses. It has been suggested that geopolymers, a type of materials that develop from the reaction between aluminosilicate minerals and alkali activators, might replace cement-based materials in tunnel restoration. This review paper focuses on evaluating the potential of geopolymers towards applications for tunnel mending because they are a new material with many possible uses.

Keywords: Geopolymer, tunnel repairing, construction materials.

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Removal of Sulfur Content in Groundwater Using Marble Filter in a Cascade Design

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Abstract. The origin of sulfide concentration in an alluvial aquifer is caused by microbiological reduction of sulfate in a seawater intrusion. This phenomenon impacts groundwater quality and releases a toxic gas of hydrogen sulfide. In order to use the groundwater resource that has the high sulfur content, the research work aimed to improve sulfur removal using marble filter media according to a cascade design. A 57-meter borehole was selected with the same sulfur issue. The highest initial value of total sulfur was 537.1 ppm. There were two groups of marble size which were pebble and sand size. The marble was filled up in the square column filter. It was arranged like a cascade design where the water can flow from the highest column to the lowest column. Each of the column filters had a different marble size. The marble media reduced in size as the column filter's height decreased. It was found that the marble in sand size at flowrate 0.011 l/s was the highest efficiency of sulfur removal with 98.3%. As the result of the impressive filtration, the true colour achieved 33-34 pt/Co from the source value, 1000-1012 pt/Co.

Keywords: alluvial aquifer, sulfide contamination, marble filter, sand particle size.

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Flow Characteristics in Subsurface Storm Water Perforated Pipe for Drainage System Application

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Abstract. This study investigates the performance of a subsurface stormwater perforated pipe as a subsurface conveyance component in a laboratory flume at Physical Laboratory, River Engineering and Urban Drainage Research Centre (REDAC), Universiti Sains Malaysia. The Manning's roughness coefficient *(n)* was measured at 9 points along the pipe to assess its relationship with the velocity, depth, and Froude number of simulated runoff flows. In this paper, a case study of Gate partially open for slope 1:500 is investigated. The results show that flow in the perforated pipe was mostly turbulent, and the calculated flow discharges and velocities from the outlets were higher under the effects of the calculated Manning coefficients ranged from 0.009 to 0.011, and an inverse linear relationship between Manning's n and flow velocity was observed. Higher values of Manning's n reduced flow velocity in the pipe, indicating the potential for peak flow attenuation and better control of stormwater quantity in subsurface urban drainages.

Keywords: sustainable urban drainage system, manning coefficient, perforated pipe, storm water runoff

The Potential of Hybrid Polymer in Treating Textile Wastewater: Optimization of pH and Dosage Using Response Surface Methodology

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Abstract. The study aimed to evaluate the effectiveness of hybrid polymer ZOPAT compared to single polymers in treating textile wastewater. The research analyzed reduction of color, chemical oxygen demand (COD), turbidity, and suspended solids using jar testing. Response Surface Methodology (RSM) was employed to optimize the treatment, analyze variance, and create perturbation and desirability plots for multiple responses. The storage conditions of the hybrid polymer were also investigated. The results showed that ZOPAT was highly effective in reducing color, with a 93% reduction compared to other treatments. Additionally, turbidity and suspended solids were reduced by 100%, and COD was reduced by up to 80%. The RSM multi-response outcome showed a desirability plot of 0.592. The hybrid polymer required only 17.5 minutes for coagulation treatment, while the other treatments required more than 40 minutes to achieve maximum effectiveness. The validation test showed that the optimization model's error rate was less than 1%. The study recommended that hybrid polymer solutions be stored in a cold room for up to 20 days to maintain consistency. The findings suggest that hybrid polymer is a highly effective coagulant for treating textile wastewater, with significant reductions in color, turbidity, and suspended solids. The use of RSM allowed for the optimization of the treatment, and the storage conditions were determined to ensure consistent results over time. Overall, the study's results have significant implications for the water treatment industry, with potential applications in treating wastewater in other industries.

Keywords: hybrid polymer; response surface methodology, desirability plot.

Prawn Shell Torrefaction: Effects of Temperature on Biochar Properties and Its Potential Application

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Abstract. This study explores the torrefaction of prawn shells, a major waste product from the seafood industry, to enhance their properties as a biomass feedstock for energy applications. Addressing the scarcity of research on prawn shell torrefaction, the study investigates the effects of three torrefaction temperatures (200, 250, and 300 °C) and characterizes the chemical composition, functional group, and morphological changes of the raw and torrefied prawn shells using thermogravimetric analysis (TGA), proximate and ultimate analysis, Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). Thermogravimetric analysis reveals a decrease in weight percentage with increased torrefaction temperature. At 200 °C in the fixed bed reactor, the torrefied biomass yield was 63.50 wt%, while the yields of volatile compounds and gases were 16.40 wt% and 20.10 wt%, respectively. As torrefaction temperature increased, the torrefied biomass yield decreased, while the yields of volatile compounds and gases increased. Significant changes were observed in carbon, hydrogen, nitrogen, and sulfur contents after torrefaction, highlighting the transformation of the prawn shell's chemical composition. FTIR analysis reveals the formation and degradation of specific functional groups during the process, while SEM images uncover increased porosity at higher torrefaction temperatures. These findings provide valuable insights into the influence of torrefaction temperature on enhancing prawn shell properties for various energy and other applications, contributing to ongoing efforts to develop sustainable and environmentally friendly resources from waste products.

Keywords: torrefaction, prawn shells, chemical composition, functional groups, morphological.

SECTION 4

MATERIALS & LIFE SCIENCE

Problems of Plants Revitalization in the East of Ukraine After the War

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Abstract. The research is devoted to the actual problem of reconstruction and repurposing of war-ravaged industrial territories in the East of Ukraine. Given that these are industrial areas, the revitalization experience of recent years was analyzed using the example of the multifunctional complex "Fabryka Norblina" in Warsaw. The authors of the article investigated the situation with the destruction of objects in the combat zone and during the years 2018 – 2022 investigated the construction process of the "Fabryka Norblina". On the basis of the conducted research, proposals were formulated regarding possible options for using the industrial territories in the East of Ukraine in the process of post-war reconstruction.

Keywords: Ukraine, war, East of Ukraine, industrial areas, revitalization, restoration.

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Reproduction and Restoration of Iconostases of Ukrainian Churches

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Abstract. The research is devoted to the problem of reproduction and restoration of wooden iconostases in churches of Ukraine. The experience of the "Ukrrestavratsiia" corporation in the reproduction of unique wooden iconostases of the Baroque era in the St. Michael's Golden-Domed Cathedral and in the Dormition Cathedral of the Kyiv-Pechersk Lavra was analyzed. The purpose of the study was to analyze how the existing domestic and foreign experience can be used in the post-war reconstruction of Orthodox churches of Ukraine. The scientific novelty of the research lies in the fact that the recommendations are formed on the basis of the author's photo-fixation of objects and practical experience of restoration and reproduction of iconostases of outstanding monuments.

Keywords: wooden iconostases, Ukraine, Russian-Ukrainian war, reproduction, restoration.

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Researchf Banksy Mural ‘Judoki’ in Borodyanka

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Abstract. The research concerns the issue of researching one of Banksy's murals, which was created in the city of Borodyanka, Ukraine. This mural, like the artist's other works, carries a deeper message. This time it is a message related to the war in Ukraine. At the same time, the authors note that the mural is a work of art and an important 'witness' for the local community to the tragic events in Borodyanka. In the current situation, where as a result of the war, the building substance is destroyed to a greater or lesser extent, it is important to consider how to protect, preserve, and restore works of street art, especially works as valuable as the Banksy mural under analysis.

Keywords: murals, Banksy, Ukraine, research, Borodyanka, exposition, conservation, and strengthening of masonry.

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Specificity of the Construction of Historical Temples of Shaanxi Province as the Basis of Their Preservation and Restoration

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Abstract. The Shaanxi province and its capital, the city of Xi'an, are areas of concentration of traditional Chinese architecture outstanding monuments. The study of the peculiarities of the genesis and compositional construction of objects of various functional purposes as a framework for restoration and monument protection activities is relevant. Using the example of the author's drawings of the temples of the Shaanxi province, the departure from the dominant pagodas of Buddhism borrowed from India in the early periods towards the temples of the local religions of Taoism and Confucianism, whose architecture is subordinated to the local environment, in the late Ming and Qing periods is argued. The commonality of temples with secular buildings – residential pavilions and small architectural forms – pavilions, which is a national and regional feature, has been proven. The gradual simplification of the types of local temples, the decrease in the number of varieties and the eclecticism of forms indicate compliance with the general process of style formation - emergence, flowering, gradual decline due to eclecticism.

Keywords: historical temples, China, Shaanxi Province, compositional analysis, preservation, restoration.

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Problems of Expositions and Protection of Banksy's Murals in Ukraine

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Abstract. The research work examines the artistic value, legal and conservation aspects of Banksy's murals created during the war in Ukraine. Currently, there are conflicting opinions both on the artistic value of street art and on how to preserve works of this type as works of art. As Banksy's works have become commercially important, there is a need to assess them in Ukraine, regarding legal aspects and the possibility of displaying them. The authors analyzed the problems of using these murals from the point of view of the law and structural possibilities, since the murals are made on dilapidated buildings.

Keywords: street art, Banksy, Ukraine, legal aspects, conservation, use.

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In-Fill Development Architecture, as Element of Post Second War Reconstruction of City of Poznan. Case Study of Joseph Stübben's Extension Plan of the City from Years 1902-1918

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Abstract. The concept of the post-war reconstruction of many Eastern European cities, shaped as a result of the actions of German town planners at the turn of the 19th and 20th centuries, in many cases consisted of negation, non-continuation or abandonment of previously set development directions. The subject of studies in this text will be the city of Poznań, which continued to develop in the post-war period on the basis of spatial arrangement created as a result of actions of Joseph Stübben in the years 1902-1918.The post-war reconstruction of the city after 1945 preserved its main urban layout created during the modernization period with the participation of a German town planner. The structure of the city preserved in this way consisted mainly of multi-family residential buildings. Urban planning and architectural activities as part of the reconstruction of the city after 1945 were aimed at continuing this concept. A critical analysis of these activities is planned in the following text.

Keywords: communist period; Joseph Stübben; post war reconstruction; heritage

Problems of Supplementing the Formed Historic Development with New Objects (On the Example of Poznań)

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Abstract. In the article, the authors discussed the course in the subject of heritage protection including conservation of historic buildings and placing new objects within historically formed development at the Faculty of Architecture of the Poznan University of Technology. The authors emphasize the importance of analysing the composition of historical buildings' elevations existing in the vicinity of the designed object. Capturing the main compositional structures and guidelines of the facades of historical objects is difficult and hence the authors show different ways to achieve this, emphasizing different ways of observing the object and graphically recording the layout of the compo-sition and later using these effects in the design stage. The aim is to acquire and improve the ability to fit the designed object into the historic context.

Keywords: historical buildings, context, heritage protection, learning in exercise.

Condition Survey and Recommendations Regarding the Repair of The Facades of the Historical Building in the Besarabskyi Quarter in Kyiv

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Abstract. The article describes the work carried out during 2021 – 2022 on the condition survey of building facades in the so-called historical Bessarabian quarter in Kyiv. The purpose of the survey is to identify defects and damage that were acquired during the operation of the facades and can reduce their durability. The following methods were used: visual – when determining the technical condition of structures based on external features; analytical – when assessing the technical condition of the surveyed object, instrumental – when studying the physical and mechanical indicators of structures. Based on the received survey data, recommendations were formulated regarding the facade restoration technology. It is recommended to focus specifically on the method of dismantling the existing decorative layers of the facade and replacing them with new ones. This approach will maximally extend the service life of the facade of the historic building.

Keywords: Bessarabskyi quarter, Kyiv, facade, architectural monument, visual survey, instrumental survey, restoration, repair.

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Potential for Phytomining of Rare Earth Elements by Naturally Occurring Plants in Reclaimed Tailing Ponds. A Case Study: Madjarovo Reclaimed Tailing Ponds

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Abstract. Rare earth elements (REEs) from the ex-mining area (reclaimed tailing ponds) in East Rodope, Bulgaria were investigated in soil and different plant species using Inductively coupled plasma-optical emission spectrometry (ICP-OES). The tailings pond was reclaimed 20 years ago. The research work aims to determine Potential for phytomining of rare earth elements by naturally occurring plants in reclaimed tailing ponds. In the soil samples, the concentration of cerium (Ce), lanthanum (La), and gadolinium (Gd) was found to exceed the average content of the elements in soils. Bioconcentration factor (BCF) was calculated. It was found light rare earth elements (LREEs) are in greater concentration in plant samples than heavy rare earth elements (HREEs).

Keywords: rare earth elements, tailing pond, bioadsorption.

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Local Conservation of Nature Heritage as an Important Component in the Water-Energy-Food Nexus Approach - a Case Study of Srebarna Lake, Bulgaria

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Abstract. The conservation and sustainable use of natural resources is gaining more and more weight on the world political agenda and is attracting the attention of national governments at the highest level. The Water-Energy-Food (WEF) approach helps to understand the interrelationship between natural resources and human activities such as planning, managing or consuming water, energy or agricultural products. The world is currently facing the challenge of providing water, energy and food for all. Scarce natural resources and the environment are increasingly being exploited, while at the same time the demand for fresh water, agricultural products and energy increases. In this context, the protection of the quality of the available water resources becomes even more important. The preservation of the quality status of water resources is compromised by excessive exploitation, the introduction of polluting substances of different origins, hydromorphological changes of aquatic habitats and climate changes. The main focus of this article is clarifying the Water-Energy-Food relationship and determining the hydrochemical status of Lake Srebarna, which is a protected natural site in Bulgaria, a wetland of international importance, a biosphere reserve and part of the list of world cultural heritage monuments and the natural sights of UNESCO.

Keywords: sustainable development, nexus water-energy-food, protected areas, lake Srebarna.

Opportunities Regarding the Innovative Conservation of the Romanian Vernacular Urbanistic Heritage

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Abstract. The main objective of the proposed research is to preserve the vernacular urban heritage of Romania by identifying realistic and innovative solutions for conceptual and applied capitalization of the traditional technologies used in creating living spaces. This can be achieved by using modern methods, techniques, and tools to redesign traditional Romanian housing entities, utilizing existing construction materials and techniques predominantly of rural origin, empirically validated over the centuries, and reformatting them with modern scientific knowledge to generate a new model, valid and compatible with current safety, aesthetic, and quality requirements. Earthen buildings use different techniques and construction technologies, and were developed differently across the Romanian territory, depending on the climatic and relief zoning. By optimizing them, identifying their vulnerabilities and the corresponding engineering solutions to counter them, the conservation of the Romanian traditional housing legacy can be achieved. The opportunity of the proposed research is connected to the current context of almost half of Romanian population leaving in rural areas, including earthen residential buildings.

Keywords: conservation, structural performance, green buildings

Acknowledgment:
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Assessment of the State of the Chemical Industry in Bulgaria for the Period 2010-2020: A Spatial Statistical Analysis

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Abstract. The main goal of the study is to analyze the condition and spatial characteristics of the chemical industry in Bulgaria for the period 2010-2020. In recent years, geographic information systems (GIS) have been increasingly used in various fields of geographical research in Bulgaria. In the present study, the authors apply the ESRI ArcGIS software, ArcMap 10.6.1, for the analysis and evaluation of statistical information from the following indicators: output (manifactured production), employed persons and BGN equivalent of foreign currency earnings from exports at NUTS 3 administrative-territorial level. Three reference years 2010, 2015 and 2020 have been selected from the considered period. The selection of indicators by which the groups are formed is in accordance with the generally accepted indicators for assessing the state and importance of the chemical industry in the structure of the economy and their information accessibility. The areas are grouped into 10 clusters. The grouping of the areas by the considered indicators in the present study was performed with the Grouping Analysis tool. NO_SPATIAL_CONSTRAINT is selected for the Spatial Constraints parameter and FIND_SEED_LOCATIONS for the Initialization Method. For this particular case, the K-Means algorithm is applied. It is one of the most popular and widely used clustering algorithms in the GIS applications [1], [2]. The territorial distribution of the population for the individual territorial units, in combination with the historical and modern economic development of the settlements, forms the regional differences in the development of the chemical industry in the country.

Keywords: K-means clustering, grouping analysis, statistical information.

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Investigation of a Bronze Harness Object from the Roman Era Discovered in Romania

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Abstract. Interdisciplinary analysis methods are currently an indispensable set of tools for the investigation of archaeological artifacts [1, 2]. Starting from this premise, in this study was investigated a bronze disc for horse harness dated to Roman era using optical microscopy (OM), scanning electron microscopy coupled with energy-dispersive X-ray analysis (SEM-EDX) and Fourier-transform infrared spectroscopy (FT-IR). The object was found during an archaeological excavation in Brașov County in 2022. The obtained results provided important data about the morphology of the piece, elemental composition, corrosion products and the deposition environment, as well as particular information related to the alloy used and its manufacturing and using method.

Keywords: Roman harness disc; OM; SEM-EDX; FT-IR; alloy; corrosion products.

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Design and Operation of Low Energy Consumption Passive Human Comfort Solutions

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Abstract. The use of renewable energy sources is a fundamental factor for a possible energy policy in the future. Taking into account the sustainable character of the majority of renewable energy technologies, they are able to preserve resources and to provide security, diversity of energy supply and services, virtually without environmental impact. Sustainability has acquired great importance due to the negative impact of various developments on environment. The rapid growth during the last decade has been accompanied by active construction, which in some instances neglected the impact on the environment and human activities. Policies to promote the rational use of electric energy and to preserve natural non-renewable resources are of paramount importance. Low energy design of urban environment and buildings in densely populated areas requires consideration of wide range of factors, including urban setting, transport planning, energy system design and architectural and engineering details. The focus of the world's attention on environmental issues in recent years has stimulated response in many countries, which have led to a closer examination of energy conservation strategies for conventional fossil fuels. One way of reducing building energy consumption is to design buildings, which are more economical in their use of energy for heating, lighting, cooling, ventilation and hot water supply. However, exploitation of renewable energy in buildings and agricultural greenhouses can, also, significantly contribute towards reducing dependency on fossil fuels. This will also contribute to the amelioration of environmental conditions by replacing conventional fuels with renewable energies that produce no air pollution or greenhouse gases. This study describes various designs of low energy buildings. It also, outlines the effect of dense urban building nature on energy consumption, and its contribution to climate change. Measures, which would help to save energy in buildings, are also presented.

Keywords: renewable technologies, built environment, sustainable development, mitigation measures.

Friendly City. Making Architectural Heritage Accessible

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Abstract. The Friendly City project (FCP) supports the blind and visually impaired (BVI) people to perceive the local architectural heritage in Lodz (Poland). The multidisciplinary project aims on promoting the accessibility of architectural heritage to the BVI community by adding Audio Descriptions (AD) to 85 public places. The ADs in FCP are guided by insights from an eye-tracking study on the perception of architecture by novices and experts, and interviews with BVIs from the Lodz association. The project supports the independence of movement of BVI people in the city center using public transport by installing 200 Bluetooth beacons on city stops and in historic places. The beacon devices communicate with smartphones of BVIs and sighted people via a mobile application. The system and applications for FCP are designed with the principles of universal user-centered design. The signals will help people with BVIs to locate the stop with voice messages about the distance and location.

Keywords: cultural heritage, visually impaired, accessibility systems, audio description, eye tracking.

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Improving the Fertile Properties of Lands with Risk of Desertification in Order to Conserve Agricultural Areas

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Abstract. Agriculture has been and continues to be a vital field of human activity since ancient times, the main source of food for humans and animals, an important supplier of raw materials for industry and at the same time a significant outlet for production. However, in the current context of climate change, agriculture suffers from soil pollution and soil degradation. Thus, the prevention of soil pollution and degradation and possible changes in one of its qualities, in order to avoid disturbances/modification of its ecological functions, and to preserve its fertile properties for the purpose of its sustainable use is imperative. The purpose of this study is to improve the quality of the soil in Galati county with the risk of degradation (desertification, erosion, landslides, excessive grazing) by adding dumped slag to increase agricultural productivity. The experimental results of the study showed that the dumped slag improves the chemical properties of the soil with risk of desertification.

Keywords: soil, dumped slag, agricultural sector, chemical properties.

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Study of the Biochemical Composition of the Pigmented Ethanolic Extracts Obtained from the Residual Biomass of *Arthrospira platensis*

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Abstract. This study focuses on the potential use of industrial by-products, particularly the microalgae Arthrospira platensis, to produce nutritive extracts that provide beneficial effects for human and animal health. The paper provides data on the biochemical composition of ethanol extracts based on pigments obtained from the remaining biomass of Arthrospira platensis. The optimal procedures for the extraction of biologically active substances with the use of ultrasound, homogenization and temperature were studied at the laboratory level. As a result, it was established that the extracts are characterized by a high content of β-carotene and lutein, but also by a balanced content of proteins and carbohydrates. Protein content was found to range from 13.33±0.038-17.55±0.13% (d.w.) and carbohydrates 12.78±0.26-24.075±0.33% (d. w.). The highest results were recorded in the experimental variant of extracting biologically active substances with 96% ethyl alcohol, at a temperature of +45˚C, for 30 minutes. Taking into account the valuable biochemical composition, ethanolic extracts of a pigmented nature have a relevant potential for application in animal husbandry, medicine, food and the cosmetic industry.

Keywords: *Arthrospira platensis*, β-carotene, lutein, carbohydrates, proteins

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Impact of the New Tram Depot on GHG Emissions. Estimating GHG Emissions of the Cars in the Area of Study

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Abstract. The level of the greenhouse effect is a risk to humans. In 2022, road transportation is the reason of a significant percent of the overall transportation emissions. As most of the existing emission reduction measurements focus on road transport, it is expected that this percentage will be reduced in relation to the faster decarbonisation of road transport compared to other ways of transport. The modernization of the tram depot can contribute substantially to reduction of GHG emissions by cars. In this paper it will be performed an analysis of how this new depot will impact the GHG emissions in the area of study. The calculation of GHG emissions already showed a positive effect of the project and this was justified by the increase of using the public transport as an effect of the improved maintenance of the tram fleet.

Keywords: GHG emissions, public transport, safety, pollution reduction, smart systems.

Granular Activated Algae Technology for Wastewater Treatment and Resources Recovery – GRAALrecovery Project

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Abstract. As the worldwide population is facing limited available freshwater resources, used water by humans, discharged as *wastewater*, must be treated to ensure its *re-use*: objective provided by wastewater treatment plants. However, with more than 100 years of application, conventional wastewater treatment technology applied worldwide is a high-energy consumer, a continuous source of waste, with limited harnessing options, and a significant contributor to environmental pollution as an important greenhouse gas source. Graalrecovery technology addresses all these problems facing operators of the water supply and sewage service, providing a nature-based solution using one of the earliest life forms developed on earth: *microalgae*, targeting wastewater treatment with a low-energy requirement, environmental protection, and waste conversion to resources. The project brings innovation by implementing a Romanian patented process of biomass granulation presenting the advantage of efficient municipal wastewater treatment with effective and fast recovery of valuable microalgae biomass only by settling. With an investment of 1.147.010 euro and by fusion of Romanian and Norwegian knowledge acquired in microalgae research, the project led to significant expertise development in the field and advancement towards different technology readiness levels, with undergoing tests in real municipal wastewater. Long-term cooperation was established for knowledge transfer by attracting the private sector's interest in advanced biomass harnessing for the production of biodegradable plastic materials.

Keywords: Norway Grants, microalgae, wastewater, renewable resources.

Acknowledgement:
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Nitrogen Buget Simulator for the Management of Recirculated Aquaculture Systems with Plant Biofilters

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Abstract. In recirculated aquaculture systems (RAS), simulations are used to decide system design, to predict chemical evolution, to forecast costs, to constrain pollution, and to prioritize management decisions. Large fish farms use advanced systems to monitor the water circuit and water chemistry and often have means of automated response. Such capabilities are yet not affordable to small and medium size fish farms. We produced a freeware simulator for RAS and aquaponic systems that only requires a personal computer and can run simulations online. The model produces stepwise simulations at 1 min. time intervals for up to 12 months equivalent of RAS evolution. Inputs are needed about the RAS or aquaponic system, such as the fish and plants stocks sizes, growth rates, feed usage efficiency, chemical analyses, and biofiltration efficiency. This software forecasts the budget of water, ammonium, ammonia, nitrite and nitrate, as well as cumulative costs of various management decisions used to control nitrogen chemistry. These decisions consist of changes in the water renewal rate and recirculation rate and in the water circuit through the chemical and biological filters present in the system. The predictive evolution of water toxicity and changes in operational costs, for various modes of operation, is how model users decide the most cost-efficient management strategy to increase the sustainability of small and medium size RAS or aquaponic farms.

Keywords: aquaculture; simulator; biofilters; nitrogen; aquaponics.

The Study and Restoration of a Batch of Coins Discovered at the Church of Saint George in Roman

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Abstract. The paper presents the study of the batch of medieval coins, consisting of 15 pieces, which arrived in the Restoration - Conservation Laboratory of the Neamț National Museum Complex in the following conservation context: two groups of three glued coins, one group of 5 glued coins and 4 individual coins. The study was carried out to highlight the characteristics of the corrosion crusts from a morphological, structural and compositional point of view (the appearance, color, composition), to explain the interactions in the contact areas of the pieces during the post-depositional period, as well as to develop the methodology for the recovery of each piece.
From the batch studied coins, we present the results obtained for the group of 5 glued coins, which was investigated to answer the questions: what is the morphology of the corrosion layer, what are the types of chemical compounds resulted in the contact areas, what is the time of their formation after abandonment, having as benchmarks, the period in which they were made and the moment of their discovery in the soil? The following analysis methods and techniques were involved in the study of the conservation status stereomicroscopy/Optical Microscopy (OM) and Scanning Electron Microscopy (SEM) coupled with Energy Dispersive X-Ray Spectroscopy (EDX). Analyzes were performed (where possible) directly on artifacts as well as on samples taken from the corrosion crust, without affecting the integrity of the pieces.

Keywords: coins, corrosion, SEM-EDX, conservation, restoration.

Assessing the Impact of Alkali Silica Reaction on the Performance of Deteriorated Concrete at Seawater Intrusion in Coastal Aquifers

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Abstract. The growth of the alkali-silica reaction (ASR) and sulphate attack have caused the deterioration of concrete structure. A reactive aggregate is made up of soluble, non-crystalline, or weakly crystalline silica that reacts with alkali hydroxides to form a hygroscopic gel. This gel may cause the concrete to expand and crack. To study the long-term behaviour of concrete structures under the natural exposure to aggressive saltwater attacks, concrete samples are taken from the port Pasir Gudang, Johor. The samples cover a wide range of various exposure times with 35 years and above. The samples composed from diverse concrete constituents and obtained from different locations along the seashore. The tests are using grid method and Petrography method with using photometer techniques) where conducted on the extracted concretes.

Keywords: Alkali-silica relation (ASR); saltwater; petrography; sulphate; anhydrite crystal.

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Mapping of Geological Structures: Potential Geohazards in Tropical Highlands

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Abstract. Landslides in tropical hilly terrain have becoming a threat to the community. The difficulty of predicting future landslides can be overcome by detecting signs of past landslides especially in tropical hilly terrain like Cameron Highland, Pahang Darul Makmur. Basic skills in geomorphology and remote sensing are needed in detecting and mapping past landslides due to its geomorphological features that has been modified because of erosion, weathering, and development. However, an approach by using remote sensing and Geographic Information System techniques, the detection of geomorphological features can be done. Among the features that can be seen is hummocky topography, existence of articulating head scarps, crowns, main scarp, side scarps and convex hillslopes followed by concave hillslopes. The activation of inactive landslides is usually caused by natural factors and human factors. Natural factors consist of high rainfall distribution which weakens the soil structure and causing physical and chemical weathering process or rate to increase. About 40% of slopes in the study area with the steepness of 25° which is identified as main natural factor to slope failures. Human factors comprise of the construction of permanent and large-scale infrastructure which exerts load hence weaken the slope strength. This causes a growth of tension cracks which is perpendicular to the slope face and is expanding up to this day

Keywords: Landslide, geohazard, slope failure.

Assessment of Hydrogen-Rich Syngas from Biogas using Aspen HYSYS

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Abstract. This study aims to compare and assess the quality of biogas reforming processes which are steam reforming of biogas (SRB) and tri-reforming of biogas (TRB). The former is the conventional method of producing hydrogen efficiently. In contrast, the latter stands as a reasonably new innovative way to achieve higher hydrogen yield at less energy expense and lower carbon dioxide (CO_2) production. Both processes still have rooms for improvement, thus, optimisations should be considered in attaining higher yield of hydrogen and assessing the effectiveness of both processes. The process simulation and sensitivity analysis are done using a chemical process simulator (CPS), Aspen HYSYS, and its built-in sensitivity analysis tool. Then, direct comparison of the results and evaluation of specific parameters targeted in the sensitivity analysis are conducted where the effect of changing molar ratio, temperature and pressure are analysed. The conversion of methane, conversion of CO_2, ratio of hydrogen to carbon monoxide (CO) produced, and hydrogen yield are calculated. As the study is only simulated on Aspen HYSYS, the results are meant to be taken as an estimation of the processes in ideal conditions, lacks chemical analysis and limited to the software's mathematical and computational abilities. Sensitivity analysis obtained decent correlation with literature and recorded trends that showed feasibility of SBR and TRB in industrial conditions.

Keywords: biogas, steam reforming, tri-reforming, sensitivity analysis, Aspen HYSYS

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