Book of Abstracts

EUROINVENT
ICIR 2020

International Conference on Innovative Research

May 21st to 22nd, 2020
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)**

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EUROPEAN EXHIBITION OF CREATIVITY AND INNOVATION

EUROINVENT

IAŞI – ROMANIA

XIIth Edition, 21th - 23th May 2020

Euroinvent is 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. ***The 2020 edition is organized 100% online due to COVID pandemic.***

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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.

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Foreword

This volume contains the information of the ICIR Euroinvent 2020 Conference and the abstracts of selected peer-reviewed papers. The event was held on-line in Iaşi, România from 21st to 22nd of May 2020.

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 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 2020 for their tremendous efforts. Thanks also to IOP Conference Series for producing the volume with full articles.

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

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PROGRAM

DAY 1 – THURSDAY MAY 21	
10.00	**ICIR Opening Ceremony**
KEYNOTE SPEAKER SESSION	
10.15	**Keynote Speaker – Joseph KOST** *Nanoparticles and Ultrasound for Targeted Therapies*
10.45	**Keynote Speaker – Mohd Arif Anuar Mohd SALLEH** *Recent Studies on the Influence of Substrates and Microalloying Additions on the Primary Intermetallic Growth of Pb-Free Solder Joints*
SESSION 1	
11.15	**Titu Aurel - Mihail, Pop Alina-Bianca** - *CNC End Milling Process Parameters by using Taguchi and Anova Methods*
11.30	**Attila Zsolt KENEZ** - *Effect of Surface Cleaning Methods on Seam Quality of Laser Beam Welded Mixed Joints*
11.45	**Laura HROSTEA** - *Improving the Photovoltaic Performance of PBDB-T-SF Thin Films by Chemical Sensitization*
12.00	**Romisuhani AHMAD** - *Comparison Study on Microstructure Properties of Kaolin Based Geopolymer Ceramics with Addition of UHMWPE under Different Sintering Condition*
12.15	**Constantin BEIU** - *The Influence of Thermal Factors on the Protection Characteristics of Electro-Insulating Materials*
12.30	**Warid Wazien Ahmad ZAILANI** - *Effect of Iron Oxide (Fe2O3) on the Properties of Fly Ash Based Geopolymer*
12.45	**Iuliana COCEAN** - *Laser induced intensified coating with Reactive Blue 21 on hemp fibers*
BREAK – INDIVIDUAL LUNCH	
INVITED SPEAKER SESSION 1	
15.00	**Invited Speaker – Hanaa HACHIMI** *Hybridization of Bio-Inspired Metaheuristics for Optimization Applications*
SESSION 2	
15.20	**Titu Aurel - Mihail, Pop Alina-Bianca - CNC End Milling Process Parameters** - *The Relationship Between the Cutting Process Parameters and the Surface Roughness ..*
15.35	**Irina-Elena CIOBOTARU** - *Improvement of microplastics separation from synthetic samples – a key step for their analysis*
15.50	**Brăduț Alexandru IONESCU** - *A Review Regarding the Use of Natural and Industrial By-products in the Production of Geopolymer Binders*
16.05	**Florina-Diana DUMITRU** - *Assessing the contamination of the Dambovita River through heavy metal indices*
16.20	**Elvira GREBENIȘAN** - *Influence of TiO2 Nanoparticles on the Performance of Cementitious Materials – Experimental Results*
16.35	**Cornelia BAERA** - *Development of cement-based materials enriched with polymeric coated reactive grains as long term promoter of matrix continuous hydration*
16.50	**Stefan-Corneliu STOICA** - *Reducing power consumption in smart monitoring systems with BLE wireless protocol*
17.05	***Marcin NABIALEK*** - *Magnetic properties of composites based on amorphous iron alloys produced with the use of a non-magnetic binder and covered with high temperature varnish*
End of Conference Day	

PROGRAM

DAY 2 – FRIDAY MAY 22	
10.00	**Start of second day of the Conference**
INVITED SPEAKER SESSION 2	
10.00	**Invited Speaker – Tünde Anna KOVÁCS** *The Microstructure Changing As A Function Of The Electroacoustic Effect Under Ultrasonic Welding Process*
10.20	**Invited Speaker – Shayfull Zamree Abd RAHIM** *Potential of Metal Epoxy Composite (MEC) as Hybrid Mold Insert in Rapid Tooling Application*
SESSION 3	
10.40	**Rodica-Mariana ION** - *Instrumental techniques for architectural heritage materials*
10.55	**Wan Mastura WAN IBRAHIM** - *The Effects of Solid to Liquid Ratio on Fly Ash-Based Lightweight Geopolymer*
11.10	**Iuliana COCEAN** - *Landfill waste fire effects over town areas under rain waters*
11.25	**Nur Syahirah Mohamad Zaimi** - *Void Distributions in Sn-3.0Ag-0.5Cu (SAC305) Composite Lead Free Solder Subjected to Thermal Ageing Using Acoustic Micro Imaging Technique*
11.40	**Alexandru COCEAN** - *Copper sulfate pentahydrate target behavior during pulsed laser deposition to produce dichroic coatings for beam splitters*
11.55	**Adrian Lazarescu** - *Experimental Investigation on the Development Geopolymer Paving Blocks Using Romanian Local Raw Materials*
12.10	**Oleksandr IVASHKO** - *A model of the functional organization of an art-cluster based on a revitalized industrial enterprise*
12.25	**Anamaria Cătălina MIRCEA** - *Designing Concrete with Self-Healing Properties Using Engineered Cementitious Composites as a Model*
12.40	**Bianca Iulia CIUBOTARU** - *Comparative study on the characteristics of silicone synthetic elastomers used in dental impression techniques*
12.55	**Luminița SCRIPCARIU** - *On the Security of the Software Defined Network Used by a Smart City*
13.10	**Andra-Teodora NEDELCU** - *Oceanographic research and recordings made on the north-west coast of the black sea*
CONFERENCE CLOSURE AND AWARDS CEREMONY	

POSTER SESSION
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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.

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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
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- Ceramic
- Electrochemistry Materials & Metallurgy
- Environmental
- Manufacturing and Design
- Green ICT

Laboratory of Scientific Investigation and Cultural Heritage Conservation
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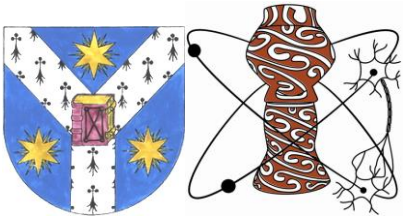
„Alexandru Ioan Cuza" UNIVERSITY OF IASI

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.

Platform of Training and Interdisciplinary Research in Archaeology involves Faculty of History, Faculty of Geography and Geology, Faculty of Biology and Faculty of Physics, opening new research lines in the field of materials and beyond.



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Keynote Speaker

Joseph KOST, PhD

Professor
Ben-Gurion University of the Negev (BGU)

Joseph Kost D.Sc. is University Distinguished Professor, he holds The Abraham and Bessie Zacks Chair in Biomedical Engineering, and was the Dean of the Faculty of Engineering Sciences at Ben-Gurion University of the Negev (BGU). Kost completed his undergraduate and graduate degrees in Chemical Engineering at the Technion, Israel Institute of Technology, before earning a doctorate in Biomedical Engineering at the same institution. Later he also earned an M.B.A. from BGU's Department of Management. He is a Fellow of the American Institute for Medical and Biological Engineering, an International Member of the United States National Academy of Engineering (NAE), an Honorary Fellow of the Israel Institute of Chemical Engineers, a Member of the Controlled Release Society College of Fellows, Doctor Honoris Causa, Transilvania University of Brasov, Romania and a Member of the Israel Academy of Sciences and Humanities. Co-author of 154 publications 64 patents and patents publications, with 13240 citations and h-index of 58. His research interests are in the field of biomedical engineering, biomaterials science, controlled drug delivery, gene therapy and ultrasound.

NANOPARTICLES AND ULTRASOUND FOR TARGETED THERAPIES

The targeted drug delivery and gene therapy through natural biodegradable nanoparticles is an area of major interest in the field of nanotechnology and pharmaceuticals. The nanoparticles used consist of different biodegradable materials such as natural or synthetic polymers, lipids, or metals. The specific cell targeting is of utmost importance in gene therapy where the main goal is the development of efficient, non-toxic gene carriers that can condense and deliver foreign genetic materials into specific cell types. Viral and non-viral carriers have been developed and some already have been approved for cancer and blindness. Still in many studies, the transfection efficiency is too low due to biological barriers in the transfection process. Physical approaches to increase efficacy and targeting to specific tissues have been also studies. In the presentation the drug delivery aspects of nanomedicine, the molecular mechanisms underlying the interactions of nanoparticles with cell-surface receptors, biological responses and ultrasound as a targeting tool and its effect on extra and intra cellular transport would be discussed.

Keynote Speaker

Mohd Arif Anuar Mohd SALLEH, PhD

Associate. Professor
Universiti Malaysia Perlis (UniMAP)

Ir Dr Mohd Arif Anuar Mohd Salleh received his PhD from the University of Queensland, Australia in the field of materials engineering focusing on light metal alloys specifically in the development of solder materials. He is currently the President of Tin Solder Technology Researchers Malaysia under the Tin Board (Research and Development), Malaysia. He is currently an Associate Professor and holds the Deputy Dean (Academic and Research) post at the School of Materials Engineering – Universiti Malaysia Perlis and was previously the Deputy Director at the Research Management and Innovation Centre (RMIC). He has experience working and lecturing in the electronic packaging materials field. Before joining Universiti Malaysia Perlis he was a Failure Analysis Engineer at Intel Malaysia. He worked as part time research officer for a few research projects on solder materials development at the University of Queensland Australia (2013-2014) and at Imperial College London (2015). Since 2010 as an academician, he published more than 140 peer reviewed journals majorly in the area of solder materials and also serves as an editorial board for several leading journals. His current google scholar H-Index is 14 with more than 500 citations. Besides that, since 2010, as a Principle Investigator he received 12 international and industrial research funding projects worth RM3 million and received more than 10 national research funding projects worth RM600K. In 2019, he was appointed as a chief research evaluator for the Tin Industry (Research and Development) Board Malaysia Industrial Research Grant. He was a visiting professor at Universitiy of Ubudiyah Indonesia, visiting research fellow at Gheorge Asachi Technical University of Iasi, Romania and research advisor to Makassar State University, Indonesia.

RECENT STUDIES ON THE INFLUENCE OF SUBSTRATES AND MICROALLOYING ADDITIONS ON THE PRIMARY INTERMETALLIC GROWTH OF PB-FREE SOLDER JOINTS

The research is focused on the influence of several substrates and microalloying additions on the microstructure of lead-free solder joints. The microstructure were mainly analysed using in-situ synchrotron imaging coupled with conventional microstructure observation techniques. Growth kinetics of primary intermetallics in the solder joints were also analysed and compared. Results shows that the substrate plays a significant role in the microstructure development in a Pb-free solder joint and consequently effects the joint strength.

Invited Speaker

Tünde Anna KOVÁCS, PhD

Associate Professor
Department of Materials Technology,
Óbuda University, HUNGARY

Dr Kovács is an Associate Professor in the Department of Materials Technology of the Óbuda University, Hungary. Member of the editorial board of the Acta Materialia Transylvania. Co-author of 109 publications with around 150 citations. Her research interests are in the field of the materials science and technologies, special welding processes (ultrasonic and explosive welding) affected phase transformation of metals, and research interest of the impact load resistance composite materials.

THE MICROSTRUCTURE CHANGING AS A FUNCTION OF THE ELECTROACOUSTIC EFFECT UNDER ULTRASONIC WELDING PROCESS

The ultrasonic welding is a new useful joining technology. The physical base of this technology is the electroacoustic effect in the metal crystal structure. The ultrasound, high-frequency vibration transmit energy to the crystal structure. During ultrasonic welding, the metal effected by pressure caused plastic deformation, high-frequency vibration and the vibration amplitude limited friction. These effects establish a metallic joint between the metal sheets. Even that the friction and electroacoustic energy input result is dynamic recrystallization and under grains refinement a softening in the welded joint. The ultrasound effect in the microstructure as a function of the process parameters is not well understand and tested yet. In this research we can try to find some relationship between these parameters and the results microstructure and mechanical parameters of the welded joint.

To understand this process is very important one side understand the physical effects and another side to optimize the welding parameters for industrial application.

Invited Speaker

Hanaa HACHIMI, Dr.

Associate Professor
Department of Mathematics and Computer Science
Sultan Moulay Slimane University of Beni Mellal, 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 Bni Melal. President of the Moroccan Society of Engineering Sciences and Technology (MSEST). I am Associate Professor at the Ibn Tofail University, in the National School of Applied Sciences ENSA in Kenitra. I am affiliated to the Systems Engineering Laboratory, precisely at the BOSS team Big Data, Optimization, Service and Security. I am the responsible and coordinator of the courses: Operational Research, Graph Theory, Statistics, Probability, Reliability and Scientific Computing.

HYBRIDIZATION OF BIO-INSPIRED METAHEURISTICS FOR OPTIMIZATION APPLICATIONS

The Optimization is a branch of applied mathematics that derives from operational research, it occupies an indispensable place for the modeling of problems in the engineering sciences sector, namely: electronics, mechanics, hydraulics or also industry. So, I'm interested on optimization because optimization is the most thing that we use and do all on our life daily, and I focus my research on heuristic algorithms, in fact the optimization is ubiquitous logistics chain, finance, hydraulics, aeronautics or other, it is a broad area of mathematics that is part of the decision support tool. Optimization is based on methods either exact or heuristic as evolutionary algorithms, for my scientific research I focus on bio inspired metaheuristics, such as the genetic algorithm, cuckoo search, fire fly and others that we will discover together later. And the choice of these algorithms based on that every algorithm has four fundamental characteristics, the complexity, the reliability and the robustness, and without forgetting the time of computation, this choice returns to the easy implementation of the algorithms under MATLAB, the robustness like as the absorption of several variables less computation time, the reliability gives better solutions even if one changes of field of application. So, in this talk I share with you some algorithms inspired by nature, and how can we make hybridization to minimize the time of computation or also to improve the fitness function. Finally, I give some engineering applications using heuristic algorithms.

Invited Speaker

Shayfull Zamree Abd RAHIM, PhD, PEng

Associate Professor
School of Manufacturing Engineering,
Universiti Malaysia Perlis, MALAYSIA

Ir. Dr. Shayfull Zamree Bin Abd Rahim is an Associate Professor at School of Manufacturing Engineering, Universiti Malaysia Perlis, Malaysia. He is also a corporate member of The Institution of Engineers, Malaysia (IEM). He has published 159 articles with 602 citations and h-index of 16. His research interest is in materials processing, injection moulding, optimization and product design engineering.

POTENTIAL OF METAL EPOXY COMPOSITE (MEC) AS HYBRID MOLD INSERT IN RAPID TOOLING APPLICATION

Recent years have shown such overwhelming uses of rapid tooling (RT) and Additive Manufacturing (AM) technologies in various field of industries. Various types of prototypes have been researched especially in the area of new product development. This research aims to develop a hybrid mold insert to increase the speed of tooling development and performance. An extensive review on the suitable development approach of a hybrid mold insert, material preparation and the filler effect on physical and mechanical properties have been conducted. Latest research indicates that it is feasible to develop a hybrid material using the combination of different shapes/sizes of filler particles. It is expected that this approach can improve the compressive strength and thermal conductivity, and consequently the hybrid mold performance (cooling time and number of cycle) will be increased. Research works in RT for hybrid mold insert are still lacking as compared to the conventional manufacturing technology. One of the significant limitations is on identifying the right method to improve physical and mechanical properties due to its limited type, size and shape of materials. A new formulation of metal epoxy composite materials for the hybrid mold insert in injection molding application and rapid tooling for non-metal products will also be investigated.


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SECTION 1

SYNTHESIS AND CHARACTERIZATION OF MATERIALS

The Relationship Between the Cutting Process Parameters and the Surface Roughness during the Aluminum Machining

Alina Bianca POP[1], Aurel Mihail ȚÎȚU[2,*]

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Abstract. The purpose of this paper is to identify based on the composite central factorial experiment, the quantitative relationships between the cutting process parameters (cutting speed, cutting depth and feed per tooth) and the arithmetic mean deviation of the surface profile, describing the system studied in any point of the chosen experimental domain. The coefficients of these equations represent the influence of the variables on the response. The analysis of the variance ANOVA is focused on estimating the different types of variability of the response and the estimations made with the Fisher test. The Fisher test, tests the significance of the coefficients of the regression equation, by comparing the ratio of two variants. This test shows the probability that there is a statistical difference between them or not. In any case, the experimental results are associated with experimental errors. Finally, based on the mathematical model, the arithmetic mean deviation of the surface profile Ra, will be determined and compared with the experimental results.

Keywords: cutting process parameters, surface roughness, end-milling process, aluminum, central composite factorial experiment, variance analysis.

References:

[1] M.D Selvam, A.K. Shaik Dawood, G. Karuppusami, Optimization of Machining Parameters for Face Milling Operation in a Vertical CNC Milling Machine using Genetic Algorithm, *Engineering Science and Technology: An Int. Journal*, 2(4), (2012), 544-547.
[2] V. Krishnaraj, R. Zitoune, F. Collombet, Study of Drilling of Multi-Material (CFRP/Al) using Taguchi and Statistical Techniques, *Usak University Journal of Material Sciences*, 2 (2012) 95-109.

Effect of Surface Cleaning Methods on Seam Quality of Laser Beam Welded Mixed Joints

Attila Zsolt KENEZ[1,2,*], Gyula BAGYINSZKI[3]

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Abstract. The laser beam welding is suitable for welding of different quality metallic materials, in this case powder metallurgy drill bit segments and thin-walled steel tubes to form a mixed joint. Laser welded joints are influenced by process parameters (e.g. laser beam power, feed rate, focus position, shielding gas composition) and other settings (e.g. distance between surfaces to be welded, surface cleanliness). In this article, we report a series of experiments using a Trumpf TruDisk 4002 (up to 4.0 kW power, 1.03 µm wavelength) welded to a 3.5 ±0.2 mm wide, Astaloy-Mo=99.8% + Graphite powder=0.2% chemical composition segment with 2±0.15 mm wall thickness 1.0308 material quality steel tube. Prior to welding, the surfaces were cleaned by various mechanical, chemical and other methods and examined for changes in the laser beam near the surface and in the entire weld cross-section. Changes in seam geometry, microstructure and hardness were analyzed.

Keywords: laser beam welding, drill bit segment, steel tube, material testing, surface cleaning.

Improving Tribological Properties of Biomedical 3D Printed Titanium Alloy with Surface Treatment

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Abstract. For medical and dental individual implants are made by additive technology. The patient-specific usable implant material is the Ti alloy (Grade 23). The used 3D printer do LMF (Laser Metal Fusion) process and melts the metal particle by the laser layer by layer. Individual implants thus produced include, but are not limited for cortical support subperiosteal implants. It is also suitable for restoring patients' chewing ability in cases where traditional bone replacement and implantation techniques are no longer possible. Surface treatment of implants affects mechanical strength, aesthetic and osseointegration properties [1]. Of these, our study investigates the mechanical strength properties of plasma nitride surface treatment. The plasma nitrided 3D printed biomedical Ti alloy (Ti6Al4V, Grade 23) tribological properties were evaluated by dry sliding wear conditions. The influence of the nitrided layer on tribological behaviour of plasma nitrided film was studied by means of XRD, SEM, microhardness tester, surface roughness tester and ball-cratering tribometer. The microhardness results pointed out that the surface treatment increased the surface hardness and reduced the plastic deformation of the alloy. The reason for the reduction in the coefficient of friction was found to be the formation of transfer film between the sliding surfaces. Wear rates demonstrated that wear resistance of the treated sample increased.

Keywords: biomedical, 3D printed, surface treatment.

References:

[1] J. Katić; A. Šarić, I. Despotović, N. Matijaković, M. Petković, Ž. Petrović, Bioactive Coating on Titanium Dental Implants for Improved Anticorrosion Protection: A Combined Experimental and Theoretical Study, *Coatings*, 9, (2019) 612.

Chemical Sensitization for Electric Properties Improvement of PBDB-T-SF Polymer for Solar Cells Application

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Abstract. This paper reports the effect of ferric chloride (FeCl3) sensitization on poly [(2,6 (4,8 bis (5 (2 ethylhexylthio) 4 fluorothiophen 2yl) benzo [1,2b:4,5b'] dithiophene))- alt -(5,5- (1',3'-di-2-thienyl-5',7'-bis (2-ethylhexyl) benzo [1',2'c:4',5'c'] dithiophene 4,8 dione)] (known as PBDB-T-SF) in thin films (93 nm thick), spin-coated onto glass and ITO substrates. The optical properties do not undergo significant changes after $FeCl_3$ immersion, polymer films exhibiting a good absorption in visible range, which slightly decreases after sensitization. Instead, $FeCl_3$ sensitization leads to a significant decrease in resistivity, of seven orders of magnitude, comparing to the pristine thin films, from $>10^3$ Ω·cm to 10^{-3} Ω·cm. This change is not stable over time, depending on $FeCl_3$ solution concentration and polymer film thickness, but still remains remarkable after a new immersion.

Keywords: chemical sensitization, fluorinated polymer, resistivity, solar cell.

References:

[1] W. Zhao, S. Li, H. Yao, S. Zhang, Y. Zhang, B. Yang, J. Hou, Molecular Optimization Enables over 13% Efficiency in Organic Solar Cells, *Journal of the American Chemical Society*. 139 (2017) 7148–7151.
[2] C.T. Hong, W. Lee, Y.H. Kang, Y. Yoo, J. Ryu, S.Y. Cho, K.-S. Jang, Effective doping by spin-coating and enhanced thermoelectric power factors in SWCNT/P3HT hybrid films, *Journal of Materials Chemistry* A. 3 (2015) 12314–12319.
[3] M. Girtan, On the stability of the electrical and photoelectrical properties of P3HT and P3HT: PCBM blends thin films, *Organic Electronics*. 14 (2013) 200–205.

Research Regarding the Influence of TiO_2 Nanoparticles on the Performance of Cementitious Materials

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Abstract. Urban buildings are subject to deterioration and degradation due to the action of external factors, air pollutants, water, compounds resulting from fuelcombustion used for heating and transportation, etc. Research on self-cleaning cementitious materials is developing at fast pace and contributes to the high interest in the industry in the decrease of evnironmental pollution, which is of real interest. The aim of this paper is to highlight the influence of the addition of TiO2 nanoparticles on the self-cleaning ability of cementitious materials, under staining with an aqueous solution of a rhodamine B, followed by exposures to the action of UV rays, followed by artificial rain cycles and to determine the physico-mechanical properties of the material, as well as the white dregree of the samples and their self-cleaning. Based on experimental research results it can be said that the white degree of the samples increased with the increase of the TiO2 amount in the mixtures. Several other factors such as the intensity of the UV light also affected the self-cleaning capacity of the samples, better results being recorded for higher UVA intensity. The TiO2 amount in the mixtures also influences fresh and hardened state properties of the material such as setting time, apparent density, water absorbtion and porosity of the material. It can therefore be said that it is necessary to identify an optimal range of TiO2 nanopraticles concentration in the cementitious matrix, in order to obtain the maximum cumulative benefits in terms of self-cleaning capacity, physico-mechanical properties and costs.

Keywords: self-cleaning composites, TiO_2 nanoparticles, photocatalysis.

The Influence of Heat Accumulation Coefficient and Casting Temperature on the Macro and Micro-Structure of Solidification

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Abstract. The purpose of the paper is to present the effect of heat accumulation coefficient and casting temperature on the aluminium alloys's structure in order to obtain better mechanical properties. The solidification structure influences the following properties: creep, ductility, fatigue strength, impact strength, mechanical strength. The experimental data has demonstrated the major influence of the thermal regime in the crystallization-solidification process regarding the occurrence of the transcrystalline zone and has marked the limits in the crystal formation. In the broad sense of the concept of directed solidification we can speak about the means of controlling the advancement of the solid-liquid interface, as well about the conditions for crystal growth. In a restricted sense, directed solidification refers to the means of achieving a successive controlled solidification, in order to obtain a product from a compact material, without micro-shrinkage. A significant factor is the melting and casting temperature, which have a strong influence on the transcrystallization process and therefore on the formation of the structure in the direction of heat transfer. The coefficient of heat transfer decreases sharply from the initial value in the case of casting the alloys, the intensity of the heat exchange being maximum at the beginning. It has been proved that this coefficient depends on many factors: the presence and thickness of the superficial layers of coating; orientation of the casting surface; duration of casting; the cooling material or the casting material; the type of alloy and its composition; superficial tension of the alloy; preheating of the metal shape or shape; overheating of the alloy.

Keywords: heat accumulation coefficient, solidification structure, casting temperature, mechanical properties.

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Copper Sulfate Pentahydrate Target Behavior During Pulsed Laser Deposition to Produce Dichroic Coatings for Beam Splitters

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Abstract. Copper sulfate pentahydrate ($CuSO_4$•$5H_2O$) used as target in the pulsed laser deposition (PLD) process led to producing thin films with dichroic properties. The coatings were applied on glass slab and hemp fabrics. Investigation of $CuSO_4$•$5H_2O$ transformation during ablation and deposition based on FTIR analysis showed that the thin film chemical composition is a mixture of different products resulted from $CuSO_4$•$5H_2O$ dehydration and decomposition, followed by melting and vaporization of the CuO and recombination of the different species in the plasma of ablation. Simulation in COMSOL of the $CuSO_4$•$5H_2O$ laser heating anticipates the processes and phenomena to be expected during PLD. Optical properties of the thin films are investigated in UV-Vis as reflecting properties and by laser induced fluorescence (LIF). Applications are considered for dichroic plate beamsplitters [1], as well as others. With this study we determine the method to produce dichroic coatings on glass and on hemp fabric, looking at the same time into the mechanism that leads to the final result.

Keywords: dichroic coatings, beamsplitter, PLD, copper sulfate.

References:

[1] V. SRS P. Kumar, P. Sunita, M. Kumar, N. Kumari, V. Karar, A. L. Sharma, Design and fabrication of multilayer dichroic beam splitter, *Advanced Materials Proceedings Research Article*, 2(6) (2017), 398-401. DOI: 10.5185/amp.2017/610.

Stability of Emulsions Prepaired by Vapor Condensation

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Abstract. Emulsions, consisting of a mixture of two immiscible liquids, one dispersed in another, with an added amphiphilic surfactant, have been extensively used in different areas such as cosmetics, pharmaceutics, material synthesis for new applications, for example thermal energy storage, new cooling systems etc. The current study focuses on emulsion preparation using a novel technique [1], namely water vapor condensation on an oil-surfactant layer containing one or two surfactants. The method was incompletely investigated previously, thus experiments were initiated in order to assess the emulsion stability for different working conditions. Two distinctive configurations were experimentally studied, one, with an adiabatic, constant room temperature surface bottom and another one, with a high, constant temperature bottom. A mixture of two surfactants, Tween 80 and Span 80, was used in different ratios, also, the condensation time and the vapor flowrate were varied. The obtained emulsions stabilities were assessed visually and also, by pH measurements, over couple of weeks time period. The estimated average emulsion particle size was wihin the microscale range.

Keywords: emulsions, vapor condensation, stability.

References:

[1] I.F. Guha, S. Anand, KK. Varanasi, Creating nanoscale emulsions using condensation, *Nature Communications*, (2017) 1-7.

Novel Trip Steel – Characterization, Impact Test and Comparison with Existing Trip Steels

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Abstract. 4 TRIP steels were produced by use of an induction furnace with controlled atmoshphere and vacuum, one of which having a compeltely new chemical composition with the purpose of obtaining an increased reaction during impact when compared to the other, already documented, steels. This study follows the heat treatment used in order to obtain the TRIP effect in the produced steels and the reaction that the steels exhibit when submitted to an impact test used to simulate a car crash at approximately 60 km/h. The preparation of the samples for both characterization and testing follow standard procedures in terms of XRD, SEM and Optical Microscopy. The crash-like tests were performed by using an INSTRON 9340 Ceast which generated an impact energy of 18J. The comparisson between the different types of TRIP steels helps to determine the best application of the purposed steel in the automotive industry.

Keywords: transform induced plasticity, steel, impact test, microscopy, XRD.

Photocatalytic degradation of methylene blue dye using TiO_2 and $Fe_3O_4/SiO_2/TiO_2$ as photocatalysts

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Abstract. This paper is focused on obtained two catalysts such as TiO2 nanoparticles and $Fe_3O_4/SiO_2/TiO_2$ nanocomposite for adsorption and photodegradation of methylene blue (MB) dyes from aqueous solution. The morphology, structure and chemical proprieties of synthesized materials were investigated by X-ray diffraction (XRD) analysis, scanning electron microscopy (SEM), N_2 adsorption-desorption isotherms and Zeta potential. The photodegradation of methylene blue under UV light in the presence of different synthesized catalysts was analyzed with Spectrometer UV-Vis. The photodegradation of methylene blue was studies by focusing of photoactivity performance of $Fe_3O_4/SiO_2/TiO_2$ in comparation with TiO_2. An attempt has been made to study the effect of process parameters through amount of the catalysts and initial concentrations of methylene blue. In all cases was found that the kinetics of the MB photodegradation under UV light was fitted to the Langmuir–Hinshelwood. Even if the photodegradation study revealed that $Fe_3O_4/SiO_2/TiO_2$ and TiO_2 degraded about 90 % of methylene blue within 60 min, the magnetic nanocomposite $Fe_3O_4/SiO_2/TiO_2$ serves as better catalyst compared with TiO_2 nanoparticles. An important role in the photodegradation of MB is adsorption characteristic of TiO_2 and $Fe_3O_4/SiO_2/TiO_2$ surface. The photocatalytic performance of $Fe_3O_4/SiO_2/TiO_2$ remained greater than TiO_2 after 5 cycles of use.

Keywords: nanocomposite $Fe_3O_4/SiO_2/TiO_2$, photocatalytic activity, methylene blue, SEM, adsorption.

Corrosion Protection of Metallic Surfaces in Peroxide – Surfactant Formulations

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Abstract. Formulations containing surfactants and oxidizing agents are used to neutralize hazardous material from surfaces where it is not wanted, in cases of chemical aggressions [1]. The formulations act chemically through different mechanisms on them, transforming them into inactive agents. The role of surfactants is to solubilize the sparingly soluble chemical warfare agents and catalyse their decontamination. In this work we evaluated the stability of surfactants in hydrogen peroxide solutions and also performed a study of the different types of surfactants, including amino acid-based surfactants, and corrosion inhibitors in an aqueous solution of hydrogen peroxide to identify the mixture that better protect the surfaces against corrosion. Corrosion tests were performed on cast iron and aluminum surface, evaluating the pinching, staining as well as staining color intensity of the surface at 24 hours after the solution is deposited on the surface. Based on the results obtained, formulations containing a system of three surfactants and a corrosion inhibitor in an aqueous solution of hydrogen peroxide were selected.

Keywords: surfactants, oxidizing agents, corrosion.

References:

[1] V. Kumar, R. Goel, R. Chawla, M. Silambarasan, R. K. Sharma, Chemical, biological, radiological, and nuclear decontamination: Recent trends and future perspective, *Journal of Pharmacy and Bioallied Sciences*, 2(3) (2010) 220-238.

Synthesis of Carbon Quantum Dots from Food Products by Hydrothermal Carbonization Method

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Abstract. Carbon quantum dots (CQDs) are zero-dimensional, fluorescent, carbon nanoparticles, typically less than 10nm in size. They were first received in 2004 during the electrophoresis process. Unlike semiconductor quantum dots, such as CdS and CdSe, carbon quantum dots are characterized by biocompatibility and non-toxicity. As a result of these unique properties, they are widely used in many branches of science. They can be used in medicine for fluorescence imaging, as biosensors and drug carriers. Moreover, they are used in optoelectronics as solar cells and photodetectors. In this paper carbon quantum dots were synthesised with cheap and environmentally friendly hydrothermal carbonization method. Spectrophotometric studies were performed to demonstrate the luminescent properties of CQDs. CQDs were found to emit green light, with a maximum emission λ = 558 nm. Using UV - VIS spectrophotometry, the maximum absorbance was determined for a wavelength of λ = 408 nm.

Keywords: carbon quantum dots, UV-VIS, hydrothermal method, fluorescent.

Carbon Quantum Dots Obtained by the Hydrothermal Method from Baby Milk Replacement

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Abstract. Nowadays, nanomaterials have been used very widely, due to the possibilities of their use in many different sciences and industry. Carbon quantum dots (CQDs) o are a new group of carbon nanomaterials, they were discovered in 2004. New methods for the synthesis of carbon quantum dots have been discovered over the years. Currently, they are possible to be obtained by low cost and green methods, without the use of toxic chemicals. CQDs synthesis methods are divided into two main groups: bottom-up and top-down. Bottom-up methods rely on the synthesis of CQDs from molecular precursors, whereas top-down methods rely on breaking down larger carbon structures. This paper focuses on obtaining CQDs by hydrothermal carbonization method. The synthesized solution was characterized using spectroscopies and the maximum absorbance was λ = 380nm and the maximum emission was λ = 519nm. The emission wavelength is characteristic of green light.

Keywords: Carbon quantum dots, UV-VIS, hydrothermal method, fluorescent.

Influence of the Imposed Parameters on XRD Patterns of Electrochemically Top-Down Obtained Nanoporous Al_2O_3 on Al1050 Alloy

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Abstract. Al1050 Aluminum alloy samples polished electrochemically in solution of 15% Na_2CO_3 and 5% Na_3PO_4 were subjected to the anodic oxidation process in an acid electrolyte, of 1 M H_2SO_4 to which 1 g / L $Al_2(SO_4)x18H_2O$ was added for the formation on their active surfaces of aluminum oxide nanoporous layers by top-down nanotechnology method. The applied parameters during the anodic oxidation processes were varied in order to obtain the most uniform aluminum oxide nanoporous layers. Thus the potential was varied between 1 V and 25 V, the duration of the oxidation processes was between 10 minutes and 48 minutes and the stirring rate of the electrolyte was between 0 and 700 rotations per minute. The formation of nanoporous layers of aluminum oxide was observed when the applied potential was between 15 V and 21 V, the duration of the anodic oxidation process was varied between 25 and 45 minutes and the stirring rate of the electrolyte was between 0 and 500 rpm. Too low duration and / or too low potential caused an electrochemical polishing phenomenon to occur and the imposition of too high potential caused dissolution of the alloy substrate. Also, the use of a dynamic electrolyte regime produced a homogenization of the electrolyte temperature during the anodic oxidation processes and the growth of the aluminum oxide nanoporous layer is slowed down.XRD diffractogram analysis reveals an increase in peak intensity corresponding to aluminum oxide concomitantly with a decrease in peak intensity of metallic aluminum for nanoporous aluminum oxide layers compared to the surface of polished Al1050 electrochemically.

Keywords: Al1050 aluminum alloy, anodic oxidation processes, oxidation potential, XRD diffractogram analysis.

Characterization of Zinc and Manganese Phosphate Layers Deposited on the Carbon Steel Surface

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Abstract. The phosphating process is usually used to improve metals corrosion resistance properties. In this work the carbon steel surface was coated with a layer of phosphate based on zinc or manganese. Three types of phosphating solutions with different substances and concentrations were used for this process. The deposited layers were structurally characterized by Fourier-transform infrared spectroscopy (FTIR) in order to highlight the main compounds specific to the phosphate layers. In the same time, by means of this analysis it is possible to confirm and evaluate the formation of coating layer and its degree of hydration.

Keywords: carbon steel, FTIR, zinc phosphate layer, manganese phosphate layer.

References:

[1] R. L. Frosta, Y. Xia, R. Scholzb, A. Lópeza, F. M. Belotti, Vibrational spectroscopic characterization of the phosphate mineral hureaulite – (Mn, Fe)$_5$(PO$_4$)$_2$(HPO$_4$)$_2$·4(H$_2$O), *Vibrational Spectroscopy*, 66 (2013) 69-75.

[2] M. Y. Eisa, M. Al. Dabbas, F. H. Abdulla, Quantitative identification of phosphate using X-Ray diffraction and Fourier transform infrared (FTIR) spectroscopy, *Int. J. Curr. Microbiol. App. Sci*, 4(1) (2015) 270-283.

Influence of the Stand-Off Distance and of the Layers Thickness on the Adhesion and Porosity of the 97MXC Deposits Obtained by Arc Spraying Process

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Abstract. In this paper, the surfaces of some weakly alloyed steel specimens were covered, by arc spraying process, with a layer of high alloyed steel: 97MXC, using core wires. The technological parameters, used to spray the high alloy steel, were kept constant except for the stand-off distance (SOD) which varied on three levels. The research was performed on deposits with a thickness between 0.2-2.4 mm. The microstructure of the deposits, the chemical composition, the physical properties of the layers were investigated by SEM analyzes, X-ray diffraction, microhardness tests and adhesion tests. The porosity of the deposits was determined by optical microscopy. The adhesion of the layer to the substrate was researched by the tensile test. Studies have shown the fact that SOD significantly influences the adhesion and porosity of the deposits. Thus, the increase of SOD determines the decrease of the adhesion of the layer to the substrate by approximately 21.4%, the increase of the porosity of the deposits by approximately 14.2% and variations up to 5% of the microhardness.

Keywords: arc spraying process, stand-off distance, adhesion.

References:

[1] P. Sheppard, H. Koiprasert, Effect of W Dissolution in NiCrBSi–WC and NiBSi–WC Arc Sprayed Coatings on Wear Behaviors, *Wear*, 317(1-2) (2014) 194-200.

[2] W. Tillmann, D. Stangier, L. Hagen, P. Schro¨der, M. Krabiell, Influence of the WC Grain Size on the Properties of PVD/HVOF Duplex Coatings, *Surf. Coat. Techno.l*., 328 (2017) 326–334.

The Effects of Solid to Liquid Ratio on Fly Ash-Based Lightweight Geopolymer

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Abstract. Geopolymer material was used as the raw material because it promotes the green technology. In this study, lightweight geopolymer was produced using fly ash as raw material with the addition of alkali activation which is mixture of sodium silicate and sodium hydroxide, foaming agent that gives lightweight properties and finally, underwent curing process. The molarity of sodium hydroxide (NaOH) used was fixed at 12 M while the ratio of fly ash to alkali activator (solid to liquid) used were varied in the range of 2.0, 2.5, 3.0 and 3.5, by mass. Besides that, foaming agent (Polyoxyethylene alkyether Sulfate) was added to the geopolymer sample to give the lightweight properties. The samples were cured at 80 °C for 24 hours in the oven for curing process and left at room temperature prior for testing for 7 days. The testing of sample was conducted in this study which includes density test, compression strength test, water absorption test and scanning electron microstructure (SEM) test. The results obtained for optimum solid to liquid ratio is 2.5, by mass with the optimum value of compressive strength density value. The mechanical and physical properties of lightweight geopolymer were based on the ASTM International Standard.

Keywords: geopolymer, lightweight, solid to liquid, foaming agent.

References:

[1] M.M. Al Bakri Abdullah, K. Hussin, M. Bnhussain, K.N. Ismail, Z. Yahya, A. Razak, Fly ash-based geopolymer lightweight concrete using foaming agent, *International Journal of Molecular Sciences*, 13(6) (2012) 7186-7198.

Void Distributions in Sn-3.0Ag-0.5Cu (SAC305) Composite Lead Free Solder Subjected to Thermal Ageing Using Acoustic Micro Imaging Technique

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Abstract. The formations of the voids in SAC305 lead free solder and SAC305 with additions of kaolin geopolymer ceramics were studied. The composite solders were fabricated by using powder metallurgy with microwave sintering method. The samples were sandwiched between two copper substrates and reflowed in a reflow oven and aged at 125°C for 0 and 7 days. The acoustic micro imaging was used to analyse the distributions of voids in the solder joints of SAC305 and SAC305 with additions of kaolin geopolymer ceramics. Results shows that, rhe void in SAC305 are larger in size and numbers as compared to SAC305 with additions of kaolin geopolymer ceramics for both reflowed and aged conditions.

Keywords: lead free solder, thermal ageing, acoustic micro imaging.

References:

[1] S. Cheng, C. Huang, M. Pecht, A review of lead-free solders for electronics applications, *Microelectronics Reliability*, 75(Supplement C) (2017) 77-95.
[2] A.K. Gain, Y.C. Chan, W.K.C. Yung, Effect of additions of ZrO_2 nano-particles on the microstructure and shear strength of Sn–Ag–Cu solder on Au/Ni metallized Cu pads, *Microelectronics Reliability*, 51(12) (2011) 2306-2313.

Comparison Study on Microstructure Properties of Kaolin Based Geopolymer Ceramics with Addition of UHMWPE under Different Sintering Condition

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Abstract. To better understand the structure-mechanical properties relation of additively fabrication of kaolin geopolymer ceramics with sintering method, a comparison study was performed. Kaolin based geopolymer ceramics were synthesized starting from the powders of kaolin based geopolymer, using powder metallurgy method. Typically, the sintering method used are one step (1200 °C – 5 min) and novel two step sintering processes (600 °C-5 min and 1200 °C – 5 min) for both kaolin based geopolymer ceramics with and without ultra high molecular weight polyethylene were applied and compared. The outcome revealed that there are no phase changes on the both sintering method pattern and the two step sintering method giving a smooth surface owing to the densification process during the preheat treatment.

Keywords: geopolymer, UHMWPE, ceramic, microstructure.

References:

[1] C. Fragassa, Limits in application of international standards to innovative ceramic solutions, *International Journal for Quality Research*, 9(2) (2015) 279-298.
[2] M.N. Rahaman, *Ceramic Processing*, CRC/Taylor & Francis, (2007) ISBN 1315276046.

Crystalization and Characterization of Iron Oxide under Geopolymerization Process

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Abstract. Geopolymer is an attractive construction binder owing to its ability to improve the properties of the concrete and preserves the environment from the high CO2 emission. Geopolymer technology will convert the potrential hazardous industrial waste such as fly ash into valuable construction materials. However, there is a need of studying the properties of iron-based geopolymer in order to enhance the fundamental and knowledge of the geopolymer research and development in this study area. Fly ash contains a significant amount of iron oxide (Fe_2O_3). Thus, crystallization of iron oxide (Fe2O3) contains in the fly ash under geopolymerization process will be able to turn waste fly ash into a strong concrete material, simultaneously creating a waste-to-wealth economy. The formation of fayalite detected from the microstructure characterization is mainly contribute to the strength development of the fly ash after 28 days curing.

Keywords: iron oxide, fly ash based geopolymer, strength development, geopolymerization process.

References:

[1] M.M.A. Abdullah, Review on fly ash-based geopolymer concrete without Portland Cement, *Journal of Engineering and Technology Research*, (2011) 1-4.
[2] W.W.A. Zailani, Bond Strength Mechanism of Fly Ash based Geopolymer Mortars: A Review, *IOP Conference Series: Materials Science and Engineering* (2017), 012008.

Recycling of Plastic throughout Pyrolysis and Distillation Process to Recover an Alternative Fuel Sources

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Abstract. Pyrolysis process is a process whereby plastic undergo the heating process and transform into another type of product either liquid form or waxy form. The basic purposed of the study was to determine the type of product formed from different type of plastic used. From the product collected in pyrolysis process it will undergo a further distillation process to increase the quality of the product. The methods that was involved in the making of the product is by using pyrolysis process, distillation process whereby a few product are derived. For pyrolysis process, plastic is heated until vaporized and the vapor is collected and condense to collect the product, while for the distillation process the separation process is done to separate the product according to its boiling point. For data collection, every sample is tested by using the Fourier Transform Infrared Spectroscopy (FTIR) and the bomb calorimeter for its calorific value. From three types of plastic used which is polystyrene, polyethylene, and polyethylene tetraphlate the most suitable type of plastic is polystyrene due to its product which is in liquid form. The distillation process will give three end product which is similar to commercial petrol, diesel and high density oil.

Keywords: recycling of plastic, pyrolysis process, distillation process , alternative fuel sources, raw material.

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Electrochemical Behaviour of Ti-Mo Alloys for Medical Application in Biological Solution

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Abstract. Nowadays, primordial concern represent population health with all materials that are used in medical applications. It were obtained three alloys of titanium with addition of elements like molybdenum, zirconium and tantalum, in a vacuum arc melting furnace (VAR), in argon atmosphere. These alloys were evaluated in biological solutions, similar with to the human body. Results revealed that it possesses a good behavior which does not influence the human body, with future applications in medical field.

Keywords: Ti-Mo-Zr-Ta alloys, corrosion resistance, medical application.

References:

[1] M.S. Bălțatu, P. Vizureanu, R. Cimpoeșu, M.M.A.B. Abdullah, A.V. Sandu. The Corrosion Behavior of TiMoZrTa Alloys Used for Medical Applications, *Revista de Chimie*, 67 (10) (2016) 2100-2002.

[2] NT.C. Oliveira, A.C. Guastaldi. Electrochemical stability and corrosion resistance of Ti–Mo alloys for biomedical applications, *Acta Biomaterialia*, 5 (2009) 399–405.

Acknowledgements:

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Microstructural Analysis of Multiple Layer Depositions on Cast Iron Using the Electrospark Deposition Method

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Abstract. The present article is focused on the obtaining of a thin layer system on Fe-C alloys by deposition of 3 succesive layers with several electrodes.These layers offer to the material a broad range of enhanced properties as: mechanical resistance, surface hardness, compression behaviour and a martensitic structure of the carbides, which reduce the effect of the wear, having positive results on the life-cicle of the product. The principle of the hardening consists in an electrical discharge by spark on which the action of the rectified current impulse transfers material from the electrode, considered cathode to the surface of the material which is the anode. This material reacts chemically with the nitrogen, from the atmosphere, with carbon and with support material, forming a diffusion layer, resistant to wear.

Keywords: deposition; thin layers; electrodes; hardness.

References:

[1] Pliszkaa, N. Radeka, Corrosion resistance of WC-Cu coatings produced by electrospark deposition, *Procedia Engineering*, **192**, 2017, 707-712.

[2] Z. Jiao, S. Peterkin, L. Felix, R. Liang, J. P. Oliveira, N. Schell, N. Scotchmer, E. Toyserkani, Y. Zhou, Surface Modification of 304 Stainless Steel by Electro-Spark Deposition, Journal of Materials Engineering and Performance, 27 (9), 2018, 4799-4809.

[3] M.C. Perju, P. Vizureanu, Chemical compounds analysis developed on the micro alloying area of coating layers obtained by impulse discharge method, Revista de Chimie (Bucharest), 65 (6), 2014, 694-696.

SECTION 2

PROCEDURES AND TECHNOLOGIES FOR MATERIALS ENGINEERING

CNC End Milling Process Parameters Optimization on Aluminium Alloy by using Taguchi and Anova Methods

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Abstract. Surface roughness is an essential indicator of the surface quality. This indicator significantly influences the technological time and costs, in other words the productivity. In this paper an experimental research is carried out on the aluminum alloy machining. The purpose of this research is to identify the optimum cutting parameters in the end-milling process. An experimental plan was established based on the L27 orthogonal matrix. The experiments were performed using values of the cutting parameters according to the recommendations of the cutting tools manufacturer in aluminum machining. The design of experiment methods that were used, are the Taguchi method, the variance analysis and the regression analysis. The controllable factors were the cutting speed, the cutting depth and thefeed per tooth. The objective functions were the surface roughness obtained by end-milling process, measured longitudinally and then transversely on the cutting direction.

Keywords: end milling process, cutting process parameters, aluminum, Taguchi method, ANOVA.

References:

[1] D.C. Montgomery, *Design and Analysis of Experiments* (7th ed.), John Wiley and Sons, (2009).
[2] M. Barkallah, J. Louati, M. Haddar, Evaluation of manufacturing tolerance using a statistical method and experimentation, *International Journal of Simulation Modeling*, 11(1) (2012) 5-16.
[3] I. Asilturk, S. Neseli. Multi response optimisation of CNC turning parameters via Taguchi method-based response surface analysis. *Measurement*, 45 (2012) 785-794.

Experiments Regarding the Possibility of Blocking the Diffusion of Sulfur at Casting-Mould Interface in Order to Limit the Graphite Degeneration in the Surface Layer of Compacted Graphite Cast Irons Pieces

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Abstract. The main objective of this experimental research is to find more detailed information about the mechanism of sulfur diffusion from the mould [cast iron was poured in a sand resin p-toluene sulfonic acid mould, sulfur-containing acid] in liquid cast iron to enhance our understanding of graphite degeneration mechanism. For this experiment, a 0.023% residual Mg content compacted graphite cast iron was developed and semi-cylindrical samples were poured. On the concave side of the samples, both steel and copper sheets with different thicknesses (0.1mm, 0.3 mm and 0.5 mm respectively) were inserted with the intention of blocking the diffusion of sulfur from the mold in the poured sample during its solidification. The obtained cast iron samples were used for structure evaluation (graphite and matrix) both in the surface layer and the casting body. The experimental results revealed the presence of degenerated graphite in the cast samples surface layer despite the presence of copper or steel sheets at cast sample – mold interface as protective elements. This suggests the possibility of diffusion of sulfur from the mold into liquid iron being solidified through copper or steel sheets.

Keywords: compacted cast iron, sulfur diffusion, resin sand mould, structure, surface layer, graphite degeneration.

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Laser Induced Intensified Coating with Reactive Blue 21 on Hemp Fibers

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Abstract. Effects of 532 nm and 320 mJ/pulse of 10 ns laser beam on aqueous solution of Reactive Blue 21 (RB21), a copper based on reactive dye [1], have been studied in both presence and absence of garnet gemstone with the aim to receive a proper coating of the hemp fibers contained in the yarns of a woven texture while reducing the dyeing time compared to the classic exhaustion dyeing method. Results show that both laser beam and garnet influenced the dyeing process with RB21, enhancing the absorption and reaction of RB21 with the composite structured hemp fibers, effect observed in the color intensities for all samples measured with the grayscale. The best results are noticed for laser effects in presence of garnet gemstone when highest coating is achieved among all samples, and the process is 6 times shorter than the classical exhausting method. Compared FTIR and UV-VIS spectra of initial dyestuff and residual dyestuff isolated from the wastewaters offered information about dyestuff exhaustion process under garnet and/or laser influence. Laser Induced Spectroscopy completed the study with the information about RB21 behavior under UV laser beam of 362 nm.

Keywords: laser induced coating, hemp composite fiber, LIF.

References:

[1] http://www.worlddyevariety.com/reactive-dyes/reactive-blue-21.html.

Influencing Factors on Premature Fracture of Cast Iron Support of Electric Motor in Aluminium Rolling Line

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Abstract. There is a limited increase in the temperature of the cast iron supports during rolling (up to 30...500C), but there is a wide range of vibration level (2.6 - 4.4 mm/s) representing 58-98% (75-80% as medium values) from the maximum admitted level (4.5 mm/s, ISO 10816). The maximum level of vibration is identified in the area where a fan is installed to cool the electric motor. In all electric motor types it appears a difference between several measurements, which highlights the appearance of various conditions in the rolling process, or in the quality of the cast iron support. The fracture of the support takes place predominantly in the area of fixing it with a screw. The cracks connect firstly the areas with casting defects (inclusions, pinholes, shrinkage and micro-shrinkages), but also coarse graphite particles (Kish or Type C- ASTM, spiky graphite) or undercooled graphite morphologies (Type-D ASTM). Lamellar graphite cast irons (traditionally used in this domain) are characterized by a low level of fracture resistance but high vibration damping capacity due to which it is necessary to make parts without casting defects and with a controlled graphite phase (high amount of graphite, graphite Type-A ASTM, without undercooled graphite), usually obtained through high performance inoculation.

Keywords: industrial engine support defects, monitoring and analizing of vibrations, defects of cast iron parts.

Acknowledgements:

The work has been funded by the Operational Programme Human Capital of the Ministry of European Funds through the Financial Agreement 51668/09.07.2019, SMIS code 124705.

The Microstructure Changing as a Function of the Electroacoustic Effect Under Ultrasonic Welding Process

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Abstract. The ultrasonic welding is a new useful joining technology. The physical base of this technology is the electroacoustic effect in the metal crystal structure. The ultrasound, high-frequency vibration transmit energy to the crystal structure [1]. During ultrasonic welding, the metal effected by pressure caused plastic deformation, high-frequency vibration and the vibration amplitude limited friction. These effects establish a metallic joint between the metal sheets. Even that the friction and electroacoustic energy input result is dynamic recrystallization and under grains refinement a softening in the welded joint. The ultrasound effect in the microstructure as a function of the process parameters is not well understood and tested yet. In this research, we can try to find some relationship between these parameters and the results microstructure and mechanical parameters of the welded joint. To understand this process is very important one side understand the physical effects and another side to optimize the welding parameters for industrial application.

Keywords: ultrasonic welding, dislocation, recrystallization.

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PVD Coating Effects for the Surface of Plasma Nitrided Dievar Tool Steel

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Abstract. The surface engineering development a key to increasing the mechanical properties of the tools [1]. In this work, it was investigated the mechanical properties of the plasma nitrided and duplex treated Dievar tool steel surface. The first examined sample was plasma nitrided and after it, was PVD coated with Cr/CrN multilayer. The second sample after plasma nitriding was PVD coated with TiN/AlTiN multilayer. The different samples were tested by microhardness test to determine the layer hardness and the Elastic modulus. The measured hardness was in the case of the duplex surface treated samples (TiN/AlTiN and Cr/CrN) double value than the plasma nitrided surface. The surface preparation of all samples was the same and showed the same surface roughness (Ra) before wear resistance tests. The surface layers microstructure have experimented by SEM and optical microscopy. The wear resistance was tested by cratering tribology tester. On the base of the results, it was determined the PVD effects for the surface properties. It was found a relationship between the surface treating affected layers structures, wear-resistance and the mechanical properties.

Keywords: surface treatment, hardness, wear resistance, coating.

References:

[1] A. Lisiecki, Tribology and Surface Engineering, *Coatings*, 9 (2019) 663.

Acknowledgements:

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Transfer Processes at the Manufacture of Metal Matrix Composite Materials

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Abstract. The main elements of composite materials technological design consist of choosing the appropriate matrix/reinforcement systems and optimal thermodynamic conditions for ensuring compatibility during processing and operation. Composite material properties depend on the volumetric characteristics of components as well on the intensity of links between these components. Initially, the mass transfer takes place under unstable conditions in the liquid matrix and at the solid/liquid interface, and finally, after casting or infiltration, stationary. Modelling of reinforcement elements transfer from gas to liquid is based on total variation of transfer energy or on the variation of the amount of the forces acting on the reinforcement. Once the basis of the models investigated and of the actual model proposed are analyzed, the densities influences, particles granulations, liquid viscocity, thermal conductivities, the energies at liquid/reinforcement interface and critical speeds of reinforcement elements, transfer from liquid to solid.

Keywords: metallic matrix composite materials, critical speed, particles, fibres, transfer processes.

References:

[1] M. Medraja, Y. Baik, W.T. Thompson, R.A.L. Drew, Understanding AlN sintering through computational thermodynamics combined with experimental investigation, *Journal of Materials Processing Technology*,161 (2005) 415-422.

Methods for Assessing the Freez-Thaw Resistance of Road Concrete Used in Our Country and at European Level

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Abstract. The paper addresses three methods of assessing the freez-thaw resistance of road concretes prepared with conventional and artificial materials. The blast furnace slag was used, as an artificial material, in granulated and milled form and in the form of crushed aggregates from the steel industry. The most common method used in our country to determine the freez-thaw resistance is the destructive method by measuring the variation of the compressive strength of the samples subjected to repeated freeze-thaw cycles. The most severe method of testing the freez resistance considered at the European level, is based on the calculation of the amount of exfoliated material in the presence of defrosting agents. Another method used is to determined the values of the dynamic modulus of elasticity after repeated cycles of freeze-thaw. The results obtained were interpreted according to different evaluation criteria and compared with limit values proposed by the standardized methods.

Keywords: blast furnace slag, freez-thaw resistance, compressive strengths, dynamic modulus of elasticity, exfoliated material.

References:

[1] CEN TR 15177, Testing the freeze-thaw resistence of concrete – Internal structural damage, 2006.

Improvement of Microplastics Separation from Synthetic Samples – A Key Step for Their Analysis

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Abstract. Identification of microplastics from the environment is a challenge mostly due to the complex nature and behaviour of samples and lack of an efficient separation method. This paper approaches the issue of microplastics separation as determining step of their analysis. The separation of two types of commercial plastics from synthetic samples was investigated, namely polyethylene terephthalate (PET) and high density polyethylene (HDPE). Subsequent filtration through filters with different porosities was tested and improved by adding a surfactant in the extraction medium. For the qualitative analysis of microplastic, optical microscopy and laser-granulometry were employed. The results proved the separation of microplastics from the samples and showed a distribution between 10-100 µm for PET and 10-200 µm for HDPE. These results provide basis for the efficient microplastics separation and further quantitative analysis from more complex samples, such as environmental samples.

Keywords: microplastics separation, improved filtration, PET, HDPE.

References:

[1] I.E. Ciobotaru, C. Maria, E. Marcu, A.A. Ivanov, C. Tociu, The Current State of the Presence of Micropollutants in the Aquatic Environment, 21st Romanian International Conference on Chemistry and Chemical Engineering, (2019), Constanța-Mamaia, Romania.

[2] W. Wang, J. Wang, Investigation of microplastics in aquatic environments: An overview of the methods used, from field sampling to laboratory analysis, *Trends in Analytical Chemistry*, 108 (2018) 195-202.

Development of Cement-Based Materials Enriched with Polymeric Coated Reactive Grains as Long-Term Promoter of Matrix Continuous Hydration

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Abstract. The continuing hydration of unhydrated cement grains was proven to be one of the most important processes for promoting the self-healing effect within cementitious composites, by generating the CSH gels as valuable healing products, not only sealing the microcracks but also being able to provide some mechanical recovery of the material, as well [1]. It was also concluded that the process slows down in time, being strongly connected to concrete age. In order to ensure the continuous hydration potential for the cementitious materials, also as essential self-healing (SH) promoter, the addition of reactive grains is considered. This paper presents preliminary aspects regarding the possibility of polymeric encapsulation of some reactive grains and the feasibility of the concept in terms of matrix compatibility to the addition and also their SH performance under induced, controlled cracking. The object of this research is less focused on regaining the mechanical characteristics of concrete, like pre-cracking strength, but mainly on preventing aggressive agents from entering in the concrete mass and aggressing the reinforcement.

Keywords: reactive grains, further hydration, self-healing capacity.

Optimized Conversion of Nyamplung Seeds Oil to Biodiesel Using Box-Behnken Response Surface Methodology (RSM)

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Abstract. This research is carried out for optimization of transesterification reaction parameters to convert oil from Nyamplung (Calophyllum inophyllum) seeds into biodiesel. Calophyllum inophyllum seeds were normally left unused due to the toxicity of calophynic acid in the unrefined extracted oil. The optimal variables (parameters) for converting Calophyllum inophyllum seeds oil into biodiesel were found to be at a methanol: oil ratio (6 to 1), 67.5 oC temperature, 1 wt% catalyst and agitation rate of 750 (rpm). The biodiesel yield obtained (93.01 wt%). The results also indicated that Calophyllum inophyllum methyl esters (CIME) fuel properties such as kinematic viscosity 4.55 mm2/s acid value 0.027 mg KOH/g, cloud point 3 oC, pour point 1 oC, flash Point 161 oC, cetane index 49 min and density of 856 kg/m3 conformed with the international standard specifications except for the oxidation stability, which was at 4.38 hour. In addition, ANOVA of the developed model displayed presentation (R2 0.99). Calophyllum inophyllum seeds oil could be a suitable non-edible feedstock for biodiesel, especially in the South East Asian region.

Keywords: Nyamplung oil, Response Surface Methodology, Biodiesel, Optimization

References:

[1] R.K. Rathour, V. Ahuja, R.K. Bhatia, A.K. Bhatt, Biobutanol: New era of biofuels, *Int. J. Energy Res*, 42 (2018) 4532–4545.
[2] T.H. Oh, S.Y. Pang, S.C. Chua, Energy policy and alternative energy in Malaysia: issues and challenged for sustainable growth, *Renew. Sustain, Energy.Rev*., 14 (2010) 1241-1252.

Reliable Method and Multistage Process Involved in the Production of Activated Carbon Based on Raw Material- A Systematic Review

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Abstract. Activated carbon has versatile usage in the modern days for water treatment, air filtration and for multipurpose adsorption. Activated carbon is a carbonaceous material with highly developed porosity. Activated carbons are artificial materials characterized by the high surface area and the extensive surface chemistry which are responsible for the significant adsorptive properties of the materials. Nowadays, activated carbons are widely used in a large range of applications, such as medical uses, removal of pollutants and odors, gas separation and purification, catalysis and gas storage. Character for based materials for activated carbon must affordable, accessible and with valorization potential in example industrial and agricultural residues. Lignocellulosic materials are one of the most important raw materials for the production of activated carbon. Over the time researcher around the world conducting research to improvised and perfecting the method for producing the activated carbon. The objective of this study is to systematic review the reliable method of activated carbon production. The process involved in the production of activated were pre- carbonization process, carbonization process, and activation process. Carbonization can be either using furnace or microwave. For activation process, there are two main activation used namely chemical activation and physical activation. However there also combination of chemical and physical activation which called physiochemical activation.

Keywords: activated carbon, carbonization process, activation process, physiochemical, raw material.

SECTION 3

MATERIALS APPLICATION

New Materials and Processes Developed for Cranioplasty

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Abstract. Traumatic brain injury is the leader in the ranking of mortality and invalidity. The surgical repair of a defect of the skull by cranioplasty has been practiced since ancient times, when materials of non-biological origin were used for this purpose. New materials and processes are sought to improve osseintegration of implants. Like any surgical procedure, cranioplasty involves complications that may be related to the surgical technique and/or to the patient's tolerance to the material used [1]. This research work describes a biocompatible medical device that include two supported meshes for providing mechanical strength and osseointegration properties of the implant, and a multiplayer porous material in between them that is loaded with the required bioactive antibacterial compound to promote a controlled and sustained release of the pharmaceutical agents at the site of surgical intervention. To increase osseointegration, meshes are designed with an open structure and coated with biocompatible materials such as hydroxyapatite. The composition gradient in the multilayer porous material is attained by loading successive layers of porous material with different amounts of bioactive materials and then stacking them to create a gradient of composition across the porous material.

Keywords: cranioplasty; composite material, nanofiber mat; controlled release; porous.

References:

[1] S. Cavalu, et al., Surface modifications of the titanium mesh for cranioplasty using selenium nanoparticles coating. *Journal of Adhesion Science and Technology*, 32 (2018) 22, 2509-2522.

A Review Regarding the Use of Natural and Industrial By-products in the Production of Geopolymer Binders

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Abstract. Rapid growth in population has led to the generation of large amounts of waste and environmental degradation. In order to protect the environment for future generations and to preserve the already limited mineral resources, a sustainable solution for traditional Portland Cement Concrete is more than necessary. In order to produce geopolymers binders, raw materials rich in aluminum and silicon are alkali-activated. Some of the raw materials, for the production of the geopolymer binders can be obtained from natural sources, such as kaolin, metakaolin (calcined kaolin), diatomite, volcanic rock, etc., or industrial waste arising from production processes, such as fly ash , iron slag, blast furnace, granulated blast furnace slag, silica fume, marble dust, etc. The aim of this paper is to present relevant data in the field of alkali-activated geopolymer materials and study the opportunities of using Romanian mineral local raw materials in order to produce these types of binders.

Keywords: alternative binders, geopolymers, alkali activation.

References:

[1] V.F. Barbosa, K.J. Mackenzie, C. Thaumaturgo (2000), Synthesis and characterisation of materials based on inorganic polymers of alumina and silica: sodium polysialate polymers, *International Journal of Inorganic Materials*, 2:309-317.

[2] [2] D. Hardjito, S.E. Wallah, D.M. Sumajouw, B.V. Rangan (2004), On the development of fly ash-based geopolymer concrete, *ACI Materials Journal-American Concrete Institute*, 101:467-472.

[3] [3] D.L. Kong, J.G. Sanjayan (2010), Effect of elevated temperatures on geopolymer paste, mortar and concrete, *Cement and concrete research*, 40:334-339.

Experimental Investigation on the Development of Geopolymer Paving Blocks by Using Romanian Local Raw Materials

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Abstract. For the world economic system, cement and concrete are indispensable elements of the construction industry. Demand for concrete, hence for cement, is constantly growing, especially in highly developed countries, which means that alternative binders are urgently needed to meet the needs of millions of people, without compromising the CO_2 levels of the atmosphere. The aim of this paper is to present results regarding the technology development and optimisation for the production of geopolymer paving blocks, their mechanical properties and possibly of implementation in accordance with the intended scope of use.
The study results indicate that alkali-activated geopolymer paving blocks have excelent mechanical properties, by reference to OPC paving blocks, making them suitable for practical applications.

Keywords: alkali-activated materials, geopolymer paving blocks, low CO_2.

References:

[1] Lăzărescu, H. Szilagyi, C. Baeră, A. Hegyi. Betoane Alternative – Betonul Geopolimer. Cercetări şi Oportunităţi Emergente. *Ed. Napoca Star.*, (2020), p.156.

Designing Concrete with Self-Healing Properties Using Engineered Cementitious Composites as a Model

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Abstract. Engineered Cementitious Composites (ECC), also known as Strain Hardening Cement-based Composites, reinforced with polymer fibers, are an easily molded mortar-based composites. ECCs are designed based both on micromechanics and on fracture mechanics theory, to feature large tensile ductility and a variety of unique properties, including tensile properties, superior to other fiber-reinforced composites. The properties of ECCs can be custom-tailored through micromechanics design due to the interaction between the fibers and cement matrix. A structural deterioration of ECC is avoided because the fibers do not allow cracks with large widths, unlike conventional concrete. ECCs has the capacity to bend, therefore generating a flexibile material. ECCs has increased ductile properties rather than brittle, unlike ordinary concrete, leading to a wide variety of applications. Obtaining superior characteristics for ECC, both in fresh and hardened state, a transition from ECC paste to concrete with self-healing properties was made. To obtain self-healing concrete, with same ECC paste behaviour and characteristics, the mix-design of the paste was optimized. The aim of this article is to present the experimental results regarding the transition from ECC paste to self-healing concrete and to analyze the results in order to establish a mix-design pattern for concrete with self-healing properties.

Keywords: engineered cementitious composites, fibers, self-healing.

References:

[1] M. Li, V.C. Li, "Rheology, Fiber Dispersion, and Robust Properties of Engineered Cementitious Composites, "*Materials and Structures*, 2012.
[2] V.C.Li: From mechanics to structural engineering - The design of cementitious composites for civil engineering applications Structural Engineering/Earthquake Engineering (1993).

Comparative Study on the Characteristics of Silicone Elastomers Used in Dental Impression Techniques

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Abstract. Even through nowadays technology and robotics seem to have taken a front seat on the medical field, there are still conventional methods being used in dental medicine, especially related to impression techniques. Elastomers such as silicone rubbers are widely used as impression materials for their suitable properties and behavior in dentistry. As the long-term success of the prosthetic therapy relies on the impression stage, it is important to know both the advantages and disadvantages of such materials. Nowadays *in vitro* and *in vivo* studies are being conducted to establish the precision and accuracy of these materials. In this study we report comparatively a number of characteristics determined by us under identical conditions for four such materials. Structural studies (through IR and XRF), morphology (through AFM and SEM) and surface (contact angle of water and moisture suction) were performed. Based on the results obtained we can identify more or less significant differences between some characteristics, which could help to indicate the right material depending on the case requirements.

Keywords: Impression materials, siliconic elastomers, characterization methodes, dentistry.

References:

[1] M. Tabesh, M. Alikhasi, H. Siadat, A Comparison of implant impression precision: Different materials and techniques. *J Clin Exp Dent*. 2018;10(2): e151-7.

Corrosion Resistance Evaluation of Zinc or Manganese Phosphate Layers Deposited on Carbon Steel Carabiners

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Abstract. This paper aims to improve the corrosion properties of carbon steel used for carabiners manufacturing by depositing on its surface different types of phosphate layers. Because during operation the carabiners are usually subjected to different types of corrosive environments such as rainwater, seawater or fire extinguishing solution, the material from which those are made must possess high corrosion resistance. Hence three types of phosphate solutions: zinc-based solution, zinc-iron-based phosphate solution, and manganese-based phosphate solution were used to obtain a suitable coating. Besides, knowing the fact that the roughness of the carabiners surface is direct proportionally with the durability of the rope, the friction coefficient of the deposited layer must be low. Since the deposited layer possesses high absorption characteristics, the friction coefficient of the phosphate layers can be reduced by impregnating the surface with oil. According to this study, the corrosion resistance of the studied carbon steel, evaluated by Electrochemical Impedance Spectroscopy, was improved by depositing zinc-based phosphate or zinc/iron-based phosphate layers in all corrosion environments, moreover, the most aggressive corrosion environment was the fire extinguishing solution.

Keywords: corrosion resistance, carbon steel, zinc phosphate layer, manganese phosphate layer, Electrochemical Impedance Spectroscopy.

References:

[1] D.P. Burduhos-Nergis, C. Nejneru, D.D. Burduhos-Nergiș, C. Savin, A.V. Sandu, S.L. Toma and C. Bejinariu. The galvanic corrosion behavior of phosphated carbon steel used at carabiners manufacturing, *Revista de Chimie*, (2019), 70, 215-219.

Influence of Primary Power Source on Heat-Insulating Material Choice for Autonomous Telecom Unit Container

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Abstract. The paper is devoted to the energy balance estimation for autonomous telecom unit, powering from photovoltaic panels and diesel-fuelled genset. Unit container has its own heat balance, basing on climate control system and parasite heating from telecom equipment inside it. Climate control system is also considered as power consumer from PV or genset. Obviously this power consumtion depends on unit load graph, heat exchange with environment, environmental temperature. Energy and economical analysis has been conducted for several possible unit geographical locations (basing on temperature and solar radiation data from [1]), three types on heat-insulating materials and different share of solar energy in energy balance. It has been shown that in case of diesel fuel domination in energy balance and not very low environmental temperature heat-insulating material with lowest heat conductivity is not an ioptimal choice from operational expences point of view (through high fuel consumption in summer for the container cooling).

Keywords: energy balance, heat-insulating materials, energy efficiency, hybrid PV-diesel power.

References:

[1] NASA Prediction Of Worldwide Energy Resources Official Website // URL: https://power.larc.nasa.gov/data-access-viewer/.

Expanded Foam Glass - An Application for Fire Resistant Multilayer Materials

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Abstract. This study is focused on obtaining a fire-resistant multilayer material resistant, which includes in the structure a layer with properties of high temperature resistance and low heat transfer. One of the research directions is focused on obtaining such a layer using expanded glass granules with two different dimensional ranges noted with A (1 - 2 mm) and B (0.25 - 0.5 mm). The target layer was realised with the shape of square plates of 50 x 50 mm, with a thickness of 5 and 10 mm respectively, from a mixture of quartz sand with sodium silicate as bonding agent in which the expanded glass granules were inserted. The following samples were obtained: P5A and P5B (5 mm thick plates), respectively P10A and P10B (10 mm thickness plates). The samples were analysed both from the morphological point of view (the emphasis being placed on the structure distribution of the expanded glass granules) and from the point of view of the resistance to high temperatures (by indirect exposure at temperatures between 400 - 600 ° C for 3 hours). The satisfactory behaviour of the samples during the tests recommends the extension of the researches in this direction, in order to establish the optimal percentage of component elements.

Keywords: expanded foam glass, fire resistance, multilayer material, heat transfer.

References:

[1] R. Schreiner, E.G. Hencke, H.P. Ebert, Intercomparison of thermal conductivity measurements on an expanded glass granulate in a wide temperature range. *International Journal of Thermal SciencesVolume* (2015) 95, 99-105.

The Effect of H_2O_2 and Lactic Acid addition in Biological Saliva on the Corrosion Behaviour of 304L Stainless Steel

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Abstract. The aim of this study is to assess the corrosion resistance of SS304L in biological solution (named Ringer) at body temperature 37^0 C. The addition of H_2O_2 and $C_3H_6O_3$ simulate the presence of microorganism metabolic product and inflammatory conditions. 304L stainless steel, in the oral cavity, can interact with other product capable of initiating corrosion of metals. H_2O_2 was used because is delivered by leukocytes and microscopic organism (bacteria) occurs in conditions in which the human body suffers a process of inflammation and lactic acid can be produced by a bacterial strain called Streptococcus mitis meeting in the dental plaque. For corrosion investigations was used in situ measurement (electrochemical) such as: OCP (open circuit potential) and EIS (electrochemical impedance spectroscopy). The electrochemical results conclude that the additions of hydrogen peroxide and lactic acid as well as these two compounds in combination have influence on the corrosion behaviour of SS304L in Ringer saliva.

Keywords: corrosion resistance, 304L stainless steel, biological saliva, lactic acid, hydrogen peroxide.

The Influence of Blast Furnace Slag on Abrasion Resistance for Road Concrete

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Abstract: In this study, the blast furnace slag was used as a mineral addition in the projected road concrete mixtures, and the blast furnace slag in the form of aggregate at 0/4 mm size was used as a percentage of 20%, 40% and 60%. Three concrete slag mixtures were compared with two other concrete mixtures made with conventional materials. Mixtures with the highest compression strength also recorded the lowest volume loss after the abrasion test (Bőhme). Compared to the first mixture made with conventional materials, the wear resistance obtained in blast furnace slag mixtures is lower. However, mixtures with 13% ground slag and up to 40% of aggregates crushed from blast furnace slag have higher wear resistance compared to the second mixture made with conventional materials.

Keywords: compressive strength, abrasion resistance, blast furnace slag, road concrete, recycle

References:

[1] SR EN 1338:2004 and SR EN 1338/AC:2007 Concrete paving blocks. Requirements and test methods
[2] SR EN 206+A1:2017 Concrete-Part1: Specification, performance, production and conformity.

Contributions to the Development of a Low-Speed Gadolinium Actuator System

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Abstract. Within the EMAD Research Centre of the USV, a low-speed actuator system has been developed which is based on the properties of the intelligent material gadolinium, i.e. the modification of the magnetic properties of the material according to temperature, magnetic at a temperature of less than 22.5 degrees and paramagnetic at a temperature greater than 22.5 degrees. The speed adjustment is made by the temperature variation (cold - warm). The paper presents the constructive solution, experimental data from which the characteristics of the equipment designed, carried out and tested and the general conclusions on its implementation in industrial actuator systems.

Keywords: motor, gadolinium, magnet, paramagnetic, ferromagnetic,

References:

[1] C.C. Cheng, T.K. Chung, C.C Chen, H.M. Wang, A Rotational Actuator Using a Thermomagnetic-Induced Magnetic Force Interaction; National Chiao Tung University, Hsinchu, Taiwan; T, *IEEE Transactions on Magnetics* (Volume: 54, Issue: 1, Jan. 2018).

[2] M. Furuse, M. Yoshikawa, Y. Itoh, S. Fukui, T. Nakamura, Fabrication and Testing of Racetrack-Shaped Double-Pancake Coil for Stator Windings of Induction-Synchronous Motor; *IEEE Transactions on Applied Superconductivity*, 15 October 2014.

A New Material for Repairs Obtained from Crushed Stone and Special Cements

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Abstract. Some of the main criteria for restoring heritage buildings are related to the appearance, composition and durability of the material used for repairs. The Rimetea Village, Alba county, is one of the known villages from Romania because it is the only one with prize from Europa Nostra.This distinction can be seen even today on the houses from the center of the village. Rimetea was resurrected by the renovation of the 19th century houses made of stone masonry. Due to humidity, improper interventions with cement mortar, an uneven load or a structural element degradation, the masonry suffers and as a consequence mocrofisures, fisures and cracks appear; now we need a diagnose from specialists and the involvment of the owners. The laboratory experiment where we mixed ground Podeni calcar stone, probably with pozzoolanic qualities, with different types of cement or hydraulic lime goal is to make compatible mortars suitable for the natural material masonry and increasing the resistance of the heritage buildings.

Keywords: rehabilitation, design of laboratory mixtures, Podeni limestone, mortar for repairs, Rimetea Village

References:

[1] Á. Furu, „Built Heritage Conservation in Rimetea”, 2006, page 8.
[2] O. Corbu, A.M. Ioani, M. M. Al Bakri Abdullah, V. Meiţă, H. Szilagyi and A.V. Sandu, article „The pozzoolanic activity level of powder waste glass in comparisons with other powders”, *Innovative Materials and Engineering Research, Key Engineering Materials* Vol. 660, p 237-243.

Handy and Sustainable Method of nano-$Ca(OH)_2$ Synthesis Used in Conservation and Consolidation Works

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Abstract.The heritage conservation it always remains a scientific and complex task. Either used for preservation of cellulose-based artifacts or as limestone consolidant, the nano-$Ca(OH)_2$ is often associated with its carbonation process. The use of waste materials for nano-$Ca(OH)_2$ synthesis transforms the entire process into a handy and sustainable one. Within this study, the calcium hydroxide nanoparticles have been synthesized from eggshell wastes through the precipitation method. For this purpose the raw eggshells were washed for organic traces removal and disolved in concentrated HCl solution to form $CaCl_2$. The nano-$Ca(OH)_2$ was obtained by adding into the chemical reaction media a solution of NaOH, the white precipitate being afterwards dried at 100ºC for two hours.
The synthesized nanoparticles were characterized by X-Ray fluorescence (XRF), scanning electron microscope (SEM), thermal analyses (ATD-TG) and laser granulometry using as comparative specimen a commercial calcium hydroxide. The granulometer analyses showed that the particle size of the nano-$Ca(OH)_2$ was in the range 10 – 150 nm, these results being also confirmed by SEM images.

Keywords: nano-$Ca(OH)_2$, eggshell wastes, consolidation works.

References:

[1] M. Panait, M. A. Moncea, F. D. Dumitru, Gy. Deák, Method of obtaining the calcium hydroxide nanopowder by recycling the eggshells wastes derived from agroindustrial activities, patent application no. A/00226, 2019.

High Density Cold Corona Generator for Increase Oxygen in Water Storage System

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Abstract. This paper presents high density cold corona generator for increase oxygen in water storage system by applied high intensity electric field corona energy. Using converter principle and controlling of the switching by IC#555. The flyback converter is designed to operate at 15 kHz frequency through a DC high voltage flyback transformer at output voltage of 1 kV to 3 kV, and at the input voltage of 36 V_{AC} , By adapting the stainless net between aluminium plates in electric field cell set , one - hour operating yields the ozone gas (O_3) generating capacity of 1.5 ppm to 5.7 ppm and the oxygen dissolved in water decreases, respectively, is 3.2 mg/L to 1.8 mg/L to 5.7 ppm ozone gas causes the oxygen dissolved in water decreases the most. Which in future could be used in the production of drinking water as well.

Keywords: corona, electric field cell, dissolved oxygen

References:

[1] S. Ketkaew. (2012). Plasma Ozonizer Using Micro-Converter for Ammonia (NH3) Decreasing in Shrimp Food Production. *Procedia Engineering* 32 (2012). 148-154.

[2] S. Ketkaew. (2017). Development of Corona Ozonizer Using High Voltage Controlling of Produce Ozone Gas for Cleaning in Cage. *Modern Environmental Science and Engineering* (ISSN 2333-2581). July 2017. Volume 3. No. 7. pp. 505-509. Doi: 10.15341/mese (2333-2581)/07.03.2017/011, Academic Star Publishing Company, 2017, www.academicstar.us.

Possibilities for Use of Vermiculite in Recultivation of Embankments Obtained as a Result of the Deposit of Mining Waste from the Extraction of Copper Ores

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Abstract. The present study examines the possibilities for vermiculite usage for recultvation of copper mining waste embankment. For this purpose, a laboratory study was carried out. The study which included the mixing of mining waste with different ratios of vermiculite and adds of other soil improvers (fertilizers and lime) with different norms. As a result is, is observed that the vermiculite addition in larger quantities did not affect the pH of the substrate. The content of major pollutants in the waste - Cu and As, remains relatively high - over the maximum permissible concentrations. Independently of the added vermiculite, it is necessary to apply calcium materials and fertilizers to improve substrate properties.

Keywords: vermiculite, soil, mine, recultivation

References:

[1] O. Abollino, A. Giacomino, M. Malandrino, E. Mentasti, Interaction of metal ions with montmorillonite and vermiculite, *Applied Clay Science* 38, (2008), 227–236.

Influence of Microparticles on Setting Time and Micromorphology of Coal Ash Geopolymers

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Abstract. Geopolymers are inorganic materials with zeolites-like microstructure and mechanical properties similar to those of Ordinary Portland cement materials [1]. However, their properties are highly depending on the constituents (raw material and activator) characteristics, as well as, on the activation particularities (mixing parameters, curing time and temperature etc.). In order to explore the influence of partial replacement of coal ash with two types of fine aggregates (glass and sand microparticles) on micromorphology and setting time, four types of geopolymers were developed. The evaluations were performed by means of electronic microscopy and Vicat method. According to this study, the coal ash replacement with glass microparticles results in an increase in the initial and the final setting time, while the replacement of coal ash with sand particles show a significant decrease. Moreover, the microstructural analysis shows different behaviour, during activation, of the studied microparticles. The surface of the glass microparticles reacts in the alkaline environment, while the sand particles did not. Therefore, the increase of initial and final setting time can be correlated with the dissolution of Si-O from the glass particles, during geopolymerisation.

Keywords: geopolymers, micromorphology, eco-friendly, fine aggregates, setting time.

References:

[1] N. B. Singh, B. Middendorf, Geopolymers as an alternative to Portland cement: An overview, *Construction and Building Materials*, 237, (2020), 117455.
[2] A. Antoni, A. W. Wijaya, D. Hardjito, Factors affecting the setting time in fly ash-based geopolymer, *Materials Science Forum,* 841, (2016), 90-97.

Progress in Electrospun Nanofibers for Air Filtration

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Abstract. Air pollution is a growing problem worldwide, reason for seeking more efficient methods to prevent exposure to contaminated air. Air filters must have the ability to effectively remove extremely small quantities of hazardous materials from the air, without causing excessive pressure drops, all at acceptable price conditions. A modern nanotechnology for obtaining polymeric nanofibers is electrospinning, capable of producing nanofibers of various materials, with controlled structures and porosity and with small pores, which makes it a favorable candidate for efficient air filtration. Electrospun nanofibers can be used directly or incorporated into various devices to reduce the negative impact of air pollution. The article briefly reviews the latest electrospinning technologies, highlighting the structural and performance advantages in producing air filters in what regards thickness, porosity, pressure drop, permeability antibacterial properties. The types of material used to obtain the nanofibers used as filtration medium are analyzed and the structural properties and performances of the filters are discussed. Finally, the challenges of electrospinning in producing air filters and future perspectives were summarized.

Keywords: electrospinning, nanofibers, air filtration.

References:

[1] D. Lv, M. Zhu et al. Electrochemical Impedance Green Electrospun Nanofibers and its Application in Air Filtration. *Macromolecular Materials and Engineering*, (2018), 1-18.

[2] H. Liu, J. Huang et al. Transparent Antibacterial Nanofiber Air Filters with Highly Efficient Moisture Resistance for Sustainable Particulate Matter Captur. *iScience*, (2019), 214-223.

SECTION 4

MATERIALS & LIFE SCIENCE

Recycling of Aqueous Phase from Hydrothermal Liquefaction and Municipal Wastewater by Microalgae

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Abstract. The search for alternatives to hydrocarbon fuels remains a trend in scientific research. Microalgae (MA) as a feedstock for the biofuels production remain an actual object of research among other types of biomass, and the scales their using are increasing. Among the producing biofuels technologies hydrothermal liquefaction (HTL) is promising since it allows to process wet biomass and convert all carbon-containing components (lipids, carbohydrates) into fuel. The cultivation of MA using wastewater in combination with biofuel production is promising, as the cost of nutrients (fertilizers), CO_2 emissions and the load on fresh water resources are reduced. In addition, the hydrothermal liquefaction process leads to the formation of a significant amount of an aqueous phase, which is a by-product, has limited energy value and also needs processing.
The article shows the experimentally achieved degree of nutrients utilization by microalgae from wastewater and an HTL-aqueous phase.

Keywords: Microalgae, biofuels, hydrothermal liquefaction, aqueous phase, wastewater, recycling.

References:

[1] M.S. Vlaskin, A.V. Grigorenko, et al. The Hydrothermal Liquefaction as a Promising Procedure for Microalgae-to-Biofuel Conversion: A General Review and Some Thermophysical Problems to be Solved. *High Temperatures - High Pressures*, (2019), 48, №4, 309-351.

Temperature Deformation Influence on the Locking Equipment Destruction in Water Supply Systems at High-Rise Buildings Upper Floors

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Abstract. The locking equipment in water supply systems destruction problem on the upper floors of high-rise buildings is being solved. After destruction products quality study did not reveal defects of a metallographic nature or rejects in manufacture. Therefore, the hypothesis that the destruction cause is low-cycle material fatigue under the dynamic loads influence, arising due to temperature deformations in the pipeline, was proposed. In this paper, we consider a pipeline scheme in which a temperature gradient arises in the fluid flow direction. At different temperature strains of the pipeline parts bending stresses emerge. These stresses cyclic nature is determined by the hot- and cold-water consumption frequency. The bending stresses calculation for this beam was performed using the initial parameter method. Plots of moments and transverse forces in the beam section are plotted. The permissible stress calculation under the dynamic loads action was made. The pipeline section size, within which shut-off equipment can be installed without destruction, was determined.

Keywords: pipelines, dynamic loads, temperature deformations, low-cycle fatigue.

References:

[1] Ekobori T 1971 Fizika i mehanika razrushenija i prochnosti tvjordyh tel [Physics and mechanics of fracture and solid strength] (Moscow: Metallurgija) p 264.
[2] Ivanova VS 1979 Razrushenie metallov [Metal destruction] (Moscow: Metallurgija) p 168.

An Integrated Approach for Biotechnological Treatment of Dairy Wastes and Bioactive Compounds Production

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Abstract. Worldwide annualy, dairy wastes released in the environment are about 11 million tones. Over the last decades, cheese whey is considered the most important pollutant of the dairy industry, associated with serious environmental hazards in the case that designated sustainable treatments are not applied. Considering these issues, several studies has been conducted in order to develop alternative methods for cheese whey valorization [1]. The present study investigates the possibility of integrating biotechnological treatment of cheese whey with production of bioactive compounds from microalgae *Chlorella vulgaris* and *Porphyridium purpureum* biomass. Microalgae growth, pigments content, phycobiliproteins, pollutants' removal efficiencies and lipid profile were evaluated for both microalgae strains.

Keywords: biotechnological treatment, cheese whey, microalgae.

References:

[1] K. Lappa et al., Cheese whey proccesing: Integrated biorefinery concepts and emerging food applications. *Foods* 8(8): 347, (2019).

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This work was supported by PN 19.23.01.01 and PN III Program, PN-III-P1-1.2-PCCDI-2017; Program 1 - Development of national CD system; Subprogram 1.2 - Institutional performance, complex projects developed in CDI consortia, Contract 32PCCDI/2018.

Microalgae Cultivation in an Open System Integrated in Biogas Installations

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Abstract. The aim of this paper is to present an innovative process for two-step heterotrophic cultivation of microalgae in an open system, using liquid digestate from biogas production as nutrient medium and intensification of lipid and phyto-catalysts accumulation in microalgae biomass by alternative illumination with natural and green artificial light. This microalgae cultivation procedure allows a high reduction of organic load from the liquid digestate used as growth medium (around 50% organic carbon, over 60% nitrogen and over 90% phosphorus), with nutrient medium recovery after microalgae concentration and harvesting by electrocoagulation-flocculation process.
Integration of these microalgae cultivation system in biogas installations represents an innovative procedure for total valorization of production side-flows, as the microalgae biomass grown on liquid digestate as nutrient medium, after extraction of lipids and phyto-catalysts, is further used as co-substrate in the process of anaerobic co-digestion for biogas production. The microalgae biomass post lipid extraction is rich in nitrogen (that contributes to maintaining an optimal C/N ration) and phyto-catalysts that intensify the anaerobic co-digestion process.

Keywords: microalgae, cultivation, biogas installation, liquid digestate, anaerobic co-digestion.

Acknowledgment:

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Studies on Two Icons Oklads with the Representation of St. Great Martyr George

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Abstract. The work represents a comparative study of two icon oklads representing St. George killing the dragon: the first of Romanian origin according to the stamp with the silver title "12" - examples of Romanian oklads with this silver title can be found in the works of S.S. Duicu, and the second oklad with stamps that seem to be specific to Russian silverware workshops. The Romanian icon oklad depicting St. George killing the dragon has in the central-lower part two stamps - the first stamp represent the monogram of master controller or craftsman or silver master "КЛ", and the second represents the silver title "12". The initials of the master are written in Cyrillic letters, as well as the inscription from the upper part of the oklad “С. ГЕОРГІЕ". The metallographic study comprises optical microscopy analyzes performed on the ReicherT Univar metallographic microscope and SEM analyzes performed on a Phillips XL-30-ESEM electron microscope using a Quanta Inspect F50, with a field emission gun (FEG) with 1.2 nm resolution and an Energy Dispersive X-ray Spectrometer (EDXS) having 133 eV resolution at MnKα. Following the analyzes, it was observed that the silver title 84 stamped on the Russian icon oklad does not correspond to reality.

Keywords: silver oklad, silver title 12, silver title 84, EDX-SEM.

References:

[1] S.S. Duicu. Testimonies of Orthodox Art and Culture from the Diocese of Tulcea 17th-20th century (in Romanian). *Editura Universitaria*, Craiova, 2013.
[2] S.S. Duicu. Testimonies of Orthodox Art and Culture from the Diocese of Alexandria and Teleorman 17th-20th century (in Romanian). *Editura Universitaria*, Craiova, 2014.

Landfill Waste Fire Effects Over Town Areas under Rain Waters

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Abstract. Identifying a dark brown color of the rain water deposited on the streets in Horezu, Romania after a landfill waste fire, the color persisting few months after the fire, an analysis of water samples collected from the streets after rain fall reveled characteristic compounds as for those resulted from urban waste combustion. A simulation of burning waste materials specific to be thrown on the landfill was conducted in the laboratory and the resulting ashes have been analyzed and compared with the dry material obtained from the rain waters collected. FTIR spectra of the two samples proved noticeable similarity among them, evidencing very toxic components, both organic and inorganic, among which dioxins and furans, sulfonic compounds, imines, imides, aromatic and aliphatic nitro and nitroso compounds, HCN and HNO3. Significant fluorescence intensity was determined for the rain waters using LIF method and peaks specific to dioxin fluorophores were obtained in the resulted spectrum. Therefore, persistent pollution generated by garbage dumps fires is proven herein to affect both air [1] and soil with the possibility to also contaminate town water supply [2], raising a major threat for human's health, as well as for vegetation and all livings.

Keywords: landfill, dioxin, furans, FTIR, LIF

References:

[1] Cocean, I. Cocean, M.M. Cazacu, G. Bulai, F. Iacomi, S. Gurlui, Atmosphere self-cleaning under humidity conditions and influence of the snowflakes and artificial light, *Applied Surface Science* 443 (2018) 83–90, DOI: 10.1016/j.apsusc.2018.02.156

[2] Cocean, A. Cocean, F. Iacomi, S. Gurlui, City water pollution by soot-surface-active agents revealed by FTIR spectroscopy, Applied Surface Science, *Applied Surface Science* 499 (2020) 142487 https://doi.org/10.1016/j.apsusc.2019.04.179

Study of Physico-Chemical Characteristics of Some Major Urban Air Pollutants

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Abstract. Urban air/environmental pollution as a major concern of contemporary civilization, substantially affecting the health of the residents, requires identification of both physico-chemical specificity and generating sources. Particle matter (PM) monitored in the atmosphere should be associated to their chemical composition that allows identification of sources as enhancement contributor and sinks as mitigation factor but also as possible spreading agent as it has been reported in rain fall for some of the pollutants cathegories [1]. After a number of episodes of increased amounts of measured PM 2.5 and PM 10, considerable dust deposits on cars were collected and SEM-EDX analyses were performed, showing the agglomerated morphology and elemental composition of the dust. Sodium aluminate and calcium chloride were identified as major contributors to the dust composition. Such chemical components may end-up into the water supply and tab water as previously reported [2] affecting the quality of the water. As sources, dust binding solutions for streets cleaning and/or coagulant agents in constructions are to be considered.

Keywords: air pollution, dust particles, environment, physico-chemical composition.

References:

[1] Cocean, I. Cocean, M.M. Cazacu, G. Bulai, F. Iacomi, S. Gurlui, Atmosphere self-cleaning under humidity conditions and influence of the snowflakes and artificial light, *Applied Surface Science* 443 (2018) 83–90, DOI: 10.1016/j.apsusc.2018.02.156.

Instrumental Techniques for Architectural Heritage Materials

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Abstract. The characterization of the building stone materials has become of primary importance, in order to obtain information about the raw ingredients and building technology of the mortars, the history of possible previous restorations and possibly deterioration processes due to physical factors, chemical factor, and biological factor. Some samples from the different locations: Corvins'Castle, Hunedoara, Adamclisi monument and Roman Mosaico, Constanta, are analyzed in this paper in order to identify the provenance of the raw materials, structure, morphology and weathering / deterioration processes of them and conservation recomendations.

Keywords: architectural heritage, materials, characterization, conservation.

References:

[1] R.M. Ion, et al., Ion-Substituted Carbonated Hydroxyapatite Coatings for Model Stone Samples. *Coatings* 2019, *9*, 231.

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Problems and Methods of Revitalization with the Restoration of Industrial Architecture in the Structure of Towns

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Abstract. The main problem is that industrial territories ended up in the central areas of cities. In many cases, objects are monuments of architecture and belong to the cultural heritage, therefore, must be preserved. The creation of art-cluster on the basis of an industrial facility provides for the creation of a model of their functioning through internal relations between participants, because an art-cluster is not an architectural object, but a form of space organization. Re-profiling an industrial architecture monument for an artistic orientation is a more gentle way to preserve the authenticity of an object than re-profiling it into a business center, hotel or shopping center. The notion of an art-cluster implies that all components with an art direction are interconnected, and the total effect of their joint action is several times greater than the effect of single components. Thus, the first defining feature of an art-cluster as a specific artistic formation is not simply a random collection of tenants-carriers of certain types of artistic activity, but the presence of tenants or owners who work on one result and their activities are interconnected.

Keywords: industrial architecture, cultural heritage, art-clusters

References:

[1] N. Leshchenko, V. Tovbych, Modern approaches to the revitalization of historical ex-industrial architecture *WIADOMOŚCI KONSERWATORSKIE* № 60 (2019), 51-59.

[2] M. Orlenko, I. Buzin, Stylistic peculiarities, features of the use of building materials and structures in buildings of the latter half of the nineteenth century and the early twentieth century, and methods for their restoration (Evidence from Ukraine) *WIADOMOŚCI KONSERWATORSKIE* № 59 (2019), 97-106.

Rational and Aesthetic Principles of Form-Making in Traditional Chinese Architecture as the Basisof Restoration Activities

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Abstract. Chinese architecture is characterized by an original structural scheme, a specific volumetric and spatial composition, and expressive silhouette, the tone of which is set by the roofs of an unusual concave end-up shape, emphasized bright polychrome with open colours and decor. All these components were not random and were not caused only by the whim of the architect or customer, but for thousands of years have been regulated by the principles of Feng Shui, the canons of Taoism, Confucianism and Buddhism. That is why every detail of the structure was provided with a particular hidden meaning. However, the spread of wood construction over time led to the emergency state of many small pavilions and gazebos. Since the authenticity of the architecture is completely lost as a result of such "reconstructions", the experience of the Ukrainian special research and restoration-design-production corporation Ukrrestavratsiia, obtained on numerous wooden churches and wooden structural elements of buildings for other purposes, can be useful in conservation and restoration of China wooden objects.

Keywords: Chinese pavilions, building structures, conservation, restoration, authenticity.

References:

[1] J. Abbasi, K. Samanian, M. Afsharpor, Evaluation of polyvinyl butyral and zinc oxide nano-composite for consolidation of historical woods. *International Journal of Conservation Science*, 7 (2),(2017), 207-214.

On the Security of a Smart City SDN-Based Network

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Abstract. Our research work focuses on the security techniques applied on a software-defined network (SDN), designed for a smart city. Information security is essential for the good functionality of the applications used in a smart city. Information should be correct and complete otherwise the 'life' of the city can be compromised by various cyberattacks targeting, for example, the public transportation system, the traffic information on highways or location services for emergency crews and many others. All the devices connected to the SDN, including end-user devices, wireless sensors, smart home equipment should be secured otherwise various cyberattacks may be launched and the smart city may be disturbed. This paper presents a risk analysis, the ways to choose the security solutions according to the smart city security policy and our proposal for the SDN security system. We compare different security techniques and present some risk scenarious with recommended solutions.

Keywords: smart city, software-defined network, cybersecurity, cyberattack.

References:

[1] V. Albino, U. Berardi, R. Dangelico. Smart Cities: Definitions, Dimensions, Performance, and Initiatives. *Journal of Urban Technology*, 22, (2015), 1-21.

[2] D. Craigen, N. Diakun-Thibault, R. Purse. Defining Cybersecurity. *Technology Innovation Management Review,* (2014), 13-21.

[3] C. Ceken, M. Al-Hubaishi. Integrating SDN – Enabled Wireless Sensor Networks Into the Internet. *The 10th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications 18-21 September 2019*, Metz, France, (2019), 1090-1094.

Intelligent Communication, Specific to the Engineering of Materials, under the Conditions of Ensuring the Circular Economy and Technological Digitization

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Abstract. The study has several motivations, one related to the analysis of the ways in which the development of the circular economy can be achieved by a company producing castings. The second one is to establish the partnerships that are necessary in order to materialize the conditions in the castings industry. The third motivation, based on the analyzes carried out at the level of the first two, aims at calibrating the communication for the actors that contribute to the realization of the circularity desideratum in the industrialization of the cast products in the new conditionings of the digitization instruments. To structure an action methodology in the direction of intelligent communication, specific to materials engineering, the paper is structured as follows: the conditions and values to which the circular economy is reported, the engineering design elements of solutions for a circular economy, communication partnerships, analysis of development measures of the circular economy in partnerships and the results of the analysis of the expected activities and partnerships.

Keywords: manufacturing, castings, circular economy, intelligent communication, technological digitization.

References:

[1] M M Vescan, V F Soporan, Castings from the perspective of digital communication in virtual space, *Proceedings of International Conference on Innovative Technologies* IN – TECH 2016, Prague, 6 – 8.09.2016, ISSN 1849-0662, p. 147-150.

Considerations Regarding the Recalibration of the Manufacture of Castings from the Perspective of the Development of the Circular Economy

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Abstract. The paper presents the issue of recalibration of cast parts from the perspective of the circular economy, by presenting the specific issue, by setting the main objective of the study, that of identifying areas that require interventions in the technological process and ensuring socio-economic functionality. The analysis, in general, includes the presentation of the specifics of the analyzed process, the construction of assessment indicators of the circular economy and the quantification and hierarchy of the influencing factors. Particular attention is paid to the quantitative indicators and value appreciation of the manufacture of castings to the rigors of the circular economy. At the level of interpretive analysis, are presented the critical areas that require a multidisciplinary intervention to ensure the specific conditionalities of the circular economy.

Keywords: castings, manufacturing, circular economy, assessment indicators, critical areas of intervention

References:

[1] V. Aurez, L. Georgeault, Economie circulaire. Système économique et finitude des resources, De Boeck Supérieur, Louvain-la-Neuve, 2016.
[2] B. Duquet, N. Laplaiche, A. Le Deaut, D. Rousiere, Ingénierie et environnement en fonderie, *Editions Techniques de l'ingénieur*, Paris, 2015.

Oceanographic Research and Recordings Made on the North-West Coast of the Black Sea

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Abstract. The objective of this paper is to provide an overview of general underwater circulation features in the Nord-West coast of Black Sea basin. In order to achieve this, during one year were analyzed data coming from different station near the coast. First is presented a general description of circulation patterns in Black Sea area. All the reference points have registered during one year data information about the water current amplitude, and water current direction and water pressure. The graphic present the average parameters in every month during one year. This data were analyzed and compared with in-situ data obtained using current metter along the Black Sea. The current velocity depend mostly on the point's location.

Keywords: direction and current value, temperature, conductivity, density

Innovation for Trap Particle and Eliminate Germs in Air by Corona Electrostatic System

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Abstract. This article presents an innovation for trap particle and eliminates germs in air by corona electrostatic system. The air circulation rate is 165 cubic meters per hour by designing the power supply with IC#TL494. The IC#TLP250 uses separate ground and drive Power MOSFET#IRFP460 by bringing DC high voltage from the transformer#TLF14511 to the dust collector unit and the electron separation unit. By designing and building a machine capable of trapping dust particles smaller in size from 0.3 microns up to the results of the tests showed that the dust collecting efficiency of 95.37% from the experiment by measuring the amount of dust using Personal pump and the dust collection efficiency of 95.86% from measuring dust using Handy laser partical counter and part of electron separation can produce corona for producing ozone gas up to 3 ppm to eliminate bacteria in the air. The UV lamps for ozone emissions are reduced to 0.1 ppm for disaster prevention to users.

Keywords: dust, electrostatic, germ, ozone, corona.

References:

[1] S. Ketkaew. (2002). Air cleaner by using high voltage electrostatic, Proceeding of the IEEE International Conference on Power System Technology. China. pp. 1611-1614.

[2] S. Ketkaew. (2012). Plasma Ozonizer Using Micro-Converter for Ammonia (NH3) Decreasing in Shrimp Food Production. Procedia Engineering 32: 148-154.

[3] S. Ketkaew, Electric air filter for dust trap and disease killing by applied electrostatic technique: TSB 2010 International Conference on Biotechnology for Healthy Living, The 22nd Annual Meeting of the Thai Society for Biotechnology, Prince of Songkla University, Trang Campus, Thailand (2010).

Toxic Gases Eliminator from Print Ink by Applied High Frequency High Ripple Pulse Corona

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Abstract. This research paper presents the design and construction of toxic gase eliminator from print ink using high frequency high ripple pulse corona technique for decrease VOCs gas in the suction gas of printing ink using high frequency high voltage pulse switching power supply. Using inverter principle and controlling of the switching by IC#TL494. The inverter is designed to operate at 20 kHz frequency through a high frequency high voltage switching transformer at output voltage of 1.5 kV, and at the input voltage of 24 VAC 50 Hz, By adapting the non uniform electric field to the electrode design 3 tubes, one - hour operating yields the ozone (O_3) generating capacity of 6.3 ppm enables decrease VOCs gas as well.

Keywords: electrode, electric field, ozone gas, print ink, VOCs gas

References:

[1] J. Marcos Alonso. Jesus Cardesín. Emilio Lopez Corominas. Manuel Rico-Secades. Jorge García. (2004). Low-Power High-Voltage High-Frequency Power Supply for Ozone Generation. *IEEE Transactions on Industry Applications*, 40(2).

[2] S. Ketkaew. (2012). Plasma Ozonizer Using Micro-Converter for Ammonia (NH_3) Decreasing in Shrimp Food Production. *Procedia Engineering*, 32, 148-154.

[3] S. Ketkaew. (July 2007). The Case Study of 5 kHz – 25 kHz High Frequency Adjustment in Converter Circuit of Generate Ozone Gas. AU Journal of Technology, Published by Assumption University (ABAC) Hua Mak, Bangkok Thailand, 11(1), 42-47.

Cellulosic and Tannins Containing Wastewater Treatment Using MBBR Technology and Fungal Strains

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Abstract. Since the beginning, Mobile Bed Biofilm Reactor (MBBR) technology has been extensively used, both at the level of small on-site treatment units and at industrial scale. Moreover, this technology represents a starting point for many researches aimed at improving performance, such as the use of microorganisms, enrichment with anammox bacteria to accelerate nitrogen removal and more. Within the present papar, a pre-screening of Cerioporus squamosus strain attachement on a new type of biofilm carriers was carried out. The tested biofilm carriers were realized from an innovative material, being a mix of polymeric material (high density polyethileme + talcum + cellulose). Thus, a bio-argumentation study was performed under static conditions, in Czapek-Dox nutritious medium (the medium was poured into the plates with biofilm carriers exceeding with few mm the height of the carriers). These were incubated for 5 days at 28 °C. After the incubation period, the probes were analyzed by stereomicroscopy

Keywords: biofilm carriers, fungi, cellulose, polyethylene

References:

[1] R.K. Sonwani, G. Swain, B.S. Giri, R.S. Singh, B.N. Rai. A novel comparative study of modified carriers in moving bed biofilm reactor for the treatment of wastewater: *Process optimization and kinetic study. Bioresour. Technol.*, (2019), 335–342.

Assessing the contamination of the Dambovita River through heavy metal indices

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Abstract. The continuous population growth, which leads to increased social and economic development, affects the quality and quantity of the freshwater resources, both directly through changes in landscapes and pollution caused by industrialization, urbanization, and agriculture, as well as indirectly through climate change pressures (such as higher air temperature, drought, frequent extreme precipitation events). Within this study, the heavy metals contamination of Dambovita River was assessed, as it is the main drinking water source for the city of Bucharest. Thus, surface water samples and sediments were collected from four sampling sites along the Dambovita River within two campaigns, in order to assess the seasonal fluctuations. The heavy metal pollution index (HPI) and metal index (MI) of the collected water samples were calculated for cadmium, nickel and lead, for each sampling site. Additionally, in order to establish the potential ecological risk index, the contamination factors and potential ecological risk factors were assessed for each of the monitored heavy metals (Cd, Ni and Pb). The results showed that the HPI values were below the critical pollution index value of 100, along with MI values below 1. Also, the sediment analyses further confirmed that all the sampling sites can be classified with low to medium levels of potential ecological risk.

Keywords: water contamination, heavy metal pollution index, metal index, potential ecological risk index, Dambovita River.

Comparison of total phenolic content, antioxidant activity and extraction yield from Apium graveolens waste using unconventional extraction methods

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Abstract. *Apium graveolens* is a medicinal and aromatic plant used in pharmaceutical industry, cosmetic industry, gastronomy and traditional medicine. It is known for its hepatoprotective, antioxidant, anticancer, antidiabetic, anti-inflammatory, antimicrobial, analgesic, anti-spasmolytic, anti-infertility, cardiotonic activities. The aim of this study was to determine and correlate the total phenolics, total flavonoids, antioxidant activity and extraction yield from ethanolic extracts of stems and leaves waste using different unconventional extraction methods. *Apium graveolens* aerial parts waste were obtained after aqueous extraction of the leaves and stems. The extraction yield was expressed as function of freeze-dried extracts, and the extraction methods were ultrasound assisted extraction, microwave assisted extraction and accelerated solvent extraction. Total phenols content was determined by Folin-Ciocalteu spectrophotometric method, the flavonoids content waste determined by aluminium chloride spectrophotometric method and the antioxidant activity was studied using DPPH (2,2-Diphenyl-1-picrylhydrazyl) spectrophotometric method.

Keywords: *Apium graveolens,* waste, phenols, flavonoids

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Experimental Research on the Behaviour of the Systems for Ventilated Facades, Exposed to the Fire Action

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Abstract. When establishing the constructive structures that must reach the required levels of fire performance, one must start from the fact that the fire is an accident. The structures must remain viable for the normal fire time considered.The behavior of the construction to the fire is dependent, besides other factors, on the contribution to the fire of the elements and parts of the construction, of the materials and products for the construction, as well as on the fire resistance of some of them.Due to the fact that the initiation and evolution of the fires is different, it was imposed that the determination of the fire behavior of the constructions and the materials that enter their composition should be done under specified conditions, by exposing them to a specified ignition source, in a good context.The general purpose of fire safety legislation is to provide fire safety. To achieve this goal, the requirements for structures (load bearing capacity), building materials (fire prevention and limitation of fire propagation, limitation of fire size), and modalities of evacuation the buildings (including the prevention of fire propagation to other neighboring buildings) are established to define how they should be designed and executed according to their purpose.

Keywords: façade system, fire test, reaction materials, ventilated facades

References:

[1] BS 8414-1 2002 Fire performance of external cladding systems applied to the face of the building BSI 4-6.
[2] ISO 13785-1 (2002), Reaction-to-fire tests for façades. Part 1: Intermediate-scale test, Part 2: Large-scale test.

Reducing Power Consumption in Smart Monitoring Systems with BLE Wireless Protocol

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Abstract. This research focuses on alternative low power consumption in smart monitoring systems and on various techniques to facilitate access to different monitoring sensors connected via BLE. Due to high complexity and power demands that new smart monitoring equipment have, the need for reduced power consumption in the context of new regulations/architectures for the Internet of Things has occurred. Sensors can have dimensions of a few centimeters, are not required to have cabling or power supply and can transmit data for a long period of time. A network of sensors connected through BLE wireless protocol with a corresponding architecture can provide a simple and versatile solution to multiple environments that need to be monitored. Data provided by the smart monitoring systems must be carried and analyzed either in upper layers of the network or close to the edge. Dedicated applications allow users to access data via smart-devices and data can be downloaded on any device, such as mobile phones. All these require communication techniques with optimized and reduced power consumption.

Keywords: low power consumption, BLE wireless protocol, smart monitoring systems, sensor network.

References:

[1] V.D. Diaconescu, L. Scripcariu, P.D. Matasaru, M.R. Diaconescu, C.A. Ignat. Risk Identification in a Smart Monitoring System Used to Preserve Artefacts Based on Textile Materials. *EUROINVENT International Conference on Innovative Research (ICIR) 17-18 May 2018*, Iasi, Romania, (2018), 1757-8981.

Simulation of Pedestrian Walking Through Angled-Corridors for Evacuation Behaviour Study

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Abstract. The effect of acute- and obtuse- angled-corridors on the evacuation behaviour is rarely studied. In the previous work, we have confirmed that corridor with less than 90o turning angle has negative impact to the pedestrians walking behaviour due to the tendency of the pedestrians to slow down their motion when approaching the turning of the corridor. In this contribution, empirical data collected from previous experimental work is utilised to further study the effect of turning angle on the evacuation behaviour. The simulations of walking through angled-corridor were reproduced which reflects evacuation scenarios. Three different types of angled-corridor are taken into consideration (a 60°-, a 90°-, and a 135°- angled-corridors) with different sets of number of pedestrians (NOP: 60, 70, 80, 90 and 100). Three metrics of evacuation behaviour measurement are reported: (1) inflexion points, (2) escape time, and (3) interaction force. Inflexion point is used to evaluate the restriction flow occurred during the evacuation. From the results, the 60o angled-corridor contained the highest number of inflexion points. With the highest number of inflexion points, the escape time for the 60o angled-corridor is 14.8% to 24% longer compared to the other two types of angled-corridors. This shows that this kind of angled-corridor need to be avoided in the future design of walkways. On top of that, the 60o angled-corridor also gives the maximum interaction force with 213.75 N. This reconfirmed that the corridor with less than 90o turning angle is not suitable to be built as a walkway. This work is relevant to be studied due to its immediate applications in assessment of crowd safety for building egress.

Keywords: evacuation behaviour, simulation, corridor, crowd safety

Polyester Dyeing and its Environmental Impact

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Abstract. Dyeing and printing of textiles are responsible for 30% of the pollutants contained in the effluents. The impact of textile dyeing processes on environment is highly variable, most important issues being the colour, the organic charge, and the solids in suspension. The present study investigates the characteristics of the polyester dyeing process in what concerns the environmental issues. Disperse dyes are non ionic, have very limited solubility in water at room temperature and have substantivity for polyester fibre. Two disperse dyes were used, and dyeing were performed at different concentrations. The exhaustion degree, the volume of wastewater used in the process, the specific flow, pH, temperature and chemical oxygen demand of the wastewater, the total residuum, volatile substances and the biological oxygen demand were determined in all the cases. The data obtained showed that the global pollutant content of the wastewater from disperse dyes dyeing is high (more than two times higher than those obtained in the case of dyeings with acid dyes).Absorption spectra of the initial and exhausted dyebath were determined, in order to evaluate the dilution degree needed to make wastewater colour acceptable.

Keywords: polyester, disperse dyeing, pollution.

References:

[1] R. Mia, M. Selim et al. Review on various types of pollution problem in textile dyeing & printing industries of Bangladesh and recommendation for mitigation. *Journal of Textile Engineering & Fashion Technology*, (2019), 5(4), 220-226.

[2] B. Agrawal. Eco-friendly Chemical-free Dyeing of Polyester/Cotton Blended Fabrics. *Research Journal of Recent Sciences*, (2016), 5(10), 20-25.

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