Book of Abstracts

EUROINVENT
ICIR 2017

International Conference on Innovative Research

May 25th to 26th, 2017
Iasi – Romania
Palace of Culture

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)**
- **Malaysian Research & Innovation Society (MyRIS)**

With support of:

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

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EUROPEAN EXHIBITION OF CREATIVITY AND INNOVATION
E U R O I N V E N T
IAŞI – ROMANIA
IXth Edition, 25th - 27th May 2017

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.

Under the auspices of EUROINVENT we organize:

1. **Inventions and Research Exhibition**

http://www.euroinvent.org/

2. **International Conference on Innovative Research**

http://www.euroinvent.org/conference

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

http://euroinvent.org/book.html

4. **European Visual Art Exhibition**

http://euroinvent.org/art.html

Event purposes:

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

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

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

euroinvent@yahoo.com

Foreword

This volume contains the information of the ICIR Euroinvent 2017 Conference and the abstracts of selected peer-reviewed papers from the 2017 International Conference on Innovative Research, which was held in Iaşi, România from 25 to 26th of May 2017.

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 2017 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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JOINT EUROINVENT PROGRAM

EUROINVENT Exhibition		EUROINVENT ICIR Conference	
DAY 1 – THURSDAY MAY 25			
08.00	Stand setup for participants	9.00	Participants registration
10.30	**Artistic moment**		
11.00	**EUROINVENT Opening Ceremony**		
		12.00	**ICIR Opening Ceremony**
13.00	First Jury Meeting	12.30	Keynote Speaker
13.30	Jury evaluation (I)	13.00	Keynote Speaker
	Visiting	13.30	Keynote Speaker
	Demonstrations of inventions	14.00	Lunch
16.45	End of exhibition day	15.00	Plenary Session
17.00	European Visual Art Expo	17.00	End of conference day
DAY 2 – FRIDAY MAY 26			
10.00	Exhibition start	10.00	Keynote Speaker
10.30	Jury evaluation (II)	10.30	Invited Speaker
	Welcoming Speeches	11.00	Plenary Session
12.30	First Jury Meeting	13.00	Break for lunch (individual)
15.00	Jury Final Decision	14.00	Plenary Session
16.00	**Book Award Ceremony**	15.00	Poster Session
17.00	Exhibition Closure	17.00	Conference End
19.00	**Cocktail Dinner**		
DAY 3 - SATURDAY MAY 27			
10.00	Exhibition Start		
11.00	Workshop		
14.30	Artistic moment		
14.00	**Euroinvent Award ceremony**		
17.00	**Exhibition teardown**		

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

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

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

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ROMANIAN INVENTORS FORUM

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

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Universiti Malaysia Perlis (UniMAP) is Malaysia's 17th public institution of higher learning. It was approved by the Malaysian Cabinet on May 2001. Originally known as Kolej Universiti Kejuruteraa Utara Malaysia (KUKUM), or Northern Malaysia University College of Engineering, it was renamed as Universiti Malaysia Perlis (UniMAP) in February 2007. The first intake consisted of 116 engineering students who started classes on June 2002. Currently, UniMAP has approximately 11,000 students and a workforce of more than 1,700 academic and non-academic staff members. It offers 21 undergraduate programs that lead to Bachelor in Engineering, one undergraduate programs that leads to an Engineering Technology degree and two undergraduate programs that lead to a Bachelor in Business. We also offer six Diploma in Engineering programs and 13 postgraduate programs that lead to the Master of Science in Engineering and PhD degrees.

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

- Geopolymer
- Polymer Advanced
- Electronic Packaging Materials
- Ceramic & Metallurgy
- Electrochemistry of Green Materials
- Green Environment
- Green Design and Manufacturing
- Green Advanced Computing & Technology
- Materials In Nanotechnology
- Green Materials for Electronic Applications

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The MyRIS acronym it came from "Malaysia Research & Innovation Society". We are solely a research & an innovation organization entity. Our goal is to create the research & an innovation environment among researchers & innovators to the high level standard thus international exposure. With various international mutual networks with several academic institutions & research & innovation entities, MyRIS able to bring up Malaysian innovation to high level standard recognition. The objectives of establishing of MyRIS are:-

1. Building research and innovation, networking between academic institutions and related societies.
2. Encouraging research and innovation activities, especially among young researchers.
3. Helping researchers in improving innovation in various aspects.

Laboratory of Scientific Investigation and Cultural Heritage Conservation
ARHEOINVEST Platform, Alexandru Ioan Cuza University of Iasi
„Alexandru Ioan Cuza" UNIVERSITY OF IASI

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

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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History of Universiti Malaysia Terengganu

Universiti Malaysia Terengganu began as Universiti Pertanian Malaysia's Centre for Fisheries and Marine Science, located at Mengabang Telipot, Kuala Terengganu. It provided facilities for both students and lecturers from the Fisheries and Marine Science programmes to conduct their practical sessions and also researches.

Eventually, the Faculty of Fisheries and Marine Science of Universiti Pertanian Malaysia (UPM) in Serdang was transferred to Kuala Terengganu, and the Centre transformed into a branch campus, being renamed Universiti Pertanian Malaysia Terengganu (UPMT) in June 1996. The name of the faculty was also changed to the Faculty of Applied Sciences and Technology. Also formed were the Faculty of Science and Professional Literature and the Matriculation Centre.

Later on, the Cabinet of Malaysia had approved the establishment of Terengganu University College (KUT) on 5th May 1999 as an associate campus of UPM. Then Terengganu Universiti College was given autonomy on 1st May 2001 and was renamed the Malaysian Science and Technology University College (KUSTEM) on 20th June 2001.

On 1st February 2007, KUSTEM was given the status of a full-fledged university, and with that elevation, it was renamed again and remain to this very day as Universiti Malaysia Terengganu.

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- Inspec
- INIS (International Nuclear Information System)
- Chemical Abstracts
- NASA Astrophysics Data System
- Polymer Library

http://iopscience.iop.org/1757-899X/

Keynote Speaker

Iulian ANTONIAC, PhD. Habil. Eng.

Professor

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Iulian Antoniac obtained his M.E., Ph.D. and Postdoc degrees in Materials Science at University Politehnica of Bucharest. Dr. Iulian Antoniac is the Head of the Biomaterials Group, full professor and ViceDean of Faculty Materials Science and Engineering, member of the Senate of University Politehnica of Bucharest. Dr. Antoniac has published widely, with over 200 papers published in peer-reviewed journals and conference proceedings, more than 50 ISI papers, 7 patents, and several books. Dr. Antoniac is Editor-in-Chief of the journal Materials Science Forum and member of the editorial board for some other journals. Dr. Antoniac is currently Vice President and Council Member of the Romanian Society for Biomaterials (SRB), Former President and permanent Member of Executive Committee of the International Society for Ceramics in Medicine (ISCM). Dr. Antoniac's research interests include: metallic biomaterials for orthopedic and dental applications, bioceramic coatings, biocomposites, biopolymers, retrieval analysis of explants, microscopy techniques for materials characterization, bone regeneration, physical and chemical characterization of nano- and micro- particles for biomedical application.

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INNOVATION IN BIOMATERIALS FIELD: BIODEGRADABLE METALS

A significant numbers of materials including metals, ceramics, polymers, composites and some nanomaterials exist and are used as biomaterials for manufacturing different medical devices. Main objective of the innovative actions in the field of biomaterials for medical devices is to transform current medical and surgical treatments by creating "smart" implants for orthopedic, cardiovascular, craniofacial, dental, thoracic and neural interventions. Biodegradable metals give the premise that new kinds of implants will be used in surgery, respectivelly implant that can adapt to the human body and dissolve when no longer needed, eliminating multiple surgeries and reduce health care costs. Magnesium based biodegradable systems offer significant therapeutic advantages over implants used today. Breakthrough activities include development, processing and testing of different degradable magnesium alloy systems, new improved versions of existing clinical-use implants. Also, different innovative coating technologies are used in order to obtain special surface functionalities. The talk will provide a status update on the biomaterials field and various innovations for developing the biodegradable implants and the impact of magnesium alloys knowledge in medical applications will be presented.

Keynote Speaker

Nor Aieni MOKHTAR, PhD

Professor
Vice Chancellor
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Professor Dato' Dr. Nor Aieni Haji Mokhtar obtained her first degree in Physics from the State University of New York, Binghamton, USA (1980) with a Physics Honor Award (Sigma Pi Sigma) from the American Society of Physics, Masters in Physics from University College of Swansea, UK (1983) and a PhD in Physics from Universiti Teknologi Malaysia (UTM, 1992) on Laser Technology Application. Nor Aieni has won several prestigious awards of national and international levels for her research and innovation including the Best Woman Inventor and the Khwarizmi International Award. She is a Fellow of RINA-InMAREST, an Associate Fellow to the Academy of Science Malaysia and a member of the National Professors Council (Environment). She was appointed as 2nd Vice Chairman of the Intergovernmental Oceanographic Commission (IOC) of UNESCO for the Western Pacific (IOC/WESTPAC) and Scientific Advisory Group. She led the related Scientific Committees and the organization of national and international Symposia, presented papers in ASEAN, APEC, ICSU and EU-SEA, and conducted scientific research and expeditions in marine science and oceanography. In 2014, she was also involved in the Global Ocean Forum, Busan, Republic of Korea and Our Ocean Conference in Washington DC, USA. Currently, she is the Vice Chancellor of Universiti Malaysia Terengganu (UMT).

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INNOVATION RESEARCH: FROM LABORATORY TO COMMUNITY

A superior position, a better remuneration, and a chance to see your research deciphered into commercial success are among the three reasons why any scientist chooses to become entrepreneur. Universities, government labs, and the industries have also work-out together to the benefits of commercializing research. In developed countries, non-profit organizations have made it easier for scientists by easing red tape and ethics rules, which have historically discouraged technology transfer from lab to market. They have realized that if they support scientists, they will have profit via shares in that particular company, and the money they gained can be channel back into research projects and the next start-up projects. The risks are huge for all parties, but so are the benefit gains. And it is the individual scientist who stands to win or lose the most. What is it like for scientist or government researcher making the transition? And how much support do they get? These are some issues needed to be explored.

Keynote Speaker

Ionel I. MANGALAGIU, PhD

Professor
Vice Rector
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Dr. Mangalagiu is a professor of organic and medicinal chemistry and Vice-Rector with research at "Alexandru Ioan Cuza" University of Iasi, Romania. Previously, prof. Mangalagiu served as Dean, Vice-Dean, Head of Organic Chemistry Department, etc. at Faculty of Chemistry. He has nearly 30 years of experience in the research, focused in the area of Heterocycles Compounds. He was Visiting Professor and/or Invited Speaker to prestigious foreign universities (Ludwig Maximilianus University Munchen and Technische Universität Braunschweig, University of Florence, Universite D'Angers) and, was Invited Lecturer at more than 20 International Meetings. He has supervised to successful completion, a total of more than 100 students for higher degrees, including 11 PhDs. He has over 20 years' experience within the field of organic and heterocyclic chemistry. He is author and co-author of more than 150 papers, 13 books and chapters at well-known publishing houses, 12 patents. He was in charge as Director for national projects, NATO and FP7 projects, etc. He was awarded with several prizes and honours: "Costin D. Nenitescu Medal" (Romanian Society of Chemistry), "Al.I.Cuza University Award in Research", "Grand Prize Euroinvent" (Euroinvent, Romania), etc. He is member of the Editorial Board of Mini-Reviews in Organic Chemistry, Rev. Chim.-Bucharest, Curr. Microwave Chem., etc.

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FIVE AND SIX MEMBER RING AZAHETEROCYCLES: SYNTHESIS AND APPLICATIONS

Five and six member ring azaheterocycles are "privileged structures" due to their important applications from pharmacological, industrial, and synthetic points of view. Azaheterocyclic derivatives were reported as valuable scaffolds in medicinal chemistry, showing variously biological activities such as antiviral and anticancer, antituberculosis and other antimicrobials, analgesic, etc. On the other hand, these compounds are widely discussed nowadays for their applications in optoelectronics (fluorescent derivatives, chemosensors, logic gates), agriculture (growth regulators, pesticides, insecticides), ionic liquids, etc. As part of our ongoing research in the field of azaheterocycles derivatives, we present herein some core results obtained by our group in the field of nitrogen heterocycles derivatives, focused on chemistry and their pharmacological and industrial potential applications.

Invited Speaker

Sultan T. Abu-Orabi ALADWAN, PhD

Professor
Secretary General, Association of Arab Universities,
Amman, Jordan
abuorabi@aaru.edu.jo

Professor **Sultan T. Abu-Orabi ALADWAN** is the Secretary General of Association of Arab Universities. He has graduated the University of Jordan in 1973, followed by a Master Degree at Western Michigan University in USA and respectively by a PhD at University of Michigan in 1982 on Organic Chemistry. He has been President of Irbid National University, Tafila Technical University and Yarmouk University in Jordan, also the President of Arab Union of Chemists, Jordanian Chemical Society. He is also Editor in Chief of several journals like Journal of the Association of Arab universities, Jordanian Journal of Chemistry, Arab Journal of Chemistry etc. He has published over 55 scientific articles.

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Scientific Research and Higher Education in the Arab World

Any worthwhile research must necessarily be based on the following pillars: vision, strategy, logistics, human resources that include well qualified researchers and meaningfull research priorities directed towards problem-solving rather than just publishing.

The Arab world today faces a host of hurdles when it comes to higher education and scientific research including a lack of clear focus in the research priorities and strategies, insufficient time and funding to meet research goals, low awarness of the importance and impact of good scientific research, inadequate networking opportunities and databases, limited international collaborative efforts, and of course, the brain-drain.

It seems that the only clear solutions would be to increase the budget for scientific research, select meaningful priority areas for research, lay down workable strategic goals and action plans, establish adequate databases and networking capabilkities, and robustly encourage private sector input and participation

Invited Speaker

Rodica Mariana ION, PhD

Professor
ICECHIM, Nanomedicine Research Group, Bucharest
Valahia University, Doctoral School, Targoviste, Romania
European Commission -DG Sante – SCHEER, Luxembourg
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Professor Rodica-Mariana Ion is professor of Nanomaterials at Valahia University, Targoviste, Romania, Head of Nanomedicine Research Group at ICECHIM, Bucharest, Expert of European Commission – DG SANTE-SCHEER, Member of CNATDCU – Ministry of Education, "Materials Engineering" commission. She has a recognized expertise in materials characterization, materials photochemistry (laboratory / clinical photodynamic therapy of cancer with lasers, lamps and LED sources), regulatory aspects of chemicals and nanomaterials (chemical safety and environmental protection). Prof. Ion is internationally known for her work on functional and bioactive compounds, characterization of engineered surfaces and biocompatible and biofunctional materials for application in nanomedicine; Author of more than 175 peer-reviewed papers in her field, 1300 ISI citations, HIRSCH index: 21 (SCHOLAR GOOGLE); 17 (SCOPUS), 17 (ISI WEB OF KNOWLEDGE). She received 57 national and international awards.

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Micro-encapsulated Porphyrins and Phthalocyanines – New Formulations in Photodynamic Therapy

Photodynamic therapy (PDT), as an innovative method for cancer treatment is based on a concerted action of reactive oxygen species (ROS) via a photochemical mechanism and some biochemical processes on various biological macromolecules and organelles, leading to cellular necrosis or apoptosis. This review presents some photosensitizers, analyzing their physicochemical and spectroscopic properties and therapeutic action in solution or encapsulated into microcapsules. Additionally, the aggregation process - J-aggregates and H-aggregates are discussed, with their spectroscopic effects, hydrophobic character and photosensitizer capacity. The antitumor effects induced by these compounds mediated-PDT on human lightly pigmented melanoma cell lines will be evaluated with focus on different mechanisms involved in oxidative stress induced cellular death, angiogenesis and inflammation. Also, the effects of porphyrins and phthalocyanines on different dermatologic diseases will be discussed, too.

Invited Speaker

Mohd Arif Anuar MOHD SALLEH, PhD

Electronic Packaging Materials Research Group,
Center of Excellence Geopolymer and Green
Technology, School of Materials Engineering,
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Dr Mohd Arif Anuar Mohd Salleh received his PhD from the University of Queensland, Australia in the field of materials engineering focusing on the development of solder materials. He is currently a senior lecturer at Universiti Malaysia Perlis (UniMAP) and a group leader of the electronic packaging materials research group under the Center of Excellence Geopolymer and Green Technology (CeGeoGTech). He is also the deputy dean of Research Management and Innovation Center (RMIC) at Universiti Malaysia Perlis (UniMAP). He has a vast experience working and lecturing in the electronic packaging field. He published several books and more than 70 peer reviewed journals majorly in the area of solder materials.

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Development of Robust Lead-free Solder Joints for Harsh Environment Electronic Applications

Electronics manufacturers are pushing the limits in reducing the physical size of circuitry while simultaneously increasing the number of transistors to satisfy Moore’s Law. This includes investing in new materials in electronic packages with a focus on high reliability. A viable method to enhance the properties and performance of solder joints is the incorporation of reinforcement particles to the solder matrix, either by intrinsic or extrinsic methods. In this study, a series of Sn-Cu Pb-free solder alloys were manufactured with a variety of reinforcing phases and the microstructure and soldering behavior were investigated in detail using advance characterisation techniques such as in-situ synchrotron X-ray radiography imaging. Shear strength of the reinforced solder joints was also evaluated. The collective results of this study demonstrate a detailed understanding of the manufacture of reinforced Sn-Cu Pb-free solder alloys and the mechanisms of microstructure development.

Invited Speaker

Anca Daniela RAICIU, PhD.Pharm.

Marketing, Sales, Logistics & Distribution
Director HOFIGAL

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Ms. Chim. Anca Daniela Raiciu is a Marketing, Sales, Logistics & Distribution Director at HOFIGAL since 2007. She is also Ph.D. in Pharmaceutical Sciences, Vice President of the Romanian Society of Chemists Cosmetology Chemists, lecturer at "TITU MAIORESCU" Pharmacy. He has proudly been HOFIGAL since 2002 and has been actively involved in the creation of new products and their promotion on the domestic and foreign markets. She also has a vast experience in the pharmaceutical and cosmetic industry since 1988, and she pass through all stages of research and production.
"The fact that nothing is more important in life than health is an old wisdom, the truth of which we convince the passing day. What we need to do to acquire and maintain this precious health is a question that has marked my meaning and course of life. That led me to use my time and energy in-depth studies of chemistry, biochemistry and pharmacy and led me to get my doctorate in an increasingly interdisciplinary field.”

*
*   *

Gemotherapy And Phytoterapy-Applications In Complementary Therapies

We use medicinal plants in complementary therapies and the doctor assumes knowledge of each plant active principles, the parties used pharmaco-dynamic actions, the conditions in which plants can be effective as adjuvant. Gemmotherapy act to organic dysfunctions, each glicerinohydroalcoolic extract, organotropism is well determined. Meristems have an important role through its high content of polyphenols, stimulating the activity of catalase enzyme system, anti-stress but also have many other compounds with antioxidant activity. By composition and special qualities of gemmotherapics they action mainly by stimulating cellular function rebalance homeostasis and tissue. Complementary medicine is used not singular, but came with allopathic medicine, and conventional treatments to increase efficiency.

SECTION 1

SYNTHESIS AND CHARACTERIZATION OF MATERIALS

Low Cost Synthesis Method of Two Dimensional Titanium Carbide Mxene Ti_3C_2

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Abstract. A layered MAX phase of Ti_3AlC_2 was synthesized through pressureless sintering (PLS) initial powder of TiH_2/Al/C without preliminary dehydrogenation under argon atmosphere at 1350 ˚C. An elegant exfoliations approach was used to prepare a two-dimensional (2D) metal carbide Ti_3C_2 from layered MAX phase by removing A layer by chemical etching. The use of PLS method instead of any pressure assistance method such as HIP and HP can reduce the cost of synthesis and have a high potential to be commercialize. Recently, some unique potential of Ti_3C_2 has been discovered which leads to the proposal of potential application, mostly on electronic devices. Morphology and structural analysis were used to validate the successful of this research.

Keywords: MXene, exfoliation, 2D materials, Ti_3C_2, Ti_3AlC_2.

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Synthesis and Characterization of TiO_2/ SiO_2 Thin Film via Sol-Gel Method

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Abstract. TiO_2/SiO_2 thin films were prepared by sol-gel spin coating method. Structural, surface morphology and optical properties were investigated for different annealing temperatures at 300 °C, 400 °C and 500 °C. X-ray diffraction pattern show that brookite TiO_2 crystalline phase with SiO_2 phase presence at 300 °C. At higher temperatures of 400-500 °C, the only phase presence was brookite. The surface morphology of film was characterized by scanning electron microscopy (SEM). The films annealed at 300 °C shows an agglomeration of small flaky with crack free. When the temperature of annealing increase to 400-500 °C, the films with large flaky and large cracks film were formed which was due to surface tension between the film and the air during the drying process. The UV-Vis spectroscopy shows that the film exhibits a low transmittance around 30% which was due to the substrate is inhomogeneously covered by the films. In order to improve the coverage of the film on the substrate, it has to repeatable the spin coating to ensure the substrate is fully covered by the films.

Keywords: TiO2/SiO2, Brookite, Films, Sol-Gel,Spin Coating

Preparation and Characterization of Linear Low-Density Polyethylene / Thermoplastic Starch Blends Filled with Banana Fibre

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Abstract. In this study, the influence of banana fibre (BF) loading using sodium hydroxide (NaOH) pre-treated and succinic anhydride-treated (SA) BF on the mechanical properties of linear low-density polyethylene (LLDPE)/thermoplastic starch (TPS) matrix is investigated. LLDPE/TPS/BF composites were developed under different BF conditions, with and without chemical modifications with the BF content ranging from 5 % to 30 % based on the total composite. The tensile strength showed an increase with an increase of fibre content up to 10 %, thereby decreasing gradually beyond this level. NaOH pre-treated and SA treated BF added with LLDPE/TPS composite displays a higher tensile strength as compared to untreated BF in LLDPE/TPS composites. Thermal behaviour of the BF incorporated in LLDPE/TPS composite was characterised using differential scanning calorimetry (DSC) and thermal gravimetric analysis (TGA). This showed that SA treated BF exhibits better thermal stability, compared to other composites. This is because of the improvement in interfacial adhesion existing between both the fibre and matrix. In addition, a morphology study confirmed that pre-treated and treated BF had excellent interfacial adhesion with LLDPE/TPS matrix, leading to better mechanical properties of resultant composites.

Keywords: banana fibre, linear low-density polyethylene (LLDPE), composites, thermoplastic starch, surface modifications.

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Fabrication Of Porous Ceramic-Geopolymer Based Material To Improve Water Absorption And Retention In Construction Materials: A Short Review

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Abstract. Porous ceramic nowadays has been investigated for a variety of it's application such as filters, lightweight structural component and others due to their specific properties such as high surface area, stability and permeability. Besides, it has the properties of low thermal conductivity. Various formation techniques making these porous ceramic properties can be tailored or further fine-tuned to obtain the optimum characteristic. Porous materials also one of the good candidate for absorption properties. Conventional construction materials are not design to have good water absorption and retention that lead to the poor performance on these creteria. Temperature is a major driving force for moisture movement and influences sorption characteristics of many constructions materials. The effect of elevated temperatures on the water absorption coefficient and retantion remain as critical issue that need to be investigated. Therefore, this paper will review the proces parameters in fabricating porous ceramic for absorption properties.

Keywords: Porous ceramic, absorption, construction materials, geopolymer

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Electromagnetic Nondestructive Evaluation of Tubes using Data Mining Procedure

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Abstract. In the absence of flaws due to inadequate technologies or improper condition and tools, the eddy current nondestructive testing can be considered as a non-Markovian process, memoryless [1]. The results of the control are presented as series of temporal data because the scanning speed can be considered as quasi-constant. In these series, events, which intuitively are associated with the existence of flaws in the product to be controlled, must be discovered. Event discovery in the series data is the focus of many temporal data mining methods. For the case in which the price per unit to be controlled is small and the number of products is high, the evaluation method is based on the establishing of a threshold, the classification being made simple: good product/bad product. This paper proposes to present the theoretical basis and few possibilities to apply data mining methods in eddy current examination of steam generators using differential inner transducers.Once the events are identified in time series, the problem of evaluation of shape and severity of discontinuities that had generated these events at eddy current examination is posed.The identifying methods proposed were used, with very good results, on data obtained from eddy current examination of tube samples, similarly with those from steam generators of PHWR nuclear power plants, CANDU 600 types.

Keywords: electromagnetic nondestructive evaluation, automatic classification, flaws, data mining.

Porous AlMg-SiC Composites Structure Modeling by Means of Fractal Analysis

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Abstract. This work is a continuation of the authors research in the field of ultralight metallic composite materials, based on AlMg10 alloy and SiC particles and obtained by salt dissolution method. We used for the fractal analysis the fractal geometry modeling by means of fractal dimension types of composites obtained from performed experiments. We achieved the following fractal dimensions for the samples: 1.37 (for 5% SiC sample), 1.41 (for 10% SiC sample) and 1.45 (for 15% SiC sample). Fractal analysis indicated that all the obtained samples have cells with a statistically regular form. We conclude that this kind of composite materials can be included in ultralights porous metal composite materials, with a tendency to a metal foam structure.

Keywords: porous metallic composite, SiC particles, fractal analisys

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The Assessing of the Failure Behavior of Glass/Polyesteric Composites Subject to Quasi Static Stresses

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Abstract. Using glass fibers reinforced composites for structure of wind turbine blades require high mechanical strengths especially to cyclic stresses. Studies have shown that approximately 50% of composite material failure occurs because of fatigue. Composites behavior to cyclic stresses involves three stages regarding to stiffness variation: the first stage is characterized by the accelerated decline of stiffness with micro-cracks, the second stage - a slight decrease of stiffness characterized by the occurrence of delamination and third stage characterized by higher decreases of resistance and occurrence of fracture thereof. The aim of the paper is to analyzed the behavior of composites reinforced with glass fiber fabric type RT500 and polyester resin subjected to cyclic loading with pulsating quasi-static regime with asymmetry coefficient R = 0. The samples were tested with the universal tensile machine LS100 Lloyd Instruments Plus, with a load capacity of 100 kN. The load was applied with different speeds of 1 mm/min, 10 mm/min and 20 mm/min. After tests, it was observed that the greatest permanent strains were recorded in the first load cycles when the total energy storage by material was lost due to internal friction. With increasing number of cycles, the glass/polyester composites ability to store energy of deformation decreases, the flow phenomenon characterized by large displacements to smaller loading forces appearing..

Keywords: cvasi-static stress, glass fiber reinforced polymer (GFRP), failure, strain.

Influence of Melt State on the Properties of Nickel-based Powders for Wear-Resistant Coat

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Abstract. Influence of melting conditions on the structure and properties of powders alloys based on Ni-Cr-Si-B-C system used to obtain wear-resistant and corrosion-resistant coatings has been studied. To this end, the temperature dependences of physical properties of some liquid alloys of PG-SR type have been investigated. It is shown that the formation of the microhomogeneous and the equilibrium melt during production of metal powders and coatings leads to increasing of powders dispersion; increasing of output of fractions of a powder, used for coating; reducing porosity of powders and quality of oxidized particles; improving alloy resistance to oxidation in various medium; increasing corrosion resistance, heat resistance and wear resistance of powders and coatings.

Keywords: powder, coating, liquid metal properties, temperature dependence, corrosion resistance, wear resistance.

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Investigation of Electrical Resistivity of Ni-Cr-Al Alloys in Liquid and Solid State

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Abstract. Temperature dependences of electric resistivity of alloys on the base of Ni-Cr-Al system in liquid and solid state have been studied. As objects it have been selected alloy compositions contained 10 and 15 % of chromium, each of which is alloyed by 5 and 10 % of aluminum. The temperature dependences of electrical resistivity are characteristic to commercial superalloys. It is founded that the higher the amount of alloyed elements, the lower critical temperature, heating up to which leads to the formation of equilibrity and microhomogeneouty of the melt structure, and the less the temperature of hysteresis of electrical resistivity polyterms. Melt state before crystallization has a significant influence on solidification process and structure of alloys in solid state.

Keywords: nickel base alloys, liquid state, electrical resistivity, temperature dependence, hysteresis, aluminum and chromium addition, melt structure.

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Mechanical Characteristics of Rubber Based Materials Irradiated with Gamma Rays

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Abstract. Natural rubber materials are used in different domains, from medical, pharmaceutical to food and manufacturing. The products range from medical devices to food packages and gaskets. The main purpose of using radiation treatment is to decontaminate or sterilise products for medical, pharmaceutical and food industry and to increase mechanical and chemical resistance of products used in manufacturing industry. The scope of this paper is to analyse the tensile mechanical strength of rubber based materials when irradiated with gamma rays at a two medium doses, 30.1 kGy and 60.6 kGy. The objectives are the following: to identify the optimum radiation dose in order to obtain a high tensile strength and to identify the tensile strength of the material when adding different quantities of natural filler (0 phr, 20 phr, 40 phr). The results indicated that the mechanical strength increase along with the increase of natural filler from 9.61 N (at 0 phr) to 16.9 N (at 40 phr). When irradiated, the highest mechanical strength of 25.93 N was obtained at 30.1 kGy and 20 phr. However, at 60.6 kGy, the 40 phr material obtained a better mechanical strength, 21.78 N in comparison with 18.05 N obtained for 20 phr.

Keywords: natural rubber, gamma irradiation, mechanical strength, modified natural composites.

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Micro-Encapsulated Porphyrins and Phthalocyanines – New Formulations in Photodynamic Therapy

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Abstract. Photodynamic therapy (PDT), as an innovative method for cancer tretament is based on a concerted action of reactive oxygen species (ROS) via a photochemical mechanism and some biochemical processes on various biological macromolecules and organelles, leading to cellular necrosis or apoptosis.
This review presents some photosensitizers, analysing their physicochemical and spectroscopic properties and their therapeutic action as photosensitizers in solution or encapsulated into microcapsules. Additionally, the aggregation process - J-aggregates and H-aggregates - are discussed, with their spectroscopic effects, hydrophobic character and photosensitizer capacity. The antitumor effects induced by these compounds mediated-PDT on human lightly pigmented melanoma cell lines will be evaluated with focus on different mechanisms involved in oxidative stress induced cellular death, angiogenesis and inflammation. Also, the effects of porphyrins and phthalocyanines on different dermatologic diseases, will be discussed, too.

Keywords: photodynamic therapy (PDT), porphyrins, phthalocyanines.

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AlMg/AlN Obtaining through Thermodynamics Combined with Experimental Investigation

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Abstract. Basic material concept, technology and some results of studies on aluminum matrix composite with dispersive aluminum nitride reinforcement was shown. Studied composites were manufactured by „in situ" technique[1]. Aluminum nitride (AlN) has attracted large interest recently, because of its high thermal conductivity, good dielectric properties, high flexural strength, thermal expansion coefficient matches that of Si and its non-toxic nature, as a suitable material for hybrid integrated circuit substrates [2].AlMg alloys are the best matrix for AlN obtaining. Al_2O_3–AlMg, AlN–Al_2O_3, and AlN–AlMg binary diagrams were thermodynamically modelled. The obtained Gibbs free energies of components, solution parameters and stoichiometric phases were used to build a thermodynamic database of AlN–Al_2O_3–AlMg system.
Obtaining of AlN with Liquid-phase of AlMg as matrix has been studied and compared with the thermodynamic results.The secondary phase microstructure has a significant effect on the final thermal conductivity of the obtained AlN. Thermodynamic modelling of AlN–Al_2O_3–AlMg system provided an important basis for understanding the obtaining behavior

Keywords: AlMg, AlN, diagram, „in situ", matrix

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An Investigation on the Thermophysics, Mechanical and Tribological Characteristics of the Polymer Systems Composites Reinforced with Carbon Fibers

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Abstract. The purpose of this paper is to highlight a number of factors that influence the physical-mechanical and tribological characteristics of sintered composite materials. Such factors are grouped generally in two categories: technological parameters (pressure compacting, sintering temperature, sintering duration, heat treatment) and the receipt of sintered composite materials. In this paper is presented a program of experiments developed in composite materials sintered polymer matrix (non-metallic) which was prepared in advance a methodology original production and research for this particular type of materials. The experiments have focused development and testing of a number of 20 polymers composite armed with carbon fiber in various forms. Tribological tests followed the establishment of the coefficient of friction and wear rate of the sliding speed at the constant values (low v = 7.2 mm/s and high v = 40.8 mm/s) the normal load (N = 8 daN) and for different orientations of the fibers to the direction of sliding: normal (N type), parallel (P) and antiparallel-perpendicular (AP type).

Keywords: composites, carbon, fibers, reinforced, aluminium, tribological.

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Development and Investigation of Tungsten Copper Sintered Parts for Using in Medium and High Voltage Switching Devices

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Abstract. Tungsten-copper (W–Cu) sintered parts with 75 wt.% W, 24 wt.% Cu and 1 wt.% Ni for using as arcing contacts in medium and high voltage switching devices were developed successfully by powder metallurgy (PM) techniques. Sintered parts with diameter of 50±0.5 mm and height of 6±0.5 mm were manufactured by pressing–sintering–infiltration (P–S–I) and spark plasma sintering (SPS) at sintering temperature of 1150°C, and 1050°C, respectively. Physical, chemical, electrical, thermal and mechanical properties of the samples were investigated. Microstructure was analyzed by optical microscopy and scanning electron microscopy. Material properties were influenced by the consolidation processes. The best results were achieved by SPS process. The relative density was more than 95 %, Vickers hardness HV1/15 was over 227, elastic modulus was over 143 GPa, and homogeneous microstructure was revealed. These good properties can contribute to higher lifetime of arcing contacts under severe working conditions.

Keywords: tungsten copper materials, sintering and infiltration, spark plasma sintering, microindentation, switching devices, circuit breakers

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Characterization of Polysulfone Membranes Prepared with Thermally Induced Phase Separation Technique

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Abstract.
Membrane technology is one of the most used water treatment technology because of its high removal efficiency and cost effectiveness. Preparation techniques for polymer membranes show an important aspect of membrane properties.Generally, polysulfone (PSF) and polyethersulfone (PES) are used for the preparation of ultrafiltration (UF) membranes.Polysulfone (PSf) membranes have been widely used for separation and purification of different solutions because of their excellent chemical and thermal stability.Polymeric membranes were obtained by phase inversion method.The polymer solution introduced in the non-solvent bath (distilled water) initiate the evaporation of the solvent from the solution, this phenomenon has a strong influence on the transport properties. The effect of the temperature of the coagulation bath on the membrane properties is of interest for this study. Membranes are characterized by pure water flux, permeability, porosity and retention of methylene blue. The low temperature of coagulation bath improves membrane's rejection and its influence was most notable.

Keywords: membranes, polysulfone (PSF), retention, methylene blue.

Development of Electrodeposited Zn/Nano-Tio$_2$ Composite Coatings with Enhanced Corrosion Performance

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Abstract. Pure zinc coatings have been found ineffective when are used in aggressive environments such as those which contain chlorides or industrial pollutants [1]. In this paper, Zn/nano-TiO_2 composite coatings with various contents of TiO_2 nanoparticles (diameter size of 10 nm) were prepared on low-carbon steel by electro-codeposition technique. The deposition was carried out at different cathodic potentials ranging from −1600 mV to −2100 mV for different deposition times between 5-15 min. Pure Zn coatings were also produced under the same experimental conditions for comparison. Present work aims to investigate the effects of selected electrodeposition parameters (cathodic potential, TiO_2 nanoparticle concentration in the plating bath and electrodeposition time) on the corrosion behavior of electrodeposited Zn/nano-TiO_2 composite obtained. The corrosion experiments were performed in natural seawater, using electrochemical methods such as open circuit potential, potentiodynamic polarization and linear polarization resistance. The results showed that the inclusion of TiO_2 nanoparticles into zinc matrix lead to an improved corrosion resistance comparatively with pure zinc coatings obtained under similar conditions.

Keywords: TiO_2 nanoparticles, electro-codeposition, nanocomposite coatings, linear polarization resistance.

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The Effect of Normal Force on Tribocorrosion Behavior of Ti-10Zr Alloy and Porous TiO_2–ZrO_2 Thin Film Electrochemical Formed

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Abstract. The tribocorrosion behavior of Ti-10Zr alloy and porous TiO_2–ZrO_2 thin film electrochemical formed on Ti-10Zr alloy was evaluated in artificial saliva solution. Tribocorrosion experiments were performed using a unidirectional pin-on-disc experimental set-up which was mechanically and electrochemically instrumented, under various solicitation conditions. The effect of applied normal force on tribocorrosion performance of the tested materials was determined. Open circuit potential (OCP) measurements performed before, during and after sliding tests were applied in order to determine the tribocorrosion degradation. The applied normal force was found to greatly affect the potential during tribocorrosion experiments, an increase in the normal force inducing a decrease in potential accelerating the depassivation of the materials studied. The results show a decrease in friction coefficient with gradually increasing the normal load. It was proved that the porous TiO_2–ZrO_2 thin film electrochemical formed on Ti-10Zr alloy lead to an improvement tribocorrosion resistance compared to Ti-10Zr alloy intended for biomedical applications.

Keywords: Ti-10Zr alloy, TiO_2–ZrO_2 thin film, tribocorrosion, friction coefficient.

Corrosion Behavior of Aluminum Oxide Film Growth by Controlled Anodic Oxidation

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Abstract. Due to the light weight and good corrosion resistance, nowadays aluminum and its alloys are used in different industries in order to decrease the maintenance costs and also to increase the equipments lifetime cycle.When aluminum and its alloys are exposed to the extreme environments, the native aluminum oxide film lose the anticorrosive properties that lead to the damage of equipments and increasing the costs.In order to improve the anticorrosive and mechanical performances of aluminum and its alloys, different techniques are used: organic coatings, the growth of a thick aluminum oxide film through different methods, etc. The most used method for aluminum oxide growth is anodic oxidation. Anodic oxidation is an electrochemical method that allows to growth an aluminum oxide film with controllable characteristics. The aim of present paper was to growth on 1050 aluminum alloy surface nanoporous aluminum oxide films with improved anticorrosive properties. The obtained nanoporous aluminum oxide films were characterized morphological and structural by scanning electron microscopy coupled with X-ray energy dispersive analyzer. The anticorrosive properties were evaluated by electrochemical methods such as: open circuit potential, electrochemical impedance spectroscopy and cyclic voltammetry. The results showed that anodic oxidation treatment improve the anticorrosive performances of 1050 aluminum alloy.

Keywords: anodic oxidation, corrosion, electrochemical methods, electrochemical impedance spestroscopy

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Technique Incorporating Cooling & Contraction / Expansion Analysis to Illustrate Shrinkage Tendency in Cast Irons

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Abstract. Commercial cast iron [more than 70% of the total world metal casting production] is a typical multi-phase, natural metal matrix composite. With the more widespread adoption of thermal analysis testing, thermal analysis data have become an indicator of cast iron quality. An experimental device was developed with a technique to simultaneously evaluate cooling curves and expansion or contraction of cast metals during solidification. Undercooling at the end of solidification relative to the metastable (carbidic) equilibrium temperature and the expansion within the solidification sequence appear to have a strong influence on the susceptibility to macro - and micro - shrinkage in ductile iron castings. Green sand moulds, as less rigid moulds, encourage the formation of contraction defects, not only because of high initial expansion values, but also because of a higher cooling rate during solidification and, consequently, increased undercooling below the metastable equilibrium temperature up to the end of solidification.

Keywords: Cast iron, solidification, thermal analysis, cooling curves, contraction curves, undercooling, contraction defects, mould, carbides

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Microstructural Investigations on Mg-2Ca-0.2Mn-0.5Zr-1Y Biodegradable Alloy

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Abstract. Authors elaborated a five component material using specific magnesium master alloys with several elements resulting a potential biocompatible and biodegradable alloy.The main goal of the present paper is to investigate the properties of some master Mg-2Ca-0.2Mn-0.5Zr-1Y alloy. The surface morphology was characterized using X-ray diffraction (XRD), optical microscopy and scanning electron microscopy (SEM). After the XRD analysis, it have been identified the following compounds, such as Mg, Mg_2Ca, $Mg_{24}Y_5$, respectively MgY. These compounds have the hexagonal crystallographic structure for Mg and Mg_2Ca type, respectively cubic form for Mg-Y and $Mg_{24}Y_5$. The microstructure presents a uniform morphology and an undisclosed zirconium. Also, manganese is embedded in magnesium and Ca forms a lamellar eutectic mixture of Mg_2Ca type. In conclusion, Mg-2Ca-0.2Mn-0.5Zr-1Y alloy shows similar characteristics from the microstructure point of view with other biodegradable materials, these alloy could be used as biodegradable implant.

Keywords: biodegrable alloy, SEM, XRD, EDS

Obtaining and Mechanical Properties of Ti-Mo-Zr-Ta Alloys

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Abstract. Ti-based alloys are successfully used in the area of orthopedic biomaterials for their enhanced biocompatibility, good corrosion and mechanical properties. The most suitable metals as an alloying element for orthopedic biomaterials are zirconium, molybdenum and tantalum because are non toxic and have good properties. The paper purpose development of two alloys of Ti-Mo-Zr-Ta (TMZT) prepared by arc-melting with several mechanical properties determined by microindentation. The mechanical properties analyzed was Vickers hardness and dynamic elasticity modulus. The investigated alloys presents a low Young’s modulus, an important condition of biomaterials for preventing stress shielding phenomenon.

Keywords titanium alloys, biomaterials, mechanical properties, TMZT alloys.

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Morpho-Structural Characterization of WC20Co deposited layers

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Abstract. Turbine hydroelectric power plants are mechanical equipment used in power plants and have strong turbines that use the power of water to produce electricity. In this paper we propose a solution that will increase the efficiency of turbine operation by implementing new innovative technologies to increase the working characteristics by depositing hard thin films of tungsten carbide. For this purpose hard tough deposits with WC20Co and Jet Plasma Jet on X3CrNiMo13-4 stainless steel were used for the realization of the Francis turbine with vertical shaft.

Keywords: microstructure, turbine blades, microhardness, roughness, plasma jet method.

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Microstructural Characterization of Metallic Alloys Obtained by Levitation Technique

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Abstract. The paper refers to the microstructure feature after levitation melting of two metallic materials, copper and aluminium alloys. In order to describe the microstructure evolution in different zones, a optical and scanning electron microscopy analysis and microhardness have been performed, both in transversal and longitudinal cross section of metallic ingot. Some diferences in microstructure aspects and microhardness are related to the diferent values of melting parameters (high frecvency, tension and current).

Keywords: Levitation melting, microstructure, microhardness, metallic alloys
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Micro-twinning and Shearing Mechanism for Ni-Cr Alloys

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Abstract. The paper presents fundamental aspects of main types of mechanism for deformation of Ni-Cr super alloys, such as micro-twinning and shearing.The nature of micro-twinning consists in dislocation of movement at atomic level. This movement is explained by shockley partial dislocations which are partial propagated thru γ precipitates.Other diffusion phenomena associated with micro-twinning such as segregation of heavy elements is also discussed in the paper. Finally the influence of γ and γ' microstructure on micro-twinning deformation mode is also discussed.

Keywords: Inconel, alloys, micro-twinning, diffusion, microstructure, testing.

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Surface Characterization of New Biomaterials

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Abstract. This paper presents the characterization of new alloys CoCrMoSi6, CoCrMoSi7, CoCrMoSi10, in terms of hardness determinations, fractographic analysis and surface analysis. The original version of the alloy was obtained by casting process in a vacuum arc furnace. Experimental results obtained from this study confirms that by increasing content of silicon, the mechanical properties are superior and the positive results obtained at surface studies favoring the formation of compounds, that lead to the reduction of alloying grade for α solid solution and the plasticity of the alloys.

Keywords: cobalt alloys, surface, fractographic analysis, hardness test

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The Structure and Properties of Rapid Cooled Iron Based Alloy

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Abstract. In this paper we studied the structure and various properties of rapidly cooled alloy which composition was based on iron. The microhardness and wearing resistance of synthesized samples were measured. Samples were prepared using arc melting under protective atmosphere of argon and then casted in the process of rapid cooling into water cooled copper mold. The high purity samples in the form of plates were obtained. According to study results, those type of materials exhibit desirable properties in comparison with conventional alloys.

Keywords: structure, rapid cooling metallic alloys, microhardness, wearing resistance

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Structure and Magnetic Properties of Composites Made on the Basis of Fast Cooled Iron Matrix Sample and Epoxy Resin

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Abstract. The paper presents the study results of composites made on the basis of fast cooled iron matrix sample and epoxy resin Epidian 100. The amorphous volumetric alloy was low-energy powdered and divided into three fractions: 20 - 50 μm, 50 - 100 μm and 100 - 200 μm and then assembled using epoxy resin. As a result of the microstructure studies, it was found that the metallic alloy composite is amorphous. Computer tomography was used to analyze the composition of composites. It was found that there was an excess volume of pores in the samples. The influence of fraction size on magnetic properties, ie: maximum magnetic permeability, saturation magnetization, and coercive field are also presented.

Keywords: epoxy resin, rapid cooling metallic alloys, structure, computer tomography, magnetic properties

Preliminary Microstructural and Microscratch Results of Ni-Cr-Fe and Cr3C2-NiCr Coatings on Magnesium Substrate

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Abstract. Thermal coatings have a large scale application in aerospace and automotive field, as barriers improving wear mechanical characteristics and corrosion resistance. In present research, there have been used two types of coatings, Ni-Cr-Fe, respectively Cr3C2-NiCr which were deposited on Mg based alloys (pure magnesium and Mg-30Y master alloy). There have been investigated the microstructural aspects through scanning electronic microscopy and XRD analysis and also a series of mechanical characteristics through microscratch and indentation determinations. The results revealed the formation of some adherent layers resistant to the penetration of the metallic indenter; the coatings did not suffer major damages. Microstructural analysis highlighted the formation of Cr3C2, Cr7C3, Cr3Ni2, Cr7Ni3, FeNi3 phases. Also, the apparent coefficient of friction for Ni-Cr-Fe coatings presents superior values than Cr3C2-NiCr coatings.

Keywords: APS coatings, SEM, XRD, scratch, microindentation

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Corrosion Evaluation of Some Phosphated Thin Layers on Reinforcing Steel

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Abstract. In this work we studied the evaluation of corrosion of chemical deposited phosphate layers on the OB37 steel used in construction. The experimental determinations were performed for short term immersion, and the samples were characterized by scanning electron microscopy. By using electro-chemical impedance spectroscopy, the corrosion speed of the alloys was investigated. The corrosive resistance of the reinforcing steel is much improved.

Keywords: corrosion resistance; reinforcing steel; zinc phosphates; coating;.

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Corrosion Studies of Fly Ash and Fly Ash-Slag Based Geopolymer

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Abstract. This paper presents the results of corrosion studies between Fly Ash Geopolymer (FG) paste and Fly Ash-Slag Geopolymer (FSG) paste. Geopolymer was made from aluminosilicate inorganic polymers mixed with the alkaline activator in order to reduce the carbon dioxide (CO_2) to the ecosystem. Samples then were cured at 60ºC for 24 hours in the oven. Reinforcement bar is placed at the center of the paste. The samples were examined after 7, 14 and 28 days in terms of Open Circuit Potential (OCP) test, phase analysis and morphology analysis. The potential values regarding OCP test for FSG paste from 7 days until 28 days are 0.464 mV, 0.474 mV and 0.498 mV more positive than FG paste which the potential values are 0.087 mV, 0.133 mV and 0.206 mV respectively. From the Pourbaix diagram, all the potential values for FG paste and FSG paste were located in the same Fe_2O_3, passivity region. Passive layer which is the oxide form exists in this region to protect the reinforcement bar from corrosion agents. It can be proved from phase analysis result which Fe_2O_3 peak exists. The differences of morphological structures of these pastes were observed by Scanning Electron Microscope (SEM). It shows that FSG paste had good corrosion performance and low corrosion rate compared to FG paste.

Keywords: corrosion, fly ash, geopolymer, passivity, slag.

The Physical and Mechanical Properties of Gellan Gum Films Incorporated Manuka Honey as Wound Dressing Materials

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Abstract. In this study, the mechanical and physical properties of gellan gum (GG) films incorporated manuka honey were investigated. The results show that by increasing the honey content in GG films, the swelling, gel fraction and mechanical properties were decreased. Gellan gum films incorporated with highest concentration of honey at 10% (GEL-H10) has the lowest tensile strength and elastic modulus at 914 ± 21 kPa and 2060 ± 15 kPa, respectively compared to GG films at lower concentrations of honey. The water vapour transmission rates of GEL-H10 film were recorded at 1145 ± 175 $g\ m^{-2}\ d^{-1}$ and comparable with the commercial wound dressing product. This film has shown promising results to be used as wound dressing materials.

Keywords: biomaterials, hydrogels, wound dressing, honey.

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ZnO Photoanode Effect on the Efficiency Performance of Organic Based Dye Sensitized Solar Cell

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Abstract. Dye sensitized solar cell has been emerged as one of the most promising candidates for photovoltaics applications in good quality of their low manufacturing cost and impressive conversion energy. Titanium dioxide (TiO2) which is used as photoanode in the market has the advantage of wide bandgap energy but low in electron mobility (~10 cm2/(V.s)). Ruthenium in the other hand, as the dye sensitizer is a rare noble metal and harmful to human health. Thus, this article reveals the performance of photo-to-electric conversion efficiency with the usage of Zinc Oxide as photoanode with higher electron mobility (155 cm2/(V.s)) compared to TiO2 utilizing three natural fruit dyes of Prunus domestica, Magnifera indica and Citrus limon. ZnO and TiO2 photoanodes were fabricated using sol gel and dr blade method respectively. The morphology of the photoanodes were characterized using Scanning Electron Microscope and the efficiency of the complete DSSC with all different fruit dyes were characterized using Semiconductor Parametric Analyzer. The different property of electron mobility photoanodes effect in DSSC proved to give better performance with the photoconversion efficiency of 3.082% using ZnO with Prunus domestica dye. This article also reveals that pH indicator does not affect the selection and the performance of DSSC.

Keywords: solar cell, dye sensitized solar cell, zinc oxide, titanium dioxide, organic dye.

Indium (In) effects to the efficiency performance of $Ga_{1-x}In_xP$/GaAs based Solar Cell using Silvaco software modelling & simulation

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Abstract. $Ga_{1-x}In_xP$ composition have been applied to the top cell of multi-junction GaInP/GaAs based solar cell and currently have achieving a conversion efficiency of more than 46%, however its capability is unclear. We performed an analysis using Silvaco simulation method to evaluate the effect of In and the substitution was made to the $Ga_{1-x}In_xP$ for the range of x from 0 to 1. We found that the highest efficiency recorded was 17.66 % when the composition of Indium was x=1. The efficiency has been increasing about 11.71 % from x=0 to x=1 In content. As the composition of In raised, the value of efficiency and short circuit current density, J_{sc} also become higher (13.60 mA/cm^2) by having a greater photon absorption in a wider band gap energy. In addition to that, V_{oc}, P_{max}, V_{max}, I_{max} and fill factor was measured to be 2.15 V, 2.44 mW/cm^2, 2.0 V, 1.22 mA/cm^2 and 83.34 respectively. In conclusion, this study confirms that the existence of In in $Ga_{1-x}In_xP$ improves the solar cell efficiency by gaining a higher energy gap and producing more electrons for better achievement in multilayer solar cell applications.

Keywords: Indium (In), Efficiency performance, $Ga_{1-x}In_xP$/GaAs Solar Cell, Silvaco software, modeling & simulation

Structural and morphological investigation for water-processed Graphene Oxide/Single-Walled Carbon Nanotubes hybrids

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Abstract. The New group of materials derived from hybridization of single walled carbon nanotubes (SWCNTs) and graphene oxide (GO) which resulting novel three dimensional (3D) materials generates an outstanding properties compared to corresponding SWCNTs and GO/Graphene. In this paper, we describe a simple approach using water processing method to develop integrated rGO/GO-SWCNT hybrids with different hybrid ratios. The hybrid ratios were varied into three divided ratio and the results were compared between pristine SWCNTs and GO in order to investigate the structural density and morphology of these carbonaceous materials. With an optimized ratio of rGO/GO-SWCNT, the hybrid shows a well-organized hybrid film structures with less defects density sites. The optimized mixture ratio emphasized the important of both rGO and SWCNTs in the hybrid structures. Morphological structural and defects density degrees were examined by Field Emission Scanning Electron Microscopy (FESEM) and Raman spectroscopy.

Keywords: electronic materials, graphene oxide, hybrid carbon nanotubes

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Surface Topographical Modification of Coronary Stent: A Review

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Abstract. Driven by the urge of mediating the inflammatory response from coronary stent implant to improve patency rates of current coronary stent, concern has been focus on reducing the risk of in-stent restenosis and thrombosis for long-term safety. Surface modification approaches has been found to carry great potential due to the surface is the vital parts that act as a buffer layer between the biomaterial and the organic material like blood and vessel tissues. Nevertheless, manipulating cell response in situ using physical patterning is very complex as the exact mechanism were yet elucidated. Thus, the aim of this review is to summarize the recent efforts on modifying the surface topography of coronary stent at the micro- and nanometer scale with the purpose of inducing rapid in situ endothelialization to regenerate a healthy endothelium layer on biomaterial surface. In particular, a discussion on the surface patterns that have been investigated on cell selective behaviour together with the methods used to generate them are presented. Furthermore, the probable future work involving the surface modification of coronary stent were indicated.

Keywords: Coronary stent, surface patterning, surface structuring, in-situ endothelialization, selective cell growth, cell guidance

SECTION 2

PROCEDURES AND TECHNOLOGIES FOR MATERIALS ENGINEERING

A Recovery Process of Active Cathode Paste from Spent Li-Ion Batteries

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Abstract. In this work, the depleted active paste from spent lithium–ion batteries was separated from cathode by means of ultrasonic vibration. First the unit cells were discharged in brine at room temperature, for safety reasons. Then anode, separator, electrolyte and cathode were separated. Spent Li-Ion batteries were introduced into a washing container to separate electrode materials from their support substrate: active paste (lithium cobalt oxide – $LiCoO_2$) from cathode (Al foil) and graphite from anode (Cu foil). The Al foil and Cu foil were also recovered. A cleaning efficiency of 91% was achieved using a solution of 1.5 M acetic acid after a 6 minute time of exposure into an ultrasonic washing container with a frequency and electric power of 50 kHz and 50 W, respectively. The XRD patterns and the morphology of $LiCoO_2$ powder were presented.

Keywords: spent Li-ion batteries, active paste, acetic acid, ultrasonic bath.

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Research on Lessening of the Bonding Effects between the Metallic and Nonmetallic Surfaces Through the Graphite Films

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Abstract. The researchings performed in the frame of doctoral thesis “Research on lessening of the bonding effects between the metallic and nonmetallic surfaces through the graphite films” were aimed to identify the phenomena that occur at the interface metal/ film of graphite, and to identify also the technological applications that it may have the surface treatment for submitting the films of graphite on metallic surfaces achieved through an innovative process of electrical pulsed discharges. After the research works from the PhD theme above mentioned, a number of interesting properties of graphite pellicle have been identified ie reducing of metal surface polarity. This led to drastic decreases for the values of adhesion when bonding of metal surfaces was performed using a structural polyurethane adhesive designed by ICECHIM. Following the thermo-gravimetric analysis, performed of the graphite film obtained by process of electrical pulsed discharges, have been also discovered other interesting properties for this,ie reversible mass additions at specific values of the working temperature Chemical and scanning electron microscopy analysis have revealed that on the metallic surface subjected to electrical pulsed discharges process, outside the graphite film, it is also obtained a series of spatial formation composed of carbon atoms fullerenes type which are responsible for the phenomenon of addition of mass

Keywords: electrical pulsed discharges, graphite film, fullerene.

A Versatile Method for Nanostructuring Metals, Alloys and Metal Based Composite

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Abstract. A new severe plastic deformation method based on High Pressure Torsion is described. The method patented as High Speed High Pressure Torsion (HSHPT) shows a wide scope and excellent adaptability assuring large plastic deformation degree on metallic alloys, even on hard to deform or brittle alloys. This paper presents results obtained on aluminium, magnesium, titanium, iron and coper based alloys. In addition, capability of HSHPT to process metallic composites is described. The variation of severe plastic deformation parameters, for these different types of alloys, were analysed. OM SEM, TEM, XRD and HV investigation methods were employed to confirm fine and ultrafine structure.

Keywords: HPT, HSHPT, severe plastic deformation, nanostructure, TEM.

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Study on Fired Clay Bricks by Replacing Clay with Palm Oil Waste: Effects on Physical and Mechanical Properties

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Abstract. Palm oil is one of the major agricultural industries in Malaysia. Due to the poor management system, the discarded palm oil waste has always been linked to the environment issues. During processing of palm oil, a considerable amount of solid waste by-products in the form of fibres, shells, empty fruit bunches and fly ashes are produce rapidly. Therefore, this study was conducted to incorporate 1%, 5% and 10% of palm oil waste into fired clay brick. Samples of brick were fired at 1050°C temperature with heating rates of 1°C/min. Manufactured bricks were tested with physical and mechanical properties including firing shrinkage, dry density, water absorption, initial rate of suction, porosity and compressive strength. The results demonstrated that the replacement of 1% up to 5% of palm oil waste has improved several properties, although, a decrease of performance in certain aspects has also been observed. As a result, palm oil waste can be utilized in an environmentally safe way into fired clay brick thus providing adequate properties of fired clay brick.

Keywords: palm oil waste, fired clay brick, agricultural waste, physical and mechanical properties

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Performance and Characterization of Geopolymer Concrete Reinforced with Short Steel Fiber

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Abstract. In the recent years, geopolymer concrete are reporting as the greener construction technology compared to conventional concrete that made up of ordinary Portland cement. Geopolymer concrete is an innovative construction material that utilized fly ash as one of waste material in coal combustion industry as a replacement for ordinary Portland cement in concrete. The uses of fly ash could reduce the carbon dioxide emission to the atmosphere, redundant of fly ash waste and costs compared to ordinary Portland cement concrete. However, the plain geopolymer concrete suffers from numerous drawbacks such as brittleness and low durability. Thus, in this study the addition of steel fiber is introduced in plain geopolymer concrete to improve its mechanical properties especially in compressive and flexural strength. Characterization of raw materials also determined by using chemical composition analysis. Short type of steel fiber is added to the mix in weight percent of 1 wt%, 3 wt%, 5 wt% and 7 wt% with fixed molarity of sodium hydroxide of 12M and solid to liquid ratio as 2.0. The addition of steel fiber showed the excellent improvement in the mechanical properties of geopolymer concrete that are determined by various methods available in the literature and compared with each other.

Keywords: Geopolymer, fly ash, short steel fiber, compressive strength, flexural strength.

The Influence of Thermoplastic Starch and Banana Fibre Contents on Physical and Thermal Properties of LLDPE

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Abstract. Blending of linear low density polyethylene (LLDPE), thermoplastic starch (TPS) and banana fiber (BF) have been studied. Two types of systems were prepared; the matrix having different ratio of LLDPE/TPS and, the LLDPE/TPS composites having 5 – 30 wt% BF. Morphological changes using scanning electron microscope (SEM) were observed and its showed that TPS particle are homogenously dispersed in LLDPE matrix. On the other hand BF was found to be well embedded in TPS phase, showing the good interaction between BF and TPS phases. This observation show an agreement with the Young's modulus value which is increased with the BF contents. The increment in Young's modulus value was also attributed to the difficulties in LLDPE/TPS chains movement with the presence of BF.

Keywords: linear low-density polyethylene (LLDPE), thermoplastic starch, banana fibre.

Correlation of the Processing Parameters in the Formation of Granulated Ground Blast Furnace Slag Geopolymer

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Abstract. Geopolymers are inorganic materials with huge potential applications including building material, fire resistant materials, and agricultural construction materials. Various parameters influenced the final properties of these geopolymer concretes. This study developed the effects of several factors such as solid-to-liquid ratio, NaOH concentration, and Na_2SiO_3/NaOH ratio on the compressive strength of granulated ground blast furnace slag (GGBFS) by statistical design of experiment (DOE) approach. Analysis of the experimental results through ANOVA exhibited that the specimen with NaOH concentration of 10M, Na_2SiO_3/NaOH ratio equals to 2.5, and solid-to-liquid ratio of 3.0 curing at room temperatures for 28 days was potential of highest strength (168.705 MPa) in the considered procedure. Besides, the relationship between compressive strength and influential factors could be suitably by fraction factorial design method.

Keywords: geopolymer, slag, iorganic polymer, compressive strength, design of experiment.

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Obtaining and Characterization of Polyolefin-Filled Calcium Carbonate Composites Modified with Stearic Acid

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Abstract. To obtain high performance calcium carbonate-reinforced HDPE and PP composites, the dispersibility and compatibility of the inorganic phase in the polymer has been achieved through surface treatment of the amorphous calcium carbonate filler with stearic acid. The surface coating of the inorganic phase has been proved by XRD and FTIR spectroscopy, through forming of an intermediate layer of calcium stearate which acts as a surfactant [1,2], efficient in providing an optimum compatibility with the dominatingly hydrophobic polymer matrix, as determined from the structural information obtained through samples cross-sections analysing.

Keywords: HDPE, calcium carbonate, hybrid composites.

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Thermal Spraying of CuAlFe Powder on Cu5Sn Alloy

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Abstract. For the improvement of the physical and mechanical properties of both components and layers, a thermal spraying technology using Cu and Al based powders was employed. The selected powder is made of Cu alloyed mainly with Al (10-12%) and the samples were obtained using the CastoDyn DS8000, SSM 10 thermal spraying unit. This Cu-Al coating prevents possible damages of aluminum components arising from high temperature oxidation, due to the formation of resistant Cu-Al intermetallic compounds. These types of powders with high-temperature particle erosion resistance and oxidizing atmosphere resistance below 800 °C could be used in reconditioning of several tools and instruments, having also potential use in the renewable energy field (IR-absorbant coatings).

Keywords: thermal spraying, CuAl powder, mechanical properties.

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Simulation of Impact Phenomena on the Composite Structures Containing Ceramic Plates and High Entropy Alloys

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Abstract. Due to excellent mechanical properties, high entropy alloys from the system AlxCrFeCoNi can be used successfully to create composite structures containing both metallic and ceramic plates, which resists at dynamic load during high speeds impact (like projectiles, explosion). The paper presents four different composite structures made from a combination of metallic materials and ceramics plates: duralumin-ceramics, duralumin-ceramics-HEA, HEA-ceramics-HEA, HEA-ceramics-duralumin. Numerical simulation of impact behavior of the composite structures was performed by virtual methods, taking into account the mechanical properties of both materials. The best results were obtained using composite structures HEA-ceramics-HEA, HEA-ceramics-duralumin.

Keywords: simulation, composite structures high entropy alloys, ceramics.

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The Simullation of Point Contact Stress State for APS Coatings

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Abstract. Surface engineering has been conquered in recent decades by the versatility of the layers produced by thermal spraying, both in terms of spraying methods, of the materials types and their applications. In some cases, the coatings can be subjected during operation to rolling contact fatigue, with the main wear factors: thermal spray coatings structure and state of stress and strain in the contact area. In this paper was studied how three types of coatings deposited by APS (Atmospheric Plasma Spray) behaved at the contact fatigue tests. Subsequently they were carried out simullation of pressures and von Mises stresses distribution. It has been observed that the presence of asperities on the surface causes the development of local micro-contacts and therefore high values of pressure and local stresses in the vicinity of the surface.

Keywords: simulation, APS coating, point contact stress, rolling contact fatigue

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New Bond Coat Materials Processed via Different Routes

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Abstract. This paper aims to describe the development of new Ru-based Bond Coats (BC) as part of Thermal Barrier Coatings. The challenge of this research was to obtain an adherent and uniform layer of alumina protective layer after oxidation.We have prepared a RuAl 50/50 at% alloy in an induction furnace which was subsequently subjected to oxidation in an electric furnace, in air, at 1100C, for 10h and 100h.Mechanical alloying of Ru and Al powders was another processing route used in an attempt to obtain a stoichiometric RuAl. The alloy was sintered by Spark Plasma Sintering (SPS) and then oxidized at 1100C for 1 and10h. The alloys obtained as such were analyzed before and after oxidation using advanced microscopy techniques (SEM and TEM). The encouraging results in case of RuAl alloys prepared by induction melting reveal that we obtained an adherent and uniform layer of alumina, free of delta-Ru. The results for the samples processed by poder metallurgy were positive but need to be further investigated. We should note here the novelty of this method for this particular type of application – as a BC part of a TBC system.

Keywords: RuAl, Bond coats, thermal barrier coatings, high temperature oxidation, powder metallurgy.

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Obtaining of High Cr Content Cast Iron Materials

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Abstract. We have obtained, through the classic casting process, 3 highly chromium-based experimental alloys proposed for replacing the FC 250 classical cast iron in braking applications. Casting was carried out in an induction furnace and cast into molds made of KALHARTZ 8500 resin casting mixture and HARTER hardener at SC RanCon SRL Iasi. It is known that the microstructure of the cast iron is a combination of martensite with a small amount of residual austenite after the heat treatment of the ingot. In the case of high-alloy chromium alloys, the performance of the material is due to the presence of M_7C_3 carbides distributed in the iron matrix Resistance to machining and deformation is based on alloy composition and microstructure, while abrasion resistance will depend on properties and wear conditions.

Keywords: high Cr content, cast iron, braking system.

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Experimental Equipment for Damping Capacity Analyze of High or Low Internal Friction Metallic Materials

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Abstract. An experimental equipment type torsion pendulum was made in laboratory in order to analyze the damping capacity of metallic materials. The scheme of the equipment is presented, 2D and 3D visions at real scale. The equipment functioning (mechanical and electrical part) and principles are presented. In this article we present some preliminary experimental results obtained on different materials (aluminium, steel etc.) using two different methods for registration the outputs (one based on optoelectronic device with Arduino acquisition board and second on video analyze (cinematic review: video to jpeg) of the damped motion of the lead pendulum). Steel materials were with shoot penning surface modification with and without heat treatment in order to establish the heat treatment influence on the damping capacity property.

Keywords: low internal friction, cinematic review, SEM

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Preliminary Results from Duplex Procedure Apply to Obtain Fe-Base Materials for Automotive Applications

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Abstract. Iron based materials still represent a high percentage from metallic materials used in industry, in general, and in automotive industry, in particular. In this case we used a duplex process in order to obtain the FeMnSiAl experimental alloy for a more efficient use of various units. In the first stage iron, manganese, silicon and aluminium were melted and mixed together using arc melting technology and for the second stage the alloy was re-melt for homogeneity in an induction furnace. Chemical composition, after each melting step, was analyzed using EDS Bruker detector for various areas and microstructural characterisation using SEM, VegaTescan LMH II with SE detector, equipment. This alloy is proposed as a metallic approach of mechanical dumpers used in automotive industry for low and medium impact contacts.

Keywords: damping capacity, SEM, EDS

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Preliminary Results on the Surface of A New Fe-Based Metallic Material after "In Vivo" Maintaining

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Abstract. A new Fe-based alloy was obtained using UltraCast melting equipment. The alloy, after mechanical processing, was implanted in five rabbit specimens (with respect for the "in-bone" procedure). After 30 days of implantation the samples were recovered and analyzed by weight and surface state meanings. Scanning electron microscopy technique was used to determine the new compounds morphology from the metallic surface and X-ray dispersive energy spectroscopy for chemical analyze results. A bond between the metallic material and biological material of the bone was observed through increasing of sample weight and by SEM images. After the first set of tests, as the samples were extracted and biologically cleaned, the samples were ultrasonically cleaned and re-analyzed in order to establish the stability of the chemical compounds.

Keywords: biodegradable materials, SEM, EDS, ultrasonically.

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Electro-chemical behavior of low carbon steel under H2S influence

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Abstract. A commercial low carbon steel material (P265GH) with application at industrial scale for natural gas delivery and transportation systems was analyzed in H2S atmosphere. The article proposed a new experimental cell in order to establish the behavior of the material in sulfur contaminated environment. In most of the industrial processes for gas purification the corrosion rate is speed up by the presence of S (sulfur) especially as ions or species like H2S [1, 2]. The H2S (hydrogen sulfide) is, beside a very toxic compound, a very active element in the acceleration of metallic materials deterioration especially in complex solicitations like pressure and temperature in the same time. For experiments we used a three electrodes cell with Na2SO4 + Na2S solution at pH 3 at room temperature (~ 25 °C) to realize EIS (electrochemical impedance spectroscopy) and potentiodynamic polarization experiments. Scanning electron microscopy and X-ray dispersive energy spectroscopy were used to characterize the metallic material surface exposed to experimental environment.

Keywords: natural gaseous, petroleum, H2S, EIS, SEM/EDS

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CMT Welding of Low Carbon Steel Thin Sheets

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Abstract. After almost 80 years from the industrial implementation of GMAW, this proces remains the most commonly used welding technology. Nowadays, lighter materials are used to reduce the manufacturing costs and the overall weight of the welded structures (eg. automotive industry). This paper addresses to the **C**old **M**etal **T**ransfer [1] MAG welding of low carbon steel thin sheets and highlights the advantages of using CMT process for but joining of S235 sheets through comparing with the conventional synergic pulse MAG welding. A lower weld bead area and heat affected zone is obtained by the continuous movement of the wire that is digitally synchronised with the short-circuit of the arc. The influence of the welding speed on the geometry profile of the wel bead and mechanical behaviour of the joints are discussed. The CMT welding can produce good weld joints even in unfavourable conditions, such as thin plates and wires with higher diamete.

Keywords: Cold metal transfer, low carbon steel, micro-hardness

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Ionic Liquid Surface Treatment of Calcite for Improved Compatibility with Polyolefin Matrix

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Abstract. Preliminary surface treatment of crystalline marble powder filler with a dominatingly hydrophobic ionic liquid, namely triethylsulfonium-bis(trifluoromethylsulfonyl) imide has been employed to design a filler with improved compatibility towards non-polar polymer matrices [1,2], such as polyolefins. The maximum uptake of ionic liquid per 1g of marble powder was 132 mg. The surface coating of the crystalline phases has been proved by XRD and FTIR spectroscopy, making our method useful in designing fillers with improved dispersibility/ compatibility in/with polyolefins. The floating test method has proved the efficiency of the alkylsulfonium ionic liquid in hydrophobization of the crystalline calcite-rich phase, thus proving useful in obtaining composites with improved properties.

Keywords: ionic liquids, calcium carbonate, surface properties.

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Structural Modifications of Superficial Layer of C45 Steel Samples Through WT20 and WZr8 Depositions

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Abstract. The paper presents technological aspects regarding the modification of mechanical chracteristics in the superficial layer of C45 steel samples, through thin layers deposition using WT20 and WZr8 electrodes. Deposition of thin layers was made through electrical discharge method in impulse. The obtained samples were microstructural analyzed, at various magnitudes, on an VegaTescan electronic microscope. Also, measurements of mechanical chracteristics were made through indentation, highlighting the improved values after layers deposition with the 2 electrods.

Keywords: deposition, low alloyed steel, tungsten, hardness, carbides

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SECTION 3

MATERIALS APPLICATION

Scientific Ground of a New Optical Device for Contactless Measurement of the Small Spatial Displacements of Control Object Surfaces

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Abstract. It is proposed scientific computational and experimental ground of developed a new optical device for contactless measurement of the small spatial displacements of control object surfaces based on the use of new methods of laser interferometry. The device allows one to register the linear and angular components of the small displacements of control object surfaces during the control of the state of the constructional materials for load-bearing elements of goods in their application by using acoustic non-destructive testing. The proposed device is protected by patents of the Russian Federation for the invention.

Keywords: laser interferometer, interference pattern, measurement of small displacements, object of control.

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Wireless Sensors for Wind Turbine Blades Monitoring

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Abstract. EU studies the possibility to update air pollution standards for thermal power station based on coal, in the conditions in which this type of installation represent the biggest source of sulfur dioxide and mercury, nitrogen oxides, arsenic, lead and cadmium emissions. Thus, the market for electrical energy obtained by harvesting wind power is expanding. In these conditions, in order to increase the power of turbine, wind turbine producers use glass fiber reinforced plastics in the construction of wind turbine blades (WTB) because these allow due to low weight, the increase of blade's dimensions. Nondestructive testing techniques for in-service inspection and determination of high risk degradation regions of blades are growing, function of the type and blade dimension, being based on numerous studies and researches. The nondestructive testing must be carried out both during the fabrication process as well as during the functioning of the blades, first for the decreasing of fabrication and maintenance costs and for reduced downtime. The blades are usually subject to random and complex mechanical stresses. The most common defects in turbine blades may be faulty microscopic and mesoscopic appeared in matrix, no detected by classical nondestructive testing (i.e. using phased array sensors), broken fibers can also appear and develop under moderated loads, or cracks and delaminations due to low energy impacts, etc. The paper propose to present the results obtained from testing of GFRP used in the construction of the WTB as well as the monitoring of the entire scalable blade using wireless sensors placed on critical location on blade. In order to monitories the strain/stress] during the tests, the determination of the location and the nature of defects have been simulated using FEM.

Keywords: structural health monitoring, nondestructive testing, wind turbine blades, wireless sensors.

Development of Anticorrosive Polymer Nanocomposite Coating for Corrosion Protection in Marine Environment

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Abstract. The marine environment is considered to be a highly aggressive environment for metal materials. Steels are the most common materials being used for shipbuilding. Corrosion is a major cause of structural deterioration in marine and offshore structures. Corrosion of carbon steel in marine environment becomes serious due to the highly corrosive nature of seawater with high salinity and microorganism.To protect metallic materials particularly steel against corrosion occurrence various organic and inorganic coatings are used. The most used are the polymeric protective coatings. The nanostructured TiO_2 polymer coating is able to offer higher protection to steel against corrosion, and performed relatively better than other polymer coatings.

Keywords: corrosion, marine corrosion, steel, polymer coatings, nanoparticles, marine environment, shipbuilding, offshore

Thermokinetic Simulation of Precipitation in NiTi Shape Memory Alloys

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Abstract. Considering classical nucleation theory and evolution equations for the growth and composition change of precipitates, we simulate the evolution of the precipitates structure in the classical stages of nucleation, growth and coarsening using the solid-state transformation Matcalc software. The formation of Ni_3Ti, Ni_4Ti_3, Ni_3Ti_2 or Ni_2Ti precipitate is the key to hardening phenomenon of the alloys, which depends on the nickel solubility in the bulk alloys. The microstructural evolution of metastable Ni_4Ti_3 and Ni_3Ti_2 precipitates in Ni-rich TiNi alloys is simulated by computational thermokinetics, based on thermodynamic and diffusion databases. The simulated precipitate phase fractions are compared with experimental data.

Key words: thermokinetic simulation, precipitate, shape memory alloys.

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Pulsed Laser Cladding of Ni Based Powder

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Abstract. Nowadays, laser cladding is one of the most used technology for improving the properties of new surfaces or reconditioning of worn components [1,2]. This paper addresses to one step laser cladding of Metco 12C power. Single tracks were obtained on AISI 316 stainless steel substrate using a high power pulsed laser, respectively a 1064 nm pulsed laser together with a Precitec cladding head manipulated by a CLOOS 7 axes robot. The study demonstrates that very good cladded layers with low dilution and increased mechanical proprieties could be fabricated using pulsed laser. Moreover, the influence of the process parameters on the geometry and quality of the Metco 12C tracks are discussed.

Keywords: Laser cladding, dendrite structures, dilution

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Research Regarding the Influence of the Elaboration Process and Heat Treatment over the Working Resistance of a Planetary Shaft under Cyclic Stress

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Abstract. The study analyzes the influence of the elaboration process and the heat treatment (superficial martensitic hardenning process with concentrated heat sources) over the metallographic structure and mechanical performances of a cillindrical planetary shaft that broke down during operation. The studied material is a improvement steel for mechanical constructions Ck45 (OLC 45). The samples were studied in terms of chemical composition, metallographic structure at the breaking point and at the median area and the material state regarding inclusions. Mechanical properties were also determined (resillience and hardness) and the break surface was analyzed through scanning electron microscopy (SEM) in order to determine the primer rupture and the steps of fissure propagation.

Keywords:steel inclusions, shaft crack, metalloraphic structure.

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Aeronautical Industry Requirements for Titanium Alloys

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Abstract. The project presents the requirements imposed for aviation components made from Titanium based alloys. Significant portions of the aircraft pylons are manufactured from Titanium alloys.The primary factors to consider in aircraft structures are strength, weight, and reliability. These factors determine the requirements to be met by any material used to construct or repair the aircraft.Many forces and structural stresses act on an aircraft when it is flying and when it is static and this thesis describes environmental factors, conditions of external aggression, mechanical characteristics and loadings that must be satisfied simultaneously by a Ti-based alloy, compared to other classes of aviation alloys (as egg. Inconel super alloys, Aluminum alloys).For this alloy class, the requirements are regarding strength to weight ratio, reliability, corrosion resistance, thermal expansion and so on. These characteristics additionally continue to provide new opportunities for advanced manufacturing methods.

Keywords: Titanium, alloys, requirements, properties, aircraft, aeronautics, testing, stress, reliability, manufacturing.

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Aeronautical Requirements for Inconel 718 Alloy

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Abstract. The project goal is to present the requirements imposed by aviation components made from super alloys based on Nickel. A significant portion of fasteners, locking lugs, blade retainers and inserts are manufactured from Alloy 718.

The thesis describes environmental factors (corrosion), conditions of external aggression (salt air, intense heat, heavy industrial pollution, high condensation, high pressure), mechanical characteristics (tensile strength, creep, density, yield strength, fracture toughness, fatigue resistance) and loadings (tensions, compression loads) that must be satisfied simultaneously by Ni-based super alloy, compared to other classes of aviation alloys (as egg. Titanium alloys, Aluminum alloys).

For this alloy the requirements are strength, durability, damage tolerance, fail safety and so on. The corrosion can be an issue, but the fatigue under high-magnitude cyclic tensile loading it what limits the lifetime of the airframe.

The excellent malleability and weldability characteristics of the 718 system make the material physical properties tolerant of manufacturing processes. These characteristics additionally continue to provide new opportunities for advanced manufacturing methods.

Keywords: Inconel, alloys, requirements, corrosion, characteristics, aeronautics, testing, stress, reliability, manufacturing.

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Preventing Bacterial Infections using Metal Oxides Nanocoatings on Bone Implant

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Abstract. Nowadays bone implant removal is caused by infection that occurs around it possibly acquired after surgery or during hospitalization. The purpose of this study was to reveal some metal oxides applied as coatings on bone implant thus limiting the usual antibiotics-resistant bacteria colonization. Therefore ZnO, TiO2 and CuO were synthesized and structurally and morphologically analized in order to use them as an alternative antimicrobial agents deposited on bone implant. XRD, SEM and FTIR characterization tehchniques were used to identify structure and texture of these nanoscaled metal oxides.These metal oxides nanocoatngs on implant surface play a big role in preventing bacterial infection and reducing surgical complications.

Keywords: implant, coatings, antibacterial, infection, zinc oxide, titanium oxide, copper oxide, structure, morphology.

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Fundamental Aspects on Conductive Textiles Implemented in Intelligent Systems

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Abstract. Conductive fibers, which are electrically conductive element having the structure of a fiber, have a fairly long history and have been used for applications in electronic textiles as well as aesthetics, anti-static and shielding purposes. Electrically conducting textile fibers such as gold-coated threads were produced in antiquity for aesthetic purposes, before the discovery of electricity, using various manufacturing methods. The textile intelligent systems, which comprises conducting textile structures (wires or structures electroconducting) presents a dynamic behavior which favors the self regulation of the thermal insulation and vapor permeability with the view to maintain the thermo-physiological balance; the clothing assembly has the module for monitoring the biologic potential, used only in critical situation.

Keywords: conductive fibers polyaniline, textile, intelligent systems

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Electrospun Based Polyaniline Sensors – A Review

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Abstract. Polyaniline is a polymer with outstanding electronic conductivity and good response to molecules at room temperature. This review focuses on the many uses of electrospun polyaniline nanofibers as chemical sensor with high sensitivity and functionality, providing a concise report of the present status of polyaniline gas sensing applications. Latest developments in this area are reported and the capability of PANi sensors to detect various gases is emphasized. Difficulties that may obstruct practical uses of these sensors are also summarized.

Keywords: polyaniline, conducting polymer, gas sensors

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The Effect of Alkaline Activators Ratio on the Strength of Fly Ash Based Geopolymer Paste

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Abstract. Alkaline activation of fly ash is a particular procedure in which ash resulting from a power plant combined with a specific alkaline activator creates a solid material when dried at a certain temperature. In order to obtain desirable compressive strengths, the mix design of fly ash based geopolymer pastes should be explored comprehensively. To determine the preliminary compressive strength for fly ash based geopolymer paste using Romanian material source, various ratios of Na_2SiO_3 solution/ NaOH solution were produced, keeping the fly ash/alkaline activator ratio constant. All the mixes were then cured at 60 °C for 24 hours and tested at 2,7 and 28 days, respectively. The aim of this paper is to present the preliminary compressive strength results for producing fly ash based geopolymer paste using Romanian material sources, the effect of alkaline activators ratio on the compressive strength and studying the directions for future research.

Keywords: alkaline activator, geopolymer paste, strength, ratio

Multifunctional Modules with Thermally Adjustable Axial Movement Obtained *via* High-Speed High Pressure Torsion from FeMnSiCr Shape Memory Alloy

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Abstract. Truncated cone-shaped modules were processed *via* high-speed high pressure torsion (HS-HPT), from circular crowns cut from axially-drilled ingots of Fe-28Mn-6Si-9Cr (mass %) shape memory alloy (SMA). Hardness measurements, static loading-unloading compression and low cycle fatigue (LCF) dynamic tests were performed, revealing hardness gradient reversion along cone generator, force plateaus both during loading and unloading stages and 50,000 cycles-LCF resistance, respectively. HS-HPT caused amorphous and nanocrystalline phases, while compression cycles enabled the occurrence of ε hexagonal close-packed stress-induced martensite, characterized by large densities of stcking faults. An experimental setup was designed and manufactured for adaptive pre-stressing of axial ball-bearings, being installed on specialized equipment for ball-bearing fatigue testing. By means of the experimental setup, the functionality of HS-HPT'ed modules was emphasized under the form of sudden increases of axial force and torque, associated with constrained recovery shape memory effect. This bevahior recommends the HS-HPT'ed multifunctional modules as viable efficient alternatives for the development of future self-adaptive displacement systems.

Keywords: high-speed high pressure torsion, shape memory alloy, nanocrystalline phase, thermomechanical training, martensitic transformation

Fungal Degradation of Pyridine-based Polyether Polyurethane

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Abstract. In these days when environmental concerns have become so significant, using the right raw materials for a better degradation of the polymeric material wastes is essential. In this context, the aim of this work was to investigate the influence of different pyridine derivatives (2-amino-3-hydroxypyridine, 2,3-diaminopyridine, 2,3-dihydroxypyridine and 3,4-diaminopyridine), used as chain extenders in the synthesis of the polyurethanes, upon the biodegradability of the obtained polymeric materials. Only the position and the nature of the functional group on the pyridine ring were changed during the synthesis of the polymers. We have selected *Alternaria Tenuissima*, as fungus species, to study the biodegradability of the polyurethanes. The biodegradation process was evaluated by FTIR spectroscopy, mechanical properties and surface morphology (using scanning electron microscopy). It was observed a modification of the culture’s colour and also the attack of the fungus in function of the chemical structure of the polymers. The fungal attack occurs especially in the hard segment region, the urethane and urea groups being affected. The mechanical properties decreased dramatically after biodegradation for the polymers obtained with 2-amino-3-hydroxypyridine and 2,3-diaminopyridine. Only the use of the 2,3-dihydroxypyridine as chain extender in the synthesis of the polyurethanes provides a good chemical resistance against fungus exposure.

Keywords: polyurethane, pyridine derivative chain extender, fungal biodegradation, mechanical properties.

Investigation of Bucket Wheel Excavator Lattice Structure Internal Stress in Harsh Environment through a Remote Measurement System

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Abstract. The paper shows the results of a lab model for strain gauges based measuring system for multiple measuring heads of the mechanical stress in lattice structures of the bucket wheel excavator for open pit mines-harsh environement. The system is designed around a microcontroller system. Because of specific working conditions, the measuring system sends data to a processing system (a PC with Matlab software), we have implemented a secure communication solution based on ISM standard, by using NRF24L01 module. The transceiver contains a fully integrated frequency synthesizer based on crystal oscillator, and a Enhanced ShockBurst™ protocol engine. The proposed solution has a current consumption arround 9.0 mA at an output power of -6dBm and 12.3mA in RX mode. Built-in Power Down and Standby modes makes power saving easily realizable for our solution battery powered. The stress from structures is taken by specific strain gauges adapted to low frequency vibrations. We are using a precision 24-bit analog-to-digital converter (ADC) designed for weigh scales and industrial control applications to interface directly with a bridge sensor- instrumentation device, with low drift voltage, low noise, common mode rejection signal, frequency and temperature stability. As backup implementation for measurements a high speed storage implementation is used.

Keywords: lattice structures health, mechanical stress, strain gauge, microcontroller system, remote tensometric measurements.

Acknowledgements

The paper is based on research activity that is the subject of a invention patent
The paper is a part of an European Union research project founded by the Coal and Steel Founding, RFCS agreement No. RFCR-CT-2015-00003 (BEWEXMIN)

Designing a Validation Method for Remote Measurements Dedicated to Investigation of Bucket Wheel Excavator Lattice Structure Internal Stress in Harsh Environment

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Abstract. The paper is a summarizing the validation stage of the strain gauges- based remote measurements in bucket wheel lattice structures. The validation process is required when multiple and synchronized measurements are required in harsh environment. The authors propose virtual models with specific interaction facilities demanded in dynamic measurement systems (like FFT parametrization). The provided data from the remote measurement system (8 heads, discrete values) are processed in time and frequency for completing the range of values, for data synchronization for realistic strain distribution for proposed lattice structures. The proposed validation method is also acting for cleaning the inter-channel influences in measurements.

Keywords: lattice structures health, remote tensometric measurements, mechanical stress, strain gauge, microcontroller system, interpolation process, validation process.

Acknowledgements

[1] The paper is based on research activity that is the subject of a invention brevet

[2] The paper is a part of an European Union research project founded by the Coal and Steel Founding, RFCS agreement No. RFCR-CT-2015-00003 (BEWEXMIN)

Designing Patern Recognition- Based Method for Fast Visual Inspection of the Bucket Wheel Excavator Lattice Structure

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Abstract. The proposed paper shows some experimental results of a research in metallic structures inspection by using a high definition camera controller by high processing capabilities. The dedicated ARM Cortex-M4 initializes the ARM Cortex-M0 system for image acquiring. Then, by programming options, we are action for patterns (abnormal situations like metal cracks, or discontinuities) types and tunning, for enabling overexposure highlighting and adjusting camera brightness/exposure, to adjust minimum brightness, and to adjust the pattern’s teach threshold. The proposed system has been tested in normal lighting conditions from the typical site.

Keywords: lattice structures health inspection, pattern recognition, visual inspection, microcontroller-based systems, Matlab, decision based systems.

Acknowledgements

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High Accuracy Investigation of Microwave Absorbtion in Polymer Electrical Components on Motherboard of Computers

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Abstract. Electronic operating at high frequencies can have problems with emission of high frequency noise. Once put inside an enclosure, the energy will add in phase at certain frequencies to cause resonances which will hinder the performance of the device. These absorbers are based upon open celled foam impregnated with a carbon coating. It is quite possible that in the near future, microprocessors would be to work on a frequency located in 5 to 10 GHz. In these circumstances it is useful to know how and how much of the electromagnetic field emitted by a microprocessor, it is absorbed by the circuit elements in the immediate vicinity of the microprocessor. The aim of this contribution is to demonstrate throughout high-level experimental analysis how the main electric parameters of polymer materials, which build the printed circuits and the one of electric capacitors and resistors, depend on the frequencies on which they work from the microwave range.

Keywords: polymer electrical components; X-band measuring line; E-field probe; TE10 mode, base support circuits.

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Designing and Implementation a Lab Testing Method for Power Cables Insulation Resistance Testing According with STAS 10411-89, SR EN ISO/CEI/17025/2005

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Abstract. Insulation resistance measurement is one of the most important tests required by standards and regulations in terms of electrical safety. Why these tests are is to prevent possible accidents caused by electric shock, damage to equipment or outbreak of fire in normal operating conditions of electrical cables. The ensulation resistance experiment refers to the testing of electrical cable insulation, which has a measured resistance that must be below the imposed regulations. Using a microcontroller system data regarding the insulation resistance of the power cables is acquired and with SCADA software the teste results are dysplaied.

Keywords: Insulation resistance, microcontroller, cable testing, mechanical stress.

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Decreasing the Functioning Consumptions of Plastics Injection Moulding Machines

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Abstract. A share of about 75% in the cost of a plastic moulded part is held by the energy consumption of the injection machine. It is the heating system of the plasticing unit which is responsible for the energophague character of the processus. The transfer rate from the heating elements to the plasticing cylinder depends hardly on the geometry of the system. A new heating system is designed, replacing the classical systems which are applied on the exterior of the cylinder with an “engrooved system”. Proposed heating system leads to decreasing of energy consumption up to 30 % and maintenance costs up to 10 %. A supplementary possibility to decrease the maintenance costs is to modify the geometry of the injection torpedo. The proposed geometry eliminates the possibility of any breaking or gripping related to the injection torpedo.

Keywords: energy, plastic, injection machines, heating system, heat transfer, injection torpedo, competitivity.

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Mechatronic Hydraulic Drive with Regulator, Based on Artificial Neural Networks

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Abstract. Mechatronic hydraulic drives, based on variable pump, proportional hydraulics and controllers find wide application in technological machines and testing equipment. Mechatronic hydraulic drives provide necessary parameters of actuating elements motion with the possibility of their correction in case of external loads change. This enables to improve the quality of working operations, increase the capacity of machines.

The scheme of mechatronic hydraulic drive, based on the pump, hydraulic cylinder, proportional valve with electrohydraulic control and programmable controller is suggested. Algorithm for the control of mechatronic hydraulic drive to provide necessary pressure change law in hydraulic cylinder is developed. For the realization of control algorithm in the controller artificial neural networks are used. Mathematical model of mechatronic hydraulic drive, enabling to create the training base for adjustment of artificial neural networks of the regulator is developed.

Keywords: mechatronic hydraulic drive, proportional control, programmable controller, control algorithm, artificial neural networks.

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Influence of the Process Parameters on the Properties of Diamax Deposits Obtained by Flame Thermal Spray

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Abstract. The paper aims to determine the influence of the process parameters, namely: spraying distance and roughness of the substrate on physico-mechanical and chemical properties of the hardalloyed layers of Diamax 10999 Eutalloy, on steel support - obtained by flame thermal spray process. For this purpose the two technological parameters varied on three levels and in each case were evaluated the deposits properties. Investigations conducted by electronical microscopy SEM, X-ray, micro-hardness, chemical analysis and by adherence evaluation and of the deposits porosity allowed the establishment of the performant deposit. Thus it was found that at the decreasing of the spraying distance,the deposit porosity decreases in average of 21%; in layer appear the phenomena of overheating, issue that determine the adherence reducing in average of 18%, and also the modification of chemical composition. The results recorded have afforded the obtaining of an optimum domain of variation of the process parameters.

Keywords: flame spray process, Diamax, porosity, adherence.

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Associated Polymers, Solvents and Doping Agents to Make Polyaniline Electrospinnable

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Abstract. Polyaniline (PANi) is a conductive polymer that has both metal (electrical, electronic, optical and magnetic properties) and polymer characteristics (low density, low-cost and resistance to chemicals). Polyaniline becomes a conductor by treatment with a dopant that acts by extracting electrons (oxidation) or by inserting electrons (reduction). The reduced solubility of PANi in all common solvents restricts its capacity to be electrospun into uniform fibres. The present paper reviews the methods to increase the solubility of PANI by blending it with other polymers and doping it with organic acids, highlighting the best polymer/solvent couples and doping agents.

Keywords: polyaniline, solvents, doping agents, solubility

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The Influence of Process Parameters on the Characteristics of Electrospun 3D Nanostructures

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Abstract. Electrospinning is a fast developing technique that employs electrostatic repulsive forces to produce ultrafine fibers with application in fields like environment protection, medicine, sensors and many others. The characteristics of the polymer jet and the properties of the electrospun nanofibers are highly influenced by technological and environmental parameters. This paper offers a report on the main processing parameters that may influence the characteristics of the obtained nanofibers. The influence of flow rate, spinneret to collector distance and applied voltage on maximum fiber length, average fiber diameter, diameter uniformity and nanofiber quality is reviewed.

Keywords: electrospun, process parameters, characteristics, 3D nanostructures

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Study of Mechanical Properties of Wool Type Fabrics Using ANCOVA Regression Model

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Abstract. The work has achieved a study on the variation of tensile strength for the four groups of wool fabric type, depending on the fiber composition, the tensile strength of the warp yarns and the weft yarns technological density using ANCOVA regression model. ANCOVA checks the correlation between a dependent variable and the covariate independent variables and removes the variability from the dependent variable that can be accounted for by the covariates. Analysis of covariance models combines analysis of variance with regression analysis techniques. Regarding design, ANCOVA models explain the dependent variable by combining categorical (qualitative) independent variables with continuous (quantitative) variables. There are special extensions to ANOVA calculations to estimate parameters for both categorical and continuous variables. However ANCOVA models can also be calculated using multiple regression analysis using a design matrix with a mix of dummy-coded qualitative and quantitative variables.

Keywords: ANCOVA regression model, elastomeric yarn, fabrics, mechanical properties

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Thermal Analysis of a Structural Solution for Sustainable, Modular and Prefabricated Buildings

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Abstract. In the construction field, the design principles for an efficient and operational use of buildings and a minimal impact on the environment are essential aspects of sustainable development. In this regard, several aspects must be taken into consideration, such as: durability, easy maintenance, flexibility in interior design, and reduced energy consumption. Decreasing energy consumption in buildings during the service life (heating / cooling / drinking water / electricity) can mean lower costs, but also a lower impact on the environment. The paper presents the thermal analysis for a GF+1F height structure, consisting of several identical, adjacent and / or overlapped metallic cubic modules. The spaces inside this cubes ensemble solve the functionality of a family home building. The good carrying capacity, the rapidity of execution, the superior degree of thermal insulation and the minimum losses of material in execution were the main advantages provided by this structural solution. Regarding the thermal comfort for the users of this constructive system, the thermal analysis showed that the internal temperatures are constant and uniform, without cold surfaces or temperature fluctuations. In addition, humidity is controlled and there is no risk of condensation.

Keywords: metallic module, sustainable building, energy efficiency, thermal analysis.

The Analysis of an Internal Combustion Engine breakdown – Case Study

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Abstract. The paper concerns with the general assembly conditions and circumstances that could cause fatal damage to an internal combustion engine during operation. In the first part, the focus is on identifying the majority of dysfunctions that may result in the connecting rod destruction. Possible causes of the connecting rod destruction that led to engine failure are presented sequentially, starting with those of conceptual nature (the right choice of material, constructive solution and cross-sectional design from a geometric-dimensional point of view), then passing through issues related to operation (the severity of thermal and mechanical operation - and lubrication regimes) and last but not least, the effects of accumulated fatigue and potential structural defects of the material. This review of possible causes takes into account the particularities induced by the ignition engines and by the type of equipped machinery. The synthesis contains a case study on a 6-L medium displacement diesel engine in which the damage cause is accurately identified and which has been investigated with a scanning electron microscope (SEM).

Keywords: internal combustion engine, engine failure, scanning electron microscope.

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Evaluation of Resin-Resin Interface in Direct Composite Restoration Repair

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Abstract. The aim of this study was to evaluate the resin-resin interface when a universal bonding agent was used in two different strategies in direct restoration repair. Two composite resins (a micro-filled hybrid and a nano-filled hybrid) as old restorations that have to be repair, a universal bonding agent and a micro-filled hybrid composite resin (different then that aged) as new material for repair were chosen for the study. Non-aged samples were used as control and aged samples were used as study groups. The universal bonding agent was applied in etch-and-rinse and in self-etch strategies. The interface between old and new composite resins was evaluated by SEM and the microleakage was assessed by scoring the dye penetration. Very good adaptation of the two different composite resins placed in direct contact in non-aged samples was recorded. No gaps or defects were visible and strong resin-resin contact was observed. After aging, enlargement of resin-resin junction were observed in most of the samples and a increased dye penetration was recorded irrespective of the strategy (etch-and-rinse or self - etch) used for bonding agent application.

Keywords: composite resin, direct restoration, repair, universal bonding agent

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SEM Evaluation of Surrounding Enamel after Finishing of Composite Restorations – Preliminary Results

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Abstract. The purpose of this study was to analyze the surface characteristics of the enamel adjacent to composite resin after finishing the restoration with different diamond and tungsten carbide burs. The topography of enamel was observed by using a scanning electron microscope. Finishing with extra-/ultrafine carbide burs and extra-fine diamond burs resulted in smooth surfaces. In few areas some superficial scratches with no clinical relevance were observed. Deep grooves were observed on the surface of enamel when fine diamond burs were used. Finishing of composite restorations with coarse burs should be avoided when there is a high risk of touching and scratching adjacent enamel during the procedure.

Keywords: composite resin, finishing, carbide bur, diamond bur, enamel

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Approaching on Colorimetric Change of Porous Calcareous Rocks Exposed in Urban Environmental Conditions from Iasi – Romania

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Abstract. According to the scientific literature, the pollution phenomenon is strongly related by the urban activity from the last decades, with direct effects on the state of conservation of the stone constructions also. This paper presents a preliminary study on the colorimetric evolution of the lithic surfaces exposed under strongly traffic influence from the urban microclimate conditions. The analysed lithic surfaces are similar with the building stone from the structure of an historical monument (from XIXth century), such as the *Stone Bridge* in Iasi - Romania, located in the immediate vicinity of the roadside loop with the same name. The colour change monitoring for the above-mentioned geomaterials aims at anticipating the effects of postponing the decongestion of car traffic and implicitly initiating the assessment of the effects of pollution over this historic monument, which is in an advanced state of deterioration and degradation.

Keywords: urban environment, atmospheric pollution, calcareous rock, stone monuments, dust and black crust, CIE *L*a*b** colorimetry.

Using Quality Management Methods in Knowledge-Based Organizations. An Approach to the Application of the Taguchi Method to the Process of Pressing Tappets into Anchors

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Abstract. This paper presents a study on the modeling and optimization of certain variables by using the Taguchi Method with a view to modeling and optimizing the process of pressing tappets into anchors [1], process conducted in an organization that promotes knowledge-based management. The paper promotes practical concepts of the Taguchi Method [2, 3] and describes the way in which the objective functions are obtained and used during the modeling and optimization of the process of pressing tappets into the anchors.

Keywords: quality management, knowledge-based organization, Taguchi Method, optimization process, tappets

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Use of Incineration Solid Waste Bottom Ash as Cement Mixture in Cement Production

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Abstract. Incineration solid waste bottom ash was use to examine the suitability as a substitution in cement production. This study enveloped an innovative technology option for designing new equivalent cement that contains incineration solid waste bottom ash. The characterization of bottom ash was carried out by using particle size analyzer, chemical and phase analysis, while the morphology characterization was examined by scanning electron microscope (SEM). The compressive strength of the samples was determined at 28 days. The result was compared to control cement with cement mixture containing incineration waste bottom ash where the result proved that bottom ash cement mixture can achieve its equivalent performance compared to control cement which meeting the requirement of the standards.

Keywords: Incineration solid waste bottom ash; Cement; Characterization; Equivalent cement.

Coagulation-Flocculation Process in Landfill Leachate Treatment: Focus on Coagulants and Coagulants Aid

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Abstract In physico-chemical treatment, the separation of suspended particles from the liquid phase is usually accomplished by coagulation, flocculation and sedimentation. Coagulation-flocculation processes have been widely used as alternative treatment to remove leachate pollutants such as BOD, COD, TSS, heavy metals, colour, and nitrogen compounds prior to other treatment methods. It is often coupled with treatment methods like biological process, chemical oxidation, adsorption or filtration to achieve desirable effluent quality. In spite of being economical, the dewatering and disposal of the precipated sludge could be laborious and time-consuming. In this manuscript, brief discussions on coagulant and coagulants aid in landfill leachate treatment is discussed with respect to their mechanism.

Keywords: Geopolymer, Ecoprocess, Landfill, Leachate, Coagulant

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Nickel (Ni) Microalloying Additions in Sn-Cu Lead-Free Solder. Short Review

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Abstract. In this digital-age era, solder plays important role in electronic packaging industries. As interconnects material, solder provide an electrical and mechanical support to the electronics devices. Solder usually consist of two or more addition of microalloying. By microalloying addition, the solidification structure can be modified. This paper reviews the addition of Ni as microalloying in Sn-Cu lead free solder. Small additions of Ni resulted with an improvement of solder in microstructure and in intermetallic compounds. The stabilization of hexagonal structure of Cu_6Sn_5 in lead-free solder alloys occurred due to present of Ni.

Keywords: Lead-free Solder, Soldering, Intermetallic, Microstructure, Nickel, Microalloying, Intermetallic.

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Review of Geopolymer in Fire Protection Systems

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Abstract. This paper presents reviews about the main objective of the study concerning the evolution thermal resistance of geopolymers. Geopolymers are one of the new class materials, emerging in far- reaching potential in fire and thermal resistance areas. Concerning the performance of the geopolymer after thermal treatment, the review includes the chemistry and structure of geopolymer before and after the thermal exposure. An overview on the recent progress of the geopolymer in high temperature application is discussed in detail to keep pace with developments in research. The works on the characterization of geopolymers that undergo thermal treatment in term of microstructural, crystallographic and functional groups are reviewed. Besides, this review is attempted to highlight the important factors (such as high proportion of ashes, calcining temperature of kaolin, Si/Al ratio of the geopolymer, curing temperature, and alkaline concentration) to foster the fire resistance properties of the geopolymer. This paper will further explore standardized passive fire protection test that previously available as well as ones that are currently being developed.

Keywords: geopolymer, fire resistance, thermal shrinkage

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Hybrid TiO2-Gigantochloa Albociliata charcoal in Dye Sensitized Solar Cell

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Abstract. The The Dye Sensitized Solar cell (DSSC) is an alternative to the silicon solar cell because it is low cost and easy to fabricate. In previous work, Remazol Orange (RO) was used as a dye sensitizer in DSSC but the efficiency is still low, 0.13%. In order to increase the device performance, TiO2 thin film as the working electrode is hybridized with high conducting and absorption material which is bamboo charcoal powder (BCP). It is founded that the nanoparticle size of TiO2-BCP composite was smaller compared to pristine TiO2. The ratio of TiO2 and BCP did not give any significant effect towards the particle size. The efficiency of RO DSSC was highly improved by 84.6% at higher carbonization temperature, 1100 °C compared to 500 °C during pyrolysis process due to its capability in absorbing more dye as it has larger specific area.

Keywords: electronic materials, dye sensitized solar cell

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Potential of Starch Nanocomposites for Biomedical Applications

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Abstract. In recent years, the development of biodegradable materials from renewable sources based on polymeric biomaterials have grown rapidly due to increase environmental concerns and the shortage of petroleum sources. In this regard, naturally renewable polymers such as starch has shown great potential as environmental friendly materials. Besides, the unique properties of starch such as biodegradable and non toxic, biocompatible and solubilty make them useful for various biomedical applications. Regardless of their unique properties, starch materials are known to have limitations in term of poor processability, low mechanical properties, poor long term stability and high water sensitivity. In order to overcome these limitations, the incorporation of nano size fillers into starch materials (nanocomposites) has been introduced. This review aims to give an overview about structure and charecteristics of starch, modification of starch by nanocomposites and their potential for biomedical applications.

Keywords: starch, biomaterial, biodegradable, nanocomposites, biomedical applications

A Study On The Use Of Mortar Utama Cement Type 420 As Concrete Admixture

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Abstract- This research is conducted at laboratory scale in the form of experiment for the purpose to know the value of concrete strength by using Mortar Utama Cement Type 420 as concrete mixing additive. The concrete mixing method being used is SNI 03-2834-2000. The concrete quality being used is K 250, K 300 and K 350. Adding Mortar Utama Cement for 5%, 10%, 15% and 20% of cement weight. The strength is tested on the 3rd, 14th, 21st and 28th days of concrete making. According to the test result, we can conclude that the highest strength of concrete for K 250 with 5% additionis 275.09 Kg/cm^2, for K 300 with 5% addition is 325.32 kg/cm^2, while for K 350 with 5% addition is 368.48 kg/cm^2. Adding Mortar Utama cement type 420 is able to influence the strength of concrete with simple linear regression model for K 250: $Y = -2.005x + 272.7$ with $R^2 = 0.757$, K 300: $Y = -3.061x + 328.3$ with $R^2 = 0.731$, and K 350: $Y = -3.114x + 362.5$ with $R^2 = 0.785$.

Keywords: Strength, Concrete Characteristics

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Laboratory Study of Methane Flux from Acid Sulfate Soil in South Kalimantan

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Abstract. Addition of organic matter in waterlogged conditions will enhance methanogenesis process that produces greenhouse gases. Fresh organic material is considered reactive because it contains carbons that is subject to decompose, therefore, when it exposed to acid sulfate soil, both in natural condition (aeration required) and intensive (aeration not required) will lower the value of redox potential. This experiment aimed to determine the flux of methane (CH_4) from various locally available organic materials applied to acid sulfate soil. The second factor was the management of organic matter i.e. placed on the soil surface with no tillage and mixed with soil during tillage. The results showed that application of fresh organic matter into inundated acid sulfate soil increased CH_4 fluxes up to 23.78 µg CH_4 g^{-1} d^{-1} which was higher than from composted organic matter (4.327 µg CH_4 $g^{-1}d^{-1}$). Methane flux due to organic matter management was significantly negatively (p=0.001) correlated with soil redox potential (Eh) with R2 of - 0.76. Organic matter placed on the soil surface with no tillage produced methane flux ranged from 0.33 to 20.78 g CH_4 g^{-1} d^{-1}, which is lower than methane flux produced from organic matter mixed with soil during tillage (0.38 to 27.27 g CH_4 g^{-1} d^{-1}). Composting organic matter before application and mix them with the soil through tillage are highly recommended to reduce greenhouse gas emissions from cultivated acid sulfate soils.

Keywords: acid sulfate soil, organic matter, methane emission, and tillage.

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PIV Study of Aeration Efficient of Stepped Spillway System

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Abstract. This paper investigates the three-dimensional (3D) simulation of Cascade aerator system using Lattice Boltzmann simulation and laboratory experiment was carried out to investigate the flow, aeration and cavitation in the spillway. Different configurations of stepped spillway are designed in this project in order to investigate the relationship between the configurations of stepped spillway and cavitation in the flow. The aeration in the stepped spillway will also be investigated. The experimental result will be compared with the simulated result at the end of this project. The figure of flow pattern at the 3rd step in simulation and experiment for Set 1 and Set 2 are look similar between LBM simulation and the experiment findings. This will provide a better understanding of the cavitation, aeration and flow in different configurations of the stepped spillway. In addition the occurrence of negative pressure region in the stepped spillway, increases the possibility of cavitation to occur. The cavitation will damage the structure of the stepped spillway. Furthermore, it also founds that increasing in barrier thickness of the stepped spillway will improve the aeration efficiency and reduce the cavitation in stepped spillway.

Keywords: three-dimensional (3D) simulation, Cascade aerator, stepped spillway, Lattice Boltzmann, cavitation.

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SECTION 4

MATERIALS & LIFE SCIENCE

Designing Predictive Diagnose Method for Insulation Resistance Degradation of the Electrical Power Cables for Neutral Insulated Power Networks

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Abstract. This paper is to describe some possibilities to minimize voltages switching off risks from the mining power networks in case of insulated resistance faults by using a predictive flowchart. A new electronic protection for insulated resistance control can be made using this predictive strategy. The main role for electronic relays for insulated resistance control used in electrical installation is to provide a permanent measurement of the insulated resistance between phases and ground in order to voltage disconnect when the resistance value is below a standardization value. The automat system of protection must be able to signalize the failure and so the system operator will be informed about the voltage disconnect and take all measures to fix the failure.

Keywords: virtual instrument, data aquisition, strain gauge, mechanical stress.

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Evaluation of Electrical Characteristics of Protective Equipment - A Prerequisite for Ensuring Safety and Health of Workers at Work

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Abstract. The protecting electrical equipment in use are subject to various factors generated by the use, maintenance, storage and working environment, which may change the characteristics of protection against electric shock. The study presents the results of research on the behaviour over time of protective characteristics of insulating coatings of material of work equipment in use, in order to determine the type and periodicity of safety tests. There were tested and evaluated safety equipment with plastic and insulating rubber coatings used in operations of verifying functionality, safety and maintenance of machinery used in manufacturing industries and specific services from electric, energy and food sector.

Keywords: electrical characteristic, protective equipment, protective material, safety.

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Hierarchical Modeling of Professional Skills in the Field of Castings Manufacture Engineering

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Abstract. **Motivation:** The work stems from the fact that the manufacturing of castings is extremely complex and is constantly growing, caused by mutations in dynamic areas of use, by diversification of alloy castings, by innovations of the technological process, by new restrictions regarding the required quality of products and assuring the existence of eco responsibility conditions. **Objective:** to structure, in terms of interdisciplinary scientific research, a modeling tool and ranking of skills to be included in the curriculum for the manufacturing of castings specialization, during the specific training in the professional field of materials engineering. **Research achievements:** The paper presents some contributions in the substantiation of professional skills in the field castings manufacture engineering: adapting the AHP method for its use as a tool for ranking vocational skills; institutional analysis and determination of the data characterizing specific professional activities; construction and algorithmization of the ranking tool specific to the AHP method; establishing the statistical basis of numerical data base introduced related to the instrument of hierarchy; establishing, under different conditionings, of the hierarchy of professional skills necessary in exercising the profession in the field of engineering the manufacture of castings; **Research conclusions:** Research results provide the basis of a methodology for determining the hierarchy of professional skills in order to structure and support of occupational standards for designing an education plan, with examples from the manufacture of castings
.

Keywords: Materials engineering, castings manufacture professional skills, hierarchy, AHP method, standard occupational curriculum.

The Engineering of Circular Economy Institutionalization at the Level of Castings Manufacture

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Abstract. **Motivation:** This paper is motivated by the necessity of introducing the principles of circular economy at the level of different social – economic activities, and from this point of view one of the fields with a special potential is that of the manufacture of castings. **Objective:** is connected to the organizing and application of the methodology of the circular economy principles, and the proposed method is an innovating one, being connected to the use of institutionalization engineering. **Research method:** An institutional structuring operation was imposed for the optimization of the research method, in which different versions interact at the following levels: the level of public policies, the level of the regulatory framework, the level of technical solutions and the level of financing solutions and financial instruments. **Achievement of the research activity:** The research activity structures a methodology of quantizing the contributions of each stage of the manufacturing process for castings at the fulfilling of the specific conditions of the circular economy, indicating the critical areas of action for more efficient actions of the circular economy, where there is a potential of implementing the technical solutions by quantizing the financial solutions and the opportunity of using the financial instruments. **The major contribution of the research:** The proposed methodology, with examples at the level of castings manufacture, sets the bases of a new field of action of the engineering thinking, namely, that of circular economy institutionalization functioning. **Conclusions of the research activity:** The proposed methodology represents the bases of establishing a new instrument of action at the level of institutionalized functioning of the circular economy.

Keywords: circular economy, institutionalization engineering, castings manufacture

RF Energy Harvesting for Charging the Mobile Phone

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Abstract. Thus, outdoor enthusiasts, tourists and travelers, and person who utilize portable electronic devices habitually experience battery exhaustion of their devices before they find a time or means to charge their electronics device. The current research paper provides, to provide operating power to an external portable appliance such as, for example, a mobile phone or any electronic device with small power. The research paper will show our activities addressed to design a wideband system to recover wideband energy from electromagnetic radiation existing around us. An RF to DC converter circuit includes one or more multiband antenna to detect many RF signals. We can charge the battery of the mobile phone by the pollution electromagnetic energy in the space.

Keywords: harvesting energy, mobile phone, patch antenna, RF converter, electromagnetic pollution, schottky diode.

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Greening Solutions Applicable in the Tailing Ponds Tăuşani and Boşneag, Moldova Nouă

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Abstract. This study aims to propose solutions for greening of the tailings ponds resulted from mining activities with transboundary impacts. As case study are proposed for greening the Boşneag and Tăuşani tailing ponds. The importance of greening of the Tăuşani and Boşneag tailing ponds is the fact that they pollute Moldova Nouă, Danube and towns on the Serbian side of the Danube with particles in suspension.Taking into account the situation described regarding the impact of tailings ponds from Moldova Nouă on the environment, we analyzed four scenarios of modeling dispersion of particles in suspension (copper and other heavy metals) from the Tăuşani and Boşneag tailing ponds in the theoretical background where pollution has cross-border nature and require studying the transport of pollutants over a long distance from the source, modeling dispersion of particles in suspension in the atmosphere, these was performed using TAPM model, able to simulate aspects mentioned.After running the software for modeling the dispersion of particles it was revealed that the pollution generated from the pollution sources taked into consideration is very high and significantly affects quality of life on considerable areas both in Romania and Serbia thus amplifying the need to implement greening solutions of the analyzed area. Following the results obtained will be presented two alternatives solutions for greening the area studied, aiming at minimizing the impact on the environmental and population.

Keywords: greening solutions, tailing ponds, copper, heavy metals, particles in suspension, mining

Efficient Use of AUVs in Maritime Environment

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Abstract. Autonomous underwater vehicle (AUV) a.k.a. underwater drones are subsea vehicles which operate in the underwater environment independently of direct human input. There is a growing interest in underwater data collection by using autonomous underwater vehicles within the oceanographic research community. In this paper, the Iver 2 AUV is examined to accomplish accurate side-scan data while executing well planned missions. Therefore, this papers goal is to establish the optimal use conditions for the AUV that RCN has so that we maximize the detection probability of sea bottom objects that can be risk factors and at the same time to cover a surface as large as possible during a single mission.

Keywords: AUV (autonomous underwater vehicle), side-scan sonar, detection probability

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Risk Factors Detection for Strategic Importance Objectives in Littoral Areas

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Abstract. With the invention and development of underwater explosive devices the need to neutralize them has also appeared, both for enemy and for own devices once conflicts are finished. The fight against active underwater explosive devices is a very complicated action that requires a very careful approach. Also, in the current context, strategic importance objectives located in the littoral areas can also become targets for divers or fast boats (suicidal actions). The system for detection, localization, tracking and identification of risk factors for strategic importance objectives in littoral areas has as one of its components an AUV and a hydro-acoustic sub-system for determining the 'fingerprints' of potential targets. The overall system will provide support for main missions such as underwater environment surveillance (detection, monitoring) in harbor areas and around other coast objectives, ship anchorage areas, mandatory pass points and also provide warnings about the presence of underwater and surface dangers in the interest areas.

Keywords: AUV (autonomous underwater vehicle), sonar, DEMON-type algorithm, risk factors

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Assessment and Rehabilitation Issues Concerning Existing 70's Structural Stock

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Abstract. The last 30years were very demanding in terms of norms and standards change concerning the structural calculus for buildings, leaving a large stock of structures erected during 70-90 decades in a weak position concerning seismic loads, loads level for live loads, wind and snow. In the same time, taking into account that a large amount of buildings are in service all over the country, they cannot be demolished, but suitable rehabilitation methods should be proposed, structural durability being achieved.
The paper proposes some rehabilitation methods suitable in terms of structural safety and cost optimization for diaphragm reinforced concrete structures, with a work example on an existing multi storey building.

Keywords: structural assessment, structural rehabilitation, reinforced concrete structures, concrete diaphragms, seismic design, durability.

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Laboratory Performance Testing Of Two Types of Geotextiles Used In Danube Hydrotechnical Works

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Abstract. Considering the increased use of geosynthetics in applications subjected to severe operating conditions, the main purpose of the present paper was to assess the durability of a geosynthetic used for the ecological restoration of riverbank defenses on the Danube River, between Calarasi and Braila. The laboratory tests evaluated two degradation mechanisms (oxidation degradation and hydrolysis resistance) for the analyzed geotextile. The effect of these mechanisms was assessed through tensile tests taking into consideration 3 parameters, namely tensile strength, elongation and failure mode. The results of the tensile tests showed that the analyzed geotextile is affected by oxidation, the tensile strength values being with about 47% lower than the ones corresponding to the reference samples. Also, a diminish of the tensile strength values was observed after the accelerated hydrolysis testing. However, the elongation values determined after mechanical testing showed that hydrolysis influences the fiber flexibility; the results showing an increase when compared to the reference samples. The failure mode of the investigated geotextile revealed the tendency of the samples to fail in the calibrated area, indicating that in use the geotextile will break in the strained region.

Keywords: geosynthetics, durability, tensile tests, oxidation degradation, hydrolysis

Testing Method for External Cladding Systems - INCERC Romania

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Abstract. This research presents a new testing method in a natural scale for façade elements tested on buildings with more than 3 floors.The results obtained from the test provide the data, needed to evaluate the fire protection performance of the ETICS systems.The determination of the fire resistance for the cladding systems is an important research that can improve the safety requirements of the new normative P118.

Keywords: façade elements, polystyrene, fire testing, cladding systems

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A Study of Temperature Reducing of High Voltage Switching Power Supply Circuit of Electrostatic Air Cleaner by Applied Thermoelectric

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Abstract.This research paper presents a study of temperature reducing of high voltage switching power supply circuit of electrostatic air cleaner by the application of thermoelectric as this air filter uses electric field force technique based on electrostatic precipitator (ESP) and high voltage direct current switching power supply. The power supply is based on a flyback converter. The converter is designed to operate high frequency more than 19 kHz and Power MOSFET is switching device through high voltage high frequency flyback transformer#TLF14649. The circuit is capable of generating up to 4 kV_{dc} for ionization part and collector part in air filter. The problem incurred is heat come up in high voltage switching power supply resulting high consumption rate of electrical power. Therefore researcher tries to find a way to reduce temperature of high voltage switching power supply by using cool air producing from Thermoelectric to observe electrical power consumption rate. Therefore in testing we measure temperature at high voltage switching power supply circuit and measure electrical power consumption rate of air filter before and after installation of cool air production system from thermoelectric. The testing result appears that before installation cool air production system from thermoelectric temperature is 27°C power consumption is 26.7 watt. And after installation cool air production system from thermoelectric temperature is 23°C power consumption is 22.9 watt. Therefore it is conclude that cool air production system from thermoelectric can reduce temperature and reduce electric consumption power of air filter resulting in lessening electric bill. And in the future researcher will develop application of cool air system from thermoelectric to reduce temperature in other industrial system to cut down electrical consumption of the country.

Keywords: temperature, high voltage, flyback converter, thermoelectric, switching power supply, air filter, cool air

Automatic System for Control Lamps Lighting

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Abstract. This paper presents the way to automatic control light's quantity that emit from light bulb. The light bulbs that we experimented are Incandescent lamps, by manage phase to adjust voltage of light bulb this way we can control light's quantity to meet our desire. The principle is to use Light Dependent Resistor as the sensor to receive light from outside then emit an analog signal. Convert the signal into a digital signal to transmit to the microcontroller, the IC # PIC16F887 that we set program to analyze the received signal. The result was a digital signal which is required to convert the signal back to analog to be applied to the control unit for controlling voltage to the light bulb then we get the desired light's quantity. After this, the sensor receives light from a light bulb to be used as feedback to the circuit. The result is the amount of electric used for illumination of the light bulb has cascaded down by the amount of light that entering the circuit. This pointed out that when there is the light from the outside, the circuit will have low energy consumption. And when the energy consumption is low, it save the energy.

Keywords: bulb, microcontroller, energy

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Development of Corona Ozonizer Using High Voltage Controlling of Produce Ozone Gas for Cleaning in Cage

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Abstract. This paper presents development of corona ozonizer using high voltage (HV) controlling for cleaning in red-whiskered bulbul cage. This power supply uses full-bridge converter at switching high frequency more than 20 kHz and controls its operation using pulse width modulation (PWM) techniques. Power MOSFET#IRFP450 is controlled by IC#TL494. The highly non-uniform electric field ozone tube of two level insulator cylindrical. The testing of multi-ozone generation system using 3 levels of high voltage controlling are 1 kV, 3 kV and 5 kilo-Volt (kV) and at one – hour, ozone tube yields the ozone generating capacity of 328 mgO_3/hr, 735 mgO_3/hr and 927 mgO_3/hr which ozone gas quantity are 328 mgO_3/hr at 30 minute, 735 mgO_3/hr at 19 minute and 927 mgO_3/hr at 12 minute enable cleaning in red-whiskered bulbul cage.

Keywords: blue corona, ozone, high voltage, electric field, cage, converter

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Steel - Concrete Materials Performance in Composite Joints Configuration

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Abstract. In many buildings there is a need to combine reinforced concrete and steel or composite members. The paper aims for an experimental program focused on the behavior of the materials steel and concrete what makes up for a composite joint configuration. Material tests were performed prior each type of testing. The main purpose is to investigate the main parameters that affect the response and the contribution of the two materials. The tests were performed at the TUCN - Laboratory of Civil Engineering Faculty, Romania. The results of the tests on the materials were used for preliminary numerical analysis of the models, in order to design and detail the test set-up.

Keywords: materials, steel, concrete, composite members.

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Influence of the Physical Properties of TiO_2 Film - Deposed on PEEK Support, on the Fungis (Candida Albicans) Growth Capacity

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Abstract. The deposits of TiO_2 on Polieteneterketona (PEEK) support, obtained by magnetron sputtering in AC can be considered convenient solutions for the production of biocompatible materials used in various medical applications. The paper presents the investigations carried out on a film of TiO_2 which was filed on PEEK by using a vacuum deposition process. The microstructure, surface topography, the porosity, adherence and the phasic analysis of the TiO_2 film were evaluated to identify the technological parameters that influence fungis growth on the deposited layer. The analyzes by SEM and AFM demonstrate that the TiO_2 film obtained on a PEEK substrate, presents a columnar structure, whose porosity is influenced in a ratio of 17% by work pressure. The comparative study carried out in this work demonstrates that the samples coated with TiO_2 - with high porosity and surface roughness shows a growth of fungis (Candida albicans), more intense compared to the coated samples - with high density and low porosity and roughness.

Keywords: vacuum deposition process, TiO_2 deposits, PEEK

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Experimental Researches on the Durability Indicators and the Physiological Comfort of Fabrics Using the Principal Component Analysis (PCA) Method

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Abstract. The work pursued the distribution of combed wool fabrics destined to manufacturing of external articles of clothing in terms of the values of durability and physiological comfort indices, using the mathematical model of Principal Component Analysis (PCA). Principal Components Analysis (PCA) applied in this study is a descriptive method of the multivariate analysis / multi-dimensional data, and aims to reduce,under control, the number of variables (columns) of the matrix data as much as possible to two or three.

Keywords: main components, elastomeric yarn, fabrics, durability indices, comfort indices

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Environment Monitoring System Based on Architecture of IoT by Wireless Sensor Network

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Abstract. The concept of Internet of Things (IoT) established on monitoring of house environment system. Use Arduino Nano as a development board. Through wireless network module (NRF24L01) receives information collected from multiple sensor modules, including temperature, humidity, brightness, methane gas, Passive Infrared (PIR), RFID, PM2.5, WebCam. Moreover, It also can control multiple loads, comprising RGB LED, stepper motors, relays. Applied PHP combine MySQL to store multiple data to personal cloud database. With C # program Human–machine Interaction (HMI), data can be displayed on a computer terminal at home, and also can be controlled loads. It also can use the mobile devices to monitor the data that capture via website from database or load control at home.

Keywords: Internet of Things, Sensor, Wireless Sensors Network, Environment Monitoring System, Human–Machine Interaction.

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The Bayesian Network Prediction in Lifelong Education Course Selection Decision Applications

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Abstract. Lifelong learning becomes critically for one to be competitive due to the rapid development of new technology shortens product cycles. As the aging population increasing, not only workers desire to improve their knowledge to be innovated, but also elder people can also enrich their live while studying in the extension centers. Some universities in Taiwan are now facing decreasing enrollment due to the low birth rate. The extension centers set in universities become one main student resources to reduce financial pressure. In this study, the Bayesian network is used to know students' intuitive decision making during the course selection process. The different demographic background students' preferences are evaluated. Results show that Female has higher enrollment rate than man. Female and male are also has different interest in course category enrollment. More than 60% of students whose age is between 31 and 50. From the Bayesian network perception, the age and gender effects the course selection directly. The course designer should consider different requests for different background students.

Keywords: Lifelong education; Bayesian Network; Course selection

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Using Value Chain and Accounting Data to Analyze the Competitiveness of the Taiwan Footwear Manufacturing Industry

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Abstract. Between 1970 and 1987 Taiwan was known as the “Shoe Kingdom”. After 1988 major shoe international shoe brands began redistributing their manufacturing around the world, and after 2010, regional trade cooperation became more prevalent, a trend Taiwan could not participate in because of political factors. These two changes had a profound impact on Taiwan. To identify how the Taiwan footwear industry can carve a new path, this study divides industry firms into upstream, midstream, and downstream firms. Combining value chain and accounting data from these three industry segments based on the financial reports of different firms, relevant financial ratios are calculated, and the value linkages along the value chains of each individual manufacturing firm are investigated. Based on this analysis, concrete recommendations for enhancing the industry’s competitiveness are offered.

Keywords: Value chain; Accounting data; Shoe Kingdom; Footwear industry.

Using Medical-device Wearable to Improve Hemodialysis Patient's Live and Access the Holistic Health

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Abstract. The increasing incidence of end-stage renal disease (ESRD) is the major burden to health budgets and a threat to public health worldwide. For many years, Taiwan has been ranked the first in the world for the number of hemodialysis patients. For solving the above-mentioned circumstance, we demonstrate the project, here, which goal is to construct the holistic health for hemodialysis patient. The project is to design a wearable medicine-device which can simultaneously measure and monitor the vital sign, including heart rate (HR), pulse oximetry (SPO2), continuous non-invasive blood pressure (c-NIBP), and total body water (TBW), of hemodialysis patient. By aid of the device we design, hemodialysis patients will get better health care than before. The stenosis detector based on autoregressive model was employed to simultaneously estimate the status of AVA life cycle and to tract changes in frequency spectra. It helps hemodialysis patients to early detect the dysfunction of AVA and alarms them to make a return visit. The second technique is named "Physiological detecting device for wearable medical device and encoding algorithm development". The feature of the second technique is to optimize the prognosis by analyzing physiological signals, including water content index, pulse oximetry, and blood pressure in the meanwhile. The third technique is named "Intelligent and smart tourniquet". This technique aims to preclude AVA dysfunction caused by inappropriate hemostasis.

Keywords: medical-device wearable, hemodialysis access, holistic health, phonoangiogfaphy, ausculation.

Hazard, Vulnerability and Capacity Mapping for Landslides Risk Analysis using Geographic Information System (GIS)

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Abstract. This research analyzed the levels of disaster risk in the Citeureup District, Bogor Regency, West Java, based on its potential hazard, vulnerability and capacity, using map to represent the results, then Miles and Huberman analytical techniques was used to analyze the qualitative interviews. The analysis conducted in this study is based on the concept of disaster risk by Wisner. The result shows that the Citeureup District has medium-low risk of landslides. Of the 14 villages, three villages have a moderate risk level, namely Hambalang, Tajur, and Tangkil, or 49.58% of the total land area. Eleven villages have a low level of risk, namely Pasir Mukti, Sanja, Tarikolot, Gunung Sari, Puspasari, East Karang Asem, Citeureup, Leuwinutug, Sukahati, West Karang Asem West and Puspanegara, or 48.68% of the total land area, for high-risk areas only around 1.74%, which is part of Hambalang village. The analysis using Geographic Information System (GIS) prove that areas with a high risk potential does not necessarily have a high level of risk. The capacity of the community plays an important role to minimize the risk of a region. Disaster risk reduction strategy is done by creating a safe condition, which intensified the movement of disaster risk reduction.

Keywords: landslides, hazard, vulnerability, capacity, mapping, risk analysis, disaster reduction, geographic information system (GIS).

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Application of Artificial Neural Network to Predict the Use of Runway at Juanda International Airport

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Abstract Abstract. Artificial neural network approaches are useful to solve many complicated problems. It solves a number of problems in various areas such as engineering, medicine, business, manufacturing, etc. This paper presents an application of artificial neural network to predict a runway capacity at Juanda International Airport. An artificial neural network model of backpropagation and multi-layer perceptron is adopted to this research to learning process of runway capacity at Juanda International Airport. The results indicate that the training data is successfully recognizing the certain pattern of runway use at Juanda International Airport. Whereas, testing data indicate vice versa. Finally, it can be concluded that the approach of uniformity data and network architecture is the critical part to determine the accuracy of prediction results.

Keywords: Artificial neural network, runway capacity, network architecture, application

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Review Study on Runway Capacity Parameters and Improvement

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Abstract. The demand of air travel continues to increase over time, due to its short travel time, reliability and safety. Problems then arise when airport capacity, especially airside (mainly runway) capacity cannot cope with the demand. Some airports build the expensive additional infrastructure, while some others believe that manage on system is more efficient and effective. The study gathered information from various source about parameters related to runway capacity so that the improvement made in the future will solve right on target. To accommodate wide number of factors, the study classify the parameters into five categories in which operation/procedure related parameters play an important role (52%). To facilitate future research on runway capacity, the study also tabulates methods used by various scholars to improve runway capacity.

Keywords: runway capacity, improvement, air travel, reliability and safety

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Growth and Production of Some Variety Corn (*Zea mays* L.). Planted under the Canopy of Palm Oil 12 Years Old in Swamp Land

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Abstract This research was conducted in wetlands Semambu Village, District of North Indralaya, Ogan Ilir, South Sumatra Province, Indonesia, which lasted from July 2015 to February 2016. The observation of a microclimate indicate that the average intensity of light outside the auspices of the plot 1968.9 m^2s mol^{-1}, under waranet 1502.40 mol^{-1} m^2s, below paranet 721.99 mol^{-1} m^2s^{-1} and under waranet 439.25 μmol m^2s^{-1} - equivalent to the light interception 1 or 100%, 76%, 37% and 22%. Results of soil chemical analysis that the soil has a low fertility study (H_20 pH of 3.32, organic C 4.47%, total N 0.35%, Bray P 13.30 ppm, K-ea 0.26 me / 100g, CEC 19.6 rne / 100g and Al-ea 3.28 me / 100g). Tests on 22 genotypes of maize grown with light interception 100%, 76%. 37% and 22%, by calculating tolerance index based on the weight of dry seed cob-1 was found four genotypes of maize tend to be tolerant to low-intensity light that were genotype B 41, Pioneer 27, Sukmaraga and Sugihan. The test results of corn planted in beds shade with light interception 100%, 76%, 37% and 22% for groups of maize tolerant and sensitive, followed by application of urea 0 kg ha^{-1}, 100 kg ha^{-1} 200 kg ha^{-1}, 300 kg ha^{-1} and 400 kg ha^{-1} indicate that maize and 41 and Pioneer 27 by Urea 300 kg ha^{-1} gives better results than other varieties at different intensities of light oil palm age of 12 years with applications Urea fertilizer 300 kg ha^{-1}, indicating that the B 41 and Pioneer 27 tends to give better results compared with other varieties. The application of a polyculture system palm-maize can produce 1000 kg of dry corn grain in a 1 ha of oil palm cultivation.

Keywords: polyculture, lowland swamps, corn, palm canopy shade

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