PEERS ALLEY MEDIA

VIRTUAL EVENT

GLOBAL SUMMIT ON FUTURE OF MATERIALS SCIENCE AND RESEARCH

29-30 JULY 2021

Theme: To codify revamping innovations in Materials Science and Engineering

Peers Alley Media
1126 59 Ave East, V5X 1Y9
Vancouver BC, Canada
WhatsApp No: +1 873-889-8976
Contact us: materialsscience@meetingsengage.com

FUTURE MATERIALS 2021

http://materialsscience.peersalleyconferences.com/

YOUR FIRST CHOICE FOR RESEARCH INGENUITY

PROGRAM-AT-A-GLANCE

FUTURE MATERIALS 2021

DAY 1

THURSDAY, JULY 29, 2021

Scientific Program

BST – British Summer Time

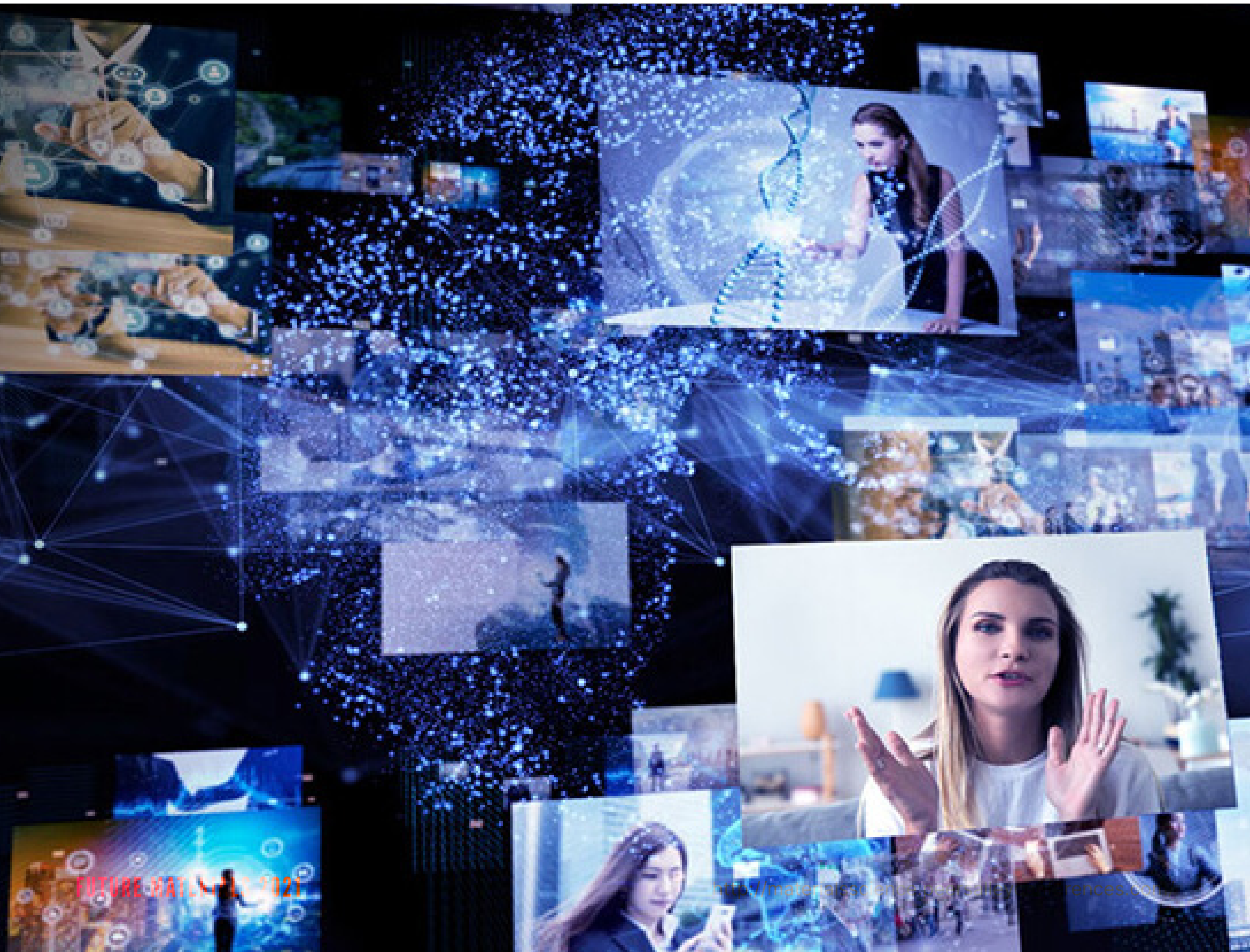
08:45-09:00	**Introduction**
09:00-09:25	**Title: Biomimetic design of closed cell lattice structure for design for additive manufacturing and post process** **Ajeet Kumar,** National Taiwan University of Science and Technology, Taiwan
09:25-09:50	**Title: Toward new perovskites solar cells and minimodules** **Annalisa Bruno,** Nanyang Technological University, Singapore
09:50-10:15	**Title: An innovative solvent-Responsive oilincg–Expanding stent** **Jinlian Hu,** City University of Hong Kong, China
10:15-10:40	**Title: Graphene coatings: Remarkable corrosion barrier** **Raman Singh,** Monash University, Australia
10:40-11:05	**Title: Training for safety culture transformation – Effective and engaging safety culture interventions** **Daniela Lud,** Rhine-Waal University of Applied Sciences, Germany
Refreshment Break 11:05-11:20	
11:20-11:45	**Title: The effect of microstructure on mechanical properties of nonferrous metals unidirectionally solidified** **Givanildo Alves dos Santos,** Federal Institute of Sao Paulo, Brazil
11:45-12:00	**Title: Corrosion behavior of epoxy-based double-layer nanocomposite coatings modified with Zirconia nanoparticles** **Sehrish Habib,** Qatar University, Qatar
12:00-12:15	**Title: Influence of Cu_2O substrate on photoinduced hydrophilicity of TiO_2 and ZnO nanocoatings** **Maria V. Maevskaya,** Saint-Petersburg State University, Russia

12:15-12:40	**Title: Photovoltaic (PV) modules recycling** **Mihaela Cosnita,** Transilvania University of Brasov, Romania
12:40-13:05	**Title: Improving the reliability of mechanical components that have failed in the field due to repetitive stress** **Seongwoo Woo,** Addis AbabaScience & Technology University, Ethiopia
13:05-13:30	**Title: Anodic nanotubes and nanochannels for biomedical applications** **Anca Mazare,** University of Erlangen-Nuremberg, Germany
Lunch Break 13:30-14:00	
14:00-14:15	**Title: Removal of pesticides in water by CeO_2-WO_3 mixed-oxide catalysts** **Roberto Fiorenza,** University of Catania, Italy
14:15-14:40	**Title: Structure and charge monitoring of Prussian Blue analogous battery materialsby operando XRD and XAS** **Marco Giorgetti,** University of Bologna, Italy
14:40-15:05	**Title: Effect of different contents of carbon nanotubes on the electrical and mechanical properties of cement paste** **Alicia Paez-Pavón,** European University of Madrid, Spain
15:05-15:20	**Title: Synthesis of graphene based materials for energy storage: Optimization of Tour's method, first part** **Hanna Bukovska,** CIEMAT, Spain
15:20-15:35	**Title: Titanium(IV) oxo-complexes with $\{Ti_4O_2\}$ core, their photocatalytic and antimicrobial properties** **Barbara Kubiak,** Nicolaus Copernicus University, Poland
15:35-15:50	**Title: Mechanical properties of bi-layer and dispersion coatings composed of several nanostructures** **Dorota Rogala-Wielgus,** Gdansk University of Technology, Poland
15:50-16:15	**Title: Ecotoxicological study of fine-recycled aggregate** **Klára A. Mocova,** University of Chemistry and Technology, Czech Republic
16:15-16:30	**Title: MWCNTs decorated with Ag nanoparticles through pulse reversed current electrodeposition using a deep eutectic solvent for energy storage applications** **Ana T. S. C. Brandao,** University of Porto, Portugal

16:30-16:55	**Title: Nanostructured surface modification of coarse-grained and ultrafine-grained Ti-13Nb-13Zr alloy for biomedical application** **Marko Rakin,** University of Belgrade, Serbia
16:55-17:20	**Title: Fast and in-plane only retardation switching of a certain type of smectic liquid crystal** **Akihiro Mochizuki,** i-CORE Technology, USA
17:20-17:45	**Title: Present and future photovoltaic modules – Trends and limits** **Vitezslav Benda,** Czech Technical University in Prague, Czech Republic
17:45-18:10	**Title: Novel composite materials for electromagnetic shielding applications** **Mirela Petruta Suchea,** Hellenic Mediterranean University, Greece

Panel Discussions

End of Day 1



DAY 2

FRIDAY, JULY 30, 2021

Scientific Program

BST – British Summer Time

08:45-09:00	**Introduction**
09:00-09:15	**Title: Architecture of copper sulfide compound boosting thermoelectric performance** **Xinqi Chen,** Hubei University of Education, China
09:15-09:40	**Title: Insights into the predicted Hf_2SN and Ti_2CdN in comparison with their synthesized carbide counter parts** **A.K.M. Azharul Islam,** International Islamic University Chittagong, Bangladesh
09:40-10:05	**Title: Dynamic mechanical performance of cornhusk film reinforced epoxy laminate composite** **Harwinder Singh,** Dr. B.R. Ambedkar National Institute of Technology, India
10:05-10:30	**Title: Hybrid organic-inorganic architectures: Blue and red shift in optical properties** **Senthil A. Gurusamy Thangavelu,** SRM Institute of Science and Technology, India
10:30-10:45	**Title: Materials processing through microwave energy: A review** **Sarbjeet Kaushal,** Gulzar Group of Institutions, India

End of Day 2

Panel Discussions

PEERS ALLEY MEDIA

I Support

PEERS ALLEY MEDIA

GLOBAL SUMMIT ON FUTURE OF MATERIALS SCIENCE AND RESEARCH

July 29-30
2021

Scientific Abstracts

Day 1

Biomimetic design of closed cell lattice structure for design for additive manufacturing and post process

Ajeet Kumar[1] and **JengYwan Jeng**[1,2]
[1]*National Taiwan University of Science and Technology, Taiwan*
[2]*Lunghwa University of Science and Technology, Taiwan*

Human made structures are dense solids but nature design its structure with cellular solids. Natural structures are structurally and functionally optimized because natural economy is directly related to saving material and energy. This is difficult to achieve through traditional manufacturing techniques due to manufacturing constraint associated with subtractive manufacturing. Hence, a very promising technology to fabricate and replicate the natural cellular structure is Additive Manufacturing (AM). These cellular structures with diverse shapes, forms and designs are responsible for various function of nature with optimum material. Understanding and analysing this cellular structure is important for design for the additive manufacturing and post processing (DfAM&PP). In depth understanding and analysing of these cellular structures and biomimicking for additive manufacturing is important for making man made product smart. Although most of the AM technology can fabricate this cellular structure with ease but each technology has its own challenges and one of major challenge is support structure. Additive manufacturing with fused filament fabrication (FFF) of a biomimetics surface-based lattice structure without support has an undisclosed advantage over other lattices which consume extra material, process time and energy. A support less lattice structure can match the performance and quality with other similar functional lattices and fasten the process of product customization and personalization. Fabricating closed cell is considered much difficult than open cell lattice structure due to entrapment of support structure with in the lattice. At presently, FFF process has a capability to print both open and closed cell. This study for DfAM&PPof biomimetic open and closed cell for energy absorption application with hyperelastic and elastic plastic material can bring aforementioned benefits. Using the proposed method large scale FFF 3DP can benefit from time and cost reduction for academic and industrial community for the application such as shoe, skiboot and other energy absorbing application.

Biography

Ajeet Kumar excited and passionate to push additive manufacturing technologies to bring sustainable engineering solutions for better digital world. He is currently Adjunct Asst Prof at high speed 3D printing research center of National Taiwan University of Science and Technology (NTUST, Taiwan). Here, he does a research on high speed additive manufacturing with technology like page wide laser-based 3D printer, design for additive manufacturing and post processing, cellular lattice structure, closed cell lattice structure. He has a PhD in Biomimetic design and additive manufacturing of lattice structure for energy absorption application. Prior to this he has four years of industrial experience in manufacturing and design with automotive component manufacturing industry. He received Master's degree in design and manufacturing from Indian Institute of information technology, design and manufacturing, (IIITDM) Kancheepuram, India. He also worked with various industries like YushanVentures,Inc. and Taiwan Tech 3D at various technical position for projects like 3D printing with smart phone and 4D printing.

Toward new perovskites solar cells and minimodules

A Bruno, J Li, H Wang, E. Erdenebleg, N. Tiwari, AD Herlina, N Mathew and **S Mhaisalkar**
Nanyang Technological University, Singapore

Metal-halide perovskites are one of the most promising active materials for optoelectronics applications such as photovoltaic, light-emitting technologies, and X-ray detectors, thanks to their excellent optoelectronic properties and thin films fabrication versatility.

In the photovoltaic domain, in less than 10 years, perovskite solar cells (PSCs) have achieved record power conversion efficiency (PCE) of 25.5% and an increasingly growing operational stability. The rapid progress has triggered the interest in transferring the existing technology from the typical laboratory small area perovskite solar cells into large-area solar modules necessary for their industrial applications and building-integrated photovoltaics.

In this talk, we will give an overview of the recent research activities on halide perovskite materials, from the synthesis to their optical and electrical properties and finally to their integration in solar cells. We will present also different technologies explored to scale them up over large areas.

Biography

Annalisa Bruno received her B.S., M.S. and Ph.D. Degrees in Physics and Applied Physics from the University of Naples Federico II, Italy, where she also worked as a post-doc in the Physics and Chemical Engineering Departments. After, she joined the Chemistry Department of Imperial College London, first as a Post-Doctoral Research Associate, studying organic and hybrid materials for optoelectronic applications.

In 2011 she became a tenured Senior Staff Scientist at Italian National Agency for New Technologies, Energy, and Sustainable Economic Development (ENEA). In 2014 she also joined the Energy Research Institute at Nanyang Technological University (ERI@N) as a Senior Scientist. Since 2017 she is leading the Thermally Evaporated and Tandem Solar Cells team in ERI@N. We aim at developing highly efficient large-area solar cells.

.

An innovative solvent-Responsive coiling–Expanding stent

Jinlian HU
City University of Hong Kong, China

Coronary artery is the "first killer" in the world, while the classical treatment for this disease is to implant stent. An ideal vascular stent should be nontoxic with self-expanding characteristics, quick expanding speed, and appropriate mechanical supporting property. However, no existing vascular stent covers all properties that can be found up to now. Herein, we construct a two-way shape-memory cellulose vascular stent, which can realize shape adjustments by mild solutions like water and alcohol. Shape memory characteristics, mechanical properties, cell toxicity, biocompatibility, ex vivo experiment as well as molecule simulation, and theoretical model have been systemically investigated, revealing that achieved bilayer two-way shape-memory films (BSMFs) can be used as artificial vascular stent. Particularly, this vascular stent made from BSMFs shows superb biocompatibility according to the live/dead cell viability assays. Ex vivo experiment revealed that the novel vascular stent can support arteria coronaria sinistra or left main coronary artery at the opening state while the cross-section of the vessel became two times larger than that of the initial state after implantation. Thus, we believe that effective and scalable BSMFs can make meritorious fundamental contributions to biomaterials science and practical applications such as vascular stent.

Biography

Jinlian HU is a renowned fibers, textiles and biomaterials scientist. Her laboratory focuses on unearthing scientific principles and providing solutions to key problems in Healthcare of Wearable Materials in four major areas: Traditional Chinese medical therapies and their materials, energy materials and healthcare, spider silks and their relatives as biomaterials as well as personal protective integration. She is a Fellow of the Royal Society of Chemistry, Hong Kong Institution of Textile and Apparel and the British Textile Institute respectively.

Graphene coatings: Remarkable corrosion barrier

Raman Singh
Monash University, Australia

Corrosion and its mitigation costs dearly (any developed economy loses 3-4% of GDP due to corrosion, which translates to ~$250B to annual loss USA). In spite of traditional approaches of corrosion mitigation (e.g., use of corrosion resistance alloys such as stainless steels and coatings), loss of infrastructure due to corrosion continues to be a vexing problem. So, it is technologically as well as commercially attractive to explore disruptive approaches for durable corrosion resistance.

Graphene has triggered unprecedented research excitement for its exceptional characteristics. The most relevant properties of graphene as corrosion resistance barrier are its remarkable chemical inertness and impermeability and toughness, i.e., the requirements of an ideal surface barrier coating for corrosion resistance. However, the extent of corrosion resistance has been found to vary considerably in different studies. The author's group has demonstrated an ultra-thin graphene coating to improve corrosion resistance of copper by two orders of magnitude in an aggressive chloride solution (similar to sea-water). In contrast, other reports suggest the graphene coating to actually enhance corrosion rate of copper, particularly during extended exposures. Authors group has investigated the reasons for such contrast in corrosion resistance due to graphene coating as reported by different researchers. On the basis of the findings, author's group has succeeded in demonstration of durable corrosion resistance as result of development of suitable graphene coating. The presentation will also assess the challenges in developing corrosion resistant graphene coating on most common engineering alloys, such as mild steel, and presents results demonstrating circumvention of these challenges.

Biography

Raman Singh's primary research interests are in the relationship of Nano-/microstructure and Environment-assisted degradation and fracture of metallic and composite materials, and Nanotechnology for Advanced Mitigation of such Degradations. He has also worked extensively on use of advanced materials (e.g., graphene) for corrosion mitigation, stress corrosion cracking, and corrosion and corrosion-mitigation of magnesium alloys. He has supervised 50 PhD students.

Training for safety culture transformation – Effective and engaging safety culture interventions

D. Lud, M. Hoebel and **N. Marquardt**
Rhine-Waal University of Applied Sciences, Germany

Safety training in chemical laboratories for international groups is a challenging form of safety culture intervention. Often safety trainings are performed routinely, conducting effective safety trainings can be challenging. The aim of the study presented here is to find out whether explicit and implicit safety attitudes can be changed by training. Before and after a safety training in a chemical lab, short-term attitude change was evaluated, both with respect to explicit and implicit attitude. Explicit attitude refers to conscious, reflective attitude, whereas implicit attitude is considered more intuitive, automatic and not altered by socially desirable answers. Effects on explicit safety attitude were measured using a self-reported explicit safety attitude scale, implicit attitude changes were investigated using an implicit association test based on matching terms and reaction times. The safety training had a significant effect on explicit safety attitudes, participants had a more positive explicit safety attitude after the training compared to before the training. Post-training effects on implicit safety attitude were non-significant. Results of the short term study are discussed in the context of different occupational scenarios in a lab and international, interdisciplinary environmental projects. Recommendations are compiled for effective, engaging safety training mindful of diversity and strengthening safety culture in various environments.

Biography

Since 2011, D. Lud has been a professor of environmental assessment and remediation at the Faculty of Communication and Environment at Rhine-Waal University of Applied Sciences, Germany. The faculty is characterized by a clearly interdisciplinary approach to research and teaching. She is teaching mainly in the study programs Environment and Energy (BSc.), Information Engineering and Computer Science (MSc.) and the certificate course Circular Economy Management. Before her appointment, she worked for about 10 years with an environmental consultant as risk assessment specialist e.g. in the field of contaminated land management and in capacity building projects on stockpiles of obsolete pesticides.

.

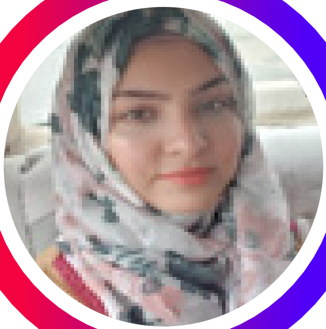
The effect of microstructure on mechanical properties of nonferrous metals unidirectionally solidified

Givanildo Alves dos Santos
Federal Institute of São Paulo, Brazil

Solidification is an important phase transformation in materials science and engineering. The imposition of a wide range of operational conditions in foundry and castings process generates, as a direct consequence, a diversity of solidification structures. A low carbon steel mold was used to promote a unidirectional heat flow during solidification and to obtain the arrangement of the microstructure. The aim of the present work is to investigate the influence of microstructure on mechanical properties of nonferrous metals, specifically aluminum alloys and copper alloys. Experimental results include phases, primary and secondary dendrite arm spacings, hardness, ultimate tensile strength and yield strength as a function of solidification conditions imposed by the metal/mold system. Finer microstructures tend to improve the mechanical resistance of aluminum alloys and copper alloys.

Biography

Givanildo Alves dos Santos Lecturer in the specialty Behavior and Selection of Materials for Mechanical Engineering by the Polytechnic School of the University of São Paulo (EPUSP), 2019. He received a Ph.D. in Aerospace Engineering from the Technological Institute of Aeronautics in 2010, Master in Aerospace Engineering from the Technological Institute of Aeronautics in 2005, with Post-Doctoral in the area of Science and Technology of Materials held at the Institute of Energy and Nuclear Research (IPEN), 2016. He is currently a professor in the area of Mechanics and the Postgraduate Program in Mechanical Engineering at Federal Institute of São Paulo (IFSP). He has experience in the area of Mechanical Engineering and Materials and Metallurgical Engineering, working mainly on the following topics: materials technology, product development and manufacturing processes.



Corrosion behavior of epoxy-based double-layer nanocomposite coatings modified with Zirconia nanoparticles

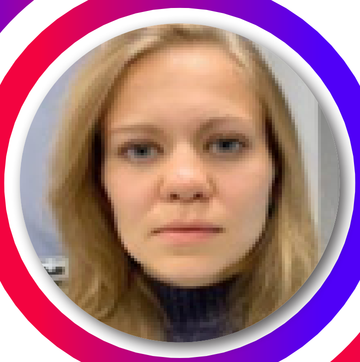
Sehrish Habib, Amani Hassanein, R.A. Shakoor, Ramazan Karahman and **Elsadig Mahdi Ahmed**

Qatar University, Qatar

This work reports the corrosion behavior of novel epoxy based double-layer nanocomposite coatings designed to mitigate corrosion in the marine environment. Zirconia (ZrO_2) nanoparticles were used as a carrier to load separately amine-based self-healing agent, polyethyleneimine (PEI), and corrosion inhibitor, imidazole (IM). The loaded zirconia (ZrO_2) nanoparticles with IM and PEI were doped into the epoxy matrix separately (1 wt. %) and applied on polished steel substrate to form pre and top layers of nanocomposite coatings, respectively. The successful modification of Zirconia nanoparticles was confirmed through various characterization techniques. Transmission electron microscopy (TEM) analysis confirms the almost globular morphology of the zirconia nanoparticles with a particle size of 15-25 nm. The chemical bonding interactions among various species were confirmed through Fourier-transform infrared spectroscopy (FTIR). The synergistic effect of self-healing agent and corrosion inhibitor in epoxy-based double-layer nanocomposite coatings demonstrated the pH and time dependence release of inhibitor and self-healing agent. A comparative electrochemical impedance spectroscopy (EIS) analysis conducted in 3.5 wt.% sodium chloride solution reveals that epoxy-based double-layer nanocomposite coatings demonstrate improved corrosion resistance performance as compared to the blank epoxy coatings and single layer epoxy reinforced coatings. This enhanced corrosion resistance of epoxy-based double-layer nanocomposite coatings can be ascribed to the efficient release of loaded IM and PEI into the ZrO_2 nanoparticles in response to the external stimuli (crack and pH change). The obtained results demonstrate that epoxy-based double-layer nanocomposite coatings reported herein can be potentially considered to circumvent corrosion in the oil & gas and marine applications.

Biography

Sehrish Habib is currently student of Ph.D. in Materials Science and Engineering in College of Engineering at Qatar University. She has done Masters in Materials and Surface engineering in 2014 from a renowned university, National University of Science and technology, Pakistan. She joined the current research group in 2018 in Center for advanced materials at Qatar University. Since then, she is working on smart coatings for corrosion protection applications in oil and gas field. She published few research papers as well in reputed journals.



Influence of Cu_2O substrate on photoinduced hydrophilicity of TiO_2 and ZnO nanocoatings

Maria V. Maevskaya[1], AidaV. Rudakova[1], Alexei V. Emeline[1] and **Detlef W. Bahnemann[1,2]**

[1]Saint-Petersburg State University, Russia
[2]Leibniz University Hannover, Germany

The effect of a Cu_2O substrate on the photoinduced change in the hydrophilicity of the surface of polycrystalline TiO_2 and ZnO films was studied in this work. It was shown that the formation of layered Cu_2O / TiO_2 and Cu_2O / ZnO heterostructures strongly changes the direction of the photoinduced change in the hydrophilic state of the surface. Under the action of ultraviolet radiation, the surfaces of TiO_2 and ZnO films transform into a super hydrophilic state, while under the action of visible light, no change in the surface hydrophilicity is observed. In this work, it is shown that the formation of Cu_2O / TiO_2 and Cu_2O / ZnO heterostructures leads to a photoinduced decrease in the hydrophilicity of the surface, both under the action of UV radiation and under the action of visible light.

Photoinduced changes in surface hydrophilicity were compared with changes in surface free energy, polar and dispersion components. The change in the photoinduced hydrophilic behavior of TiO_2 and ZnO surfaces during the formation of a heterostructure with Cu_2O is explained by the transfer of electrons and an increase in the concentration of electrons on the TiO_2 and ZnO surfaces.

Biography

Maria V. Maevskaya a PhD-student in Department of Photonics, Faculty of Physics, St. Petersburg State University;employee of the Laboratory “Photoactive Nanocomposite Materials”. Her research area is synthesis and characterization of semiconductor heterosystems, control of light by the hydrophilic state of the surface. Her research interests are IR spectroscopy of adsorbed molecules, photochemistry on the surface of semiconductors, photoactive nanocomposite materials.

Photovoltaic (PV) modules recycling

M. Cosnita and **C.Cazan**
Transilvania University of Brasov, Romania

The worldwide trend of reducing energy production from fossil fuels and of meeting the nZEB (nearly Zero Energy Buildings) concept will determine the increase of the installed PV module numbers. PV wastes amount could reach about 10 million tons in 2050. The EU Directive 19/2012 includes the PV modules wastes in the WEEE category and requires PVs to be recycled with a 45% share in 2016, and up to 65 % after 2020. The PV modules market includes: crystalline silicon (c-Si, i.e. mono- and polycrystalline), amorphous silicon (a-Si); CIS and CIGS (CuInSe(S), CuInGaSe(S)); CdTe, but the prevalent is cSi-PV (80%), The PVs disposing in municipal landfills will became an issue because of their cost and because they may contain small amounts of hazardous materials (e.g., Cd, Pb, In, Ga, Se). The PV modules could be recycled as follows: c-Si PV module containing high purity Si can be re-used if a cost effective technology is developed; a-Si PV modules - the Si recovery is usually overlooked given the small amount of recoverable material. Recently studies on PV modules recycling report on the existence of two processes in the market (Deutsche Solar, First Solar) consisting of: mechanical separation, laminated glass recycling, chemical and/or mechanical treatment, thermal separation, waste incineration, smelting. In Europe was proposed a pilot scale PV panel recycling-Full Recovery of End of Life Photovoltaic, but is still under investigation because of economic issues. The difficulties of PV modules recycling are the environmental and financial issues.

Therefore speech is focused on feasible and sustainable solution for end of life (EoL) Si-PV recycling by developing all wastes composites with high silicon photovoltaics (Si-PV) content.

Biography

Mihaela Cosnita is a doctor in domain Materials Science and Engineering Since 2014. Her PhD thesis title is Composites materials with controlled properties based on recyclable rubber, PET and wood. The most important contribution brought in the field, during her PhD, was the development of novel composites entirely based on wastes, with tailored mechanical properties by optimal interface control, without toxic additives. She continued research in the field, after PhD and she won the Novel all wastes composites PV based for indoor/outdoor applications project proposal in a national competition. Thus she has extended the development of all waste composites by sustainable Si-PV recycling, blending Si-PV-rubber-plastic waste. S mnfehe has acquired specific competencies in the composites, wastewater treatment field, managerial skills and analytical thinking.

Improving the reliability of mechanical components that have failed in the field due to repetitive stress

S. Woo
Addis AbabaScience & Technology University, Ethiopia

To improve the reliability of mechanical parts that have failed in the field, a reliability methodology for parametric accelerated life testing (ALT) is proposed. It consists of: (1) a parametric ALT plan, (2) a load analysis, (3) a tailored series of parametric ALTs with action plans, and (4) an evaluation of the final designs to ensure the design requirements are satisfied. This parametric ALT should help an engineer reproduce the fractured or failed parts in a product subject edto repetitive loading and correct the faulty designs. As a test case, the helix upper dispenser of a refrigerator icemaker fractured in field was studied. Using a load analysis, we discerned that the helix upper dispenser fracture was due to repetitive loads and a faulty design with a 2 mm gap between the blade dispenser and the helix upper dispenser. During the first and second ALTs, the fracture in the helix upper dispenser was reproduced. The failure modes and mechanisms found were similar to those of the failed sample in field. As an action plan, the design of the helix upper dispenser was modified by eliminating the 2 mm gap and adding enforced ribs. In the third ALT there were no problems. After three rounds of parametric ALTs, the reliability of the e helix upper dispenser was guaranteed as a 10-year life with an accumulated failure rate of 1%.

Biography

Seongwoo Woo has a BS and MS in Mechanical Engineering, and he has obtained PhD in Mechanical Engineering from Texas A&M. He major in energy system such as HVAC and its heat transfer, optimal design and control of refrigerator, reliability design of mechanical components, and failure Analysis of thermal components in marketplace using the Non-destructive such as SEM & XRAY. Especially, he developed parametric accelerated life testing (ALT) as new reliability methodology. If there is design fault in the mechanical system that is subjected to repetitive stress, it will fail in its lifetime. Engineer should find the design faults by parametric ALT before product launches.

In 1992–1997 he worked in Agency for Defense Development, Chinhae, South Korea, where he has researcher in charge of Development of Naval weapon System. In 2000-2010 he had been working as a Senior Reliability Engineer in Side-by-Side Refrigerator Division, Digital Appliance, SAMSUNG Electronics, where he focused on enhancing the life of refrigerator as using parametric the accelerating life testing. Now he is working as associate professor in mechanical department, Addis Ababa Science & Technology University.

PEERS ALLEY MEDIA

Theme: To codify revamping innovations in Materials Science and Engineering

VIRTUAL EVENT

GLOBAL SUMMIT ON

FUTURE OF MATERIALS SCIENCE AND RESEARCH

July 29-30, 2021

Anodic nanotubes and nanochannels for biomedical applications

A. Mazare[2] and **A. Cimpean**[1]

[1]University of Bucharest, Romania

[2]University of Erlangen-Nuremberg, Germany

Titanium and titanium-based alloys are well established as ideal implant biomaterials and their biological response is ruled by the surface properties. Therefore, increased attention was given to nanoscale a surface modification that leads to improved biocompatibility and corrosion resistance.

Self-organized TiO_2 nanostructures grown by electrochemical anodization havecontrolled nanoscale topography, large surface area, directional charge and ion transport properties, etc., this led to their extensive use. Anodization can be used on a wide range of elements and alloys (Ta, Nb, Zr, TiZr, TiNb, Ti6Al7Nb, etc.). Biomedical applications involve osseo integration, biosensors, antibacterial activity, drug delivery, mitigation of the inflammatory response, etc. and are based on the excellent control over the morphology and nanotopography. Moreover, cells respond to the nanoscale dimensions of the surface and can be synergistically influenced by the nanotopograhy and by addition of growth factors.

Here we present an overview for obtaining nanotubular or nanochannelar topographies and we further discuss the key interactions with osteoblast cells in in vitro tests (osteoblasts in cell culture models), thus evaluating the use of various nano-topographies in biomedical applications and their advantage for further use in biomedical applications (with respect to drug delivery, osseointegration, inflammatory cell response).

Biography

Anca Mazare received her Ph.D. in Chemistry from Politechnica University of Bucharest, Romania, in 2012 under the supervision of Prof. Ioana Demetrescu. She joined the group of Prof. Schmuki at the University of Erlangen-Nuremberg, Germany, in 2012 as a postdoctoral fellow where she has been working on synthesis and modification of semiconductor nanomaterials for biomedical and energy-related applications. Synthesis of semiconductor nanomaterials and their application in various biomedical and energy-related fields. Research interests also include novel fabrication methods for oxides and nitrides, novel nanostructuring of metals and various alloys either in bulk or thin films, as well as a detailed structural characterization of films and interfaces (morphology, chemical structure and composition, elemental distribution, corrosion stability, stability over time, etc.).

Removal of pesticides in water by CeO_2-WO_3 mixed-oxide catalysts

R. Fiorenza, S.A.Balsamo and **S.Sciré**
University of Catania, Italy

The water pollution due to the emerging contaminants as pesticides, pharmaceutics and/or plasticizers, is an urgent environmental problem strictly connected to the safety of the human and ecosystem life. In the recent years, the combination of different Advanced Oxidation Processes (AOPs) can be a performing strategy to remove these recalcitrant contaminants in water. In this contest, we have examined the (photo) catalytic activity of CeO_2-WO_3 materials for the degradation of the orto-phenylphenol fungicide comparing the photocatalytic, the Fenton and the photo-Fenton-like processes.

The samples were synthesized through deposition-precipitation mediated with the hexamethylenetetramine (HMTA) surfactant. The chemico-physical properties of the materials were examined by Raman, UV-Vis Diffuse Reflectance (Uv-vis DRS) and X-Ray photoelectron (XPS) spectroscopies, N_2 adsorption-desorption measurements and transmission electron microscopy (TEM). The (photo)catalytic measurements were made through a home-made photoreactor irradiated by a solar lamp. The degradation of the fungicide was measured by UV-vis spectroscopy.

An efficient heterojunction was formed between the CeO_2 and the WO_3 oxides which allowed to obtain a good degradation percentage of the pesticide (65%) employing the solar photo-Fenton-like reaction that among the three AOPs was the best performing process. The addition of WO_3 on CeO_2 facilitated the ionic exchange between the Ce and the W ions, boosting the redox properties of cerium oxide.

The strong interaction between the CeO_2 and WO_3 and the peculiar properties of this unconventional composite pave the way to its use as promising material for water depollution.

Biography

Roberto Fiorenza is a PhD in chemical Science. The main scientific interests are focused on some environmental (VOCs oxidation, air and water purification) and industrial (H_2 production and purification, CO_2 valorization) applications of heterogeneous catalysis with particular concern on semiconductors -based materials for photocatalysis. He won the Young Scientist Award at E-MRS (European Materials Research Society) 2017 ("Photocatalytic material for energy and environment "), the best PhD thesis 2018 for the Catania Gioeni's Accademy, and the "Adolfo Parmaliana prize 2019" for the best PhD thesis in the field of catalysis for a sustainable development. Presently he is a researcher in industrial chemistry at University of Catania (Italy).

Structure and charge monitoring of Prussian Blue analogous battery materialsby operando XRD and XAS

M. Giorgetti[1], **A. Mullaliu**[1,2], **M. Li**[1], **S. Passerini**[2], **G. Aquilanti**[3] and **J. R. Plaisier**[3]

[1]*University of Bologna, Italy*
[2]*Helmholtz Institute Ulm (HIU) and Karlsruhe Institute of Technology (KIT), Germany*
[3]*Elettra Sincrotrone trieste, Italy*

Nowadays, electrochemical energy storage plays a major societal role due to its widespread technological applications. Host nanostructured materials having a crystal structure with insertion sites, channels and/or interlayer spacings, allows the rapid insertion and extraction of lithium and sodium ions with generally little lattice strain. Therefore they are used as electrode materials for batteries.

X-ray absorption spectroscopy is a synchrotron radiation based technique that is able to provide information on local structure and electronic properties in a chemically selective mode. Operando synchrotron radiation x-ray powder diffraction (SR-XRPD) experiments allow monitoring the extended structure of a material during the intercalation/release process of ions. Both techniques were adopted in the study intercalation site, charge modification, and lattice modification of battery materials. In addition to ex situexperiment, dynamic processes occurring in batteries can be studied by operando modality. Operando experiments provide a realistic representation of the reaction behavior occurring at electrodes

The potentiality of the joint XAS-XRD approach in the newly proposed Prussian Blue-like cathodes materials for rechargeable batteries is here underlined. In our group, a series of PBAs have been synthesized, such as copper hexacyanoferrate (CuHCF), manganese hexacyanoferrate (MnHCF), titanium hexacyanoferrate (TiHCF), multi-metal doped hexacyanoferrate, as well as copper nitroprusside etc. In particular, this talk will be summarize results obtained in the case of copper, manganese, and the titanium analogs. As an example, the electrochemical activity of MnHCF without extensive dehydration was investigated by varying the interstitial ion content through a joint approach using operando x-ray absorption fine structure (XAFS) spectroscopy and multivariate curve resolution with alternating least squares algorithm (MCR-ALS), with the intent to assess the structural and electronic modifications occurring during sodium release and lithium insertion as well as the overall dynamic evolution of the system. The study is also complemented to the and operando XRPD. It was found that only a minor volume change (about 2%) is recorded upon cycling the electrode material against lithium.

Biography

Marco Giorgetti is an Associate Professor at the University of Bologna and local coordinator of the Erasmus Mundus Joint Master Degree in Advanced Spectroscopy in Chemistry (ASC). He has coordinated more than 30 projects in synchrotron radiation facilities. He received Ph.D. in Chemical Sciences (1998) in Italy and held a two-years post-doc position at the University of Minnesota, Minneapolis (1998-2000). The research activity he covers the field of the structural and electronic characterization of materials and solutions by core level spectroscopies, such as X-Ray Absorption Spectroscopy, the applied electrochemistry, sensors, the synthesis and characterization of materials for batteries, and methodology for data analysis

Effect of different contents of carbon nanotubes on the electrical and mechanical properties of cement paste

A. Páez-Pavón[1], A. Galán-Salazar[1], R. G. Merodio-Perea[1], J. Sánchez del Río[2] and **I. Lado-Touriño[1]**

[1]European University of Madrid, Spain
[2]Polytechnic University of Madrid, Spain

Cement is a low price and available material, whose properties can be substantially modified with the addition of different reinforcements, so that it can be used in novel applications, such as sensors for structure monitoring, structures for electromagnetic shielding, etc. Among the different available reinforcements, carbon nanotubes give rise to a novel composite material. These nanoparticles can increase the mechanical and electrical properties of the cement, without significantly modifying the weight and the final microstructure of the material. However, the addition of carbon nanotubes to the cement paste changes the viscosity, affecting the workability of the material. In the present study, cement paste was reinforced with different contents of multi-walled carbon nanotubes (MWCNTs). The effect of the reinforcement on the indirect compression resistance, electrical resistivity, density and viscosity were evaluated. The obtained results showed that the MWCNTs modified the hydration process of the cement, so that the material retained a higher degree of humidity at low setting times, which reduces the viscosity of the material. On the other hand, the addition of nanotubes to the cement slightly decreased its density, while the compressive strength and electrical conductivity of the material were increased. The improvement of the conductivity opens these materials the possibility of being used in a higher number of applications related to microelectronics and communications at different environments from building and edification to space.

Biography

Alicia Páez-Pavón is an Industrial Engineer and PhD in Materials Science and Engineering (Universidad Carlos III de Madrid). Her main research topics are the development of cement-based materials reinforced with carbon nanoparticles to improve mechanical, thermal and electrical properties, and the development of new procedures and new binder compositions for Metal Injection Molding (MIM) process. She is currently an adjunct professor in the Department of Industrial and Aerospace Engineering at the Universidad Europea de Madrid, and responsible for the degree in Aerospace Engineering.

Synthesis of graphene based materials for energy storage: Optimization of Tour´s method, first part

Hanna Bukovska, M. Belén Gómez-Mancebo, Rodolfo Fernández-Martínez and **Isabel Rucandio**
CIEMAT, Spain

Many attempts have been made to apply graphene in scientific areas due to its interesting properties.

Graphene synthesis methods could be categorized into two basic types: bottom-up or top-down. The methods for obtaining graphene materials by chemical synthesis are included in the top-down methods, which have two important advantages: low cost, nontoxic procedure that are easily to apply for a large-scale graphene production. Within these syntheses, three-dimensional graphene structures, called hydrogels, that presents some relevant properties such as: high specific surface area, low density, high pore volume and acoustic insulation, may be appropriate to be applied into energy storage purposes.

Hydrothermal synthesis is a simple method to obtain hydrogels starting from graphene oxide (GO), which consists of forming a three-dimensional structure of reduced graphene oxide (rGO) from an aqueous solution of GO. The complete synthetic route consists of oxidizing graphite to obtain graphite oxide which is, in turn, exfoliated to give rise to graphene oxide. The latterwill be the starting material to carry out the hydrothermal synthesis of hydrogels. These hydrogels must provide the following characteristics to be implemented in energy storage applications: a) High specific surface area (SSA), b) Large porosity made up of mesopores or micropores. c) High electric conductivity.

In this study, the aim is to optimize the initial step of the synthesis, the oxidation of graphite to graphite oxide. For this purpose, Tour´s method has been employed since that this method leads to water groups intercalated between graphite sheets. This gives rise to larger specific surface areas than those obtained with Hummers´ method, the most commonly used method. The different variables influencing the process: temperature, time and H2O2 and KMNO4concentrations have been optimized by applying an experimental design and all the materials obtained have been characterized by X-ray diffraction (XRD), analysis by Brunauer-Emmett-Teller (BET) method, Raman, X-ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM) and elemental analysis (EA).

Biography

Hanna Bukovska is developing her doctoral thesis at the Chemistry Area of the Research Center for Energy, Environment and Energy (CIEMAT). She studied bachelor's degree in chemistry at the Complutense University of Madrid and later did her master's degree in Materials Processing Technologies at the Rey Juan Carlos University. She is currently researching on the synthesis of graphene hydrogels for applications in water decontamination, supercapacitors and hydrogen storage.

Titanium(IV) oxo-complexes with $\{Ti_4O_2\}$ core, their photocatalytic and antimicrobial properties

B. Kubiak, P. Piszczek and **A. Radtke**
Nicolaus Copernicus University, Poland

The current epidemiological situation in the world has revealed that microorganisms are still a huge threat to human life and health. This is due to the fact that most of the microorganisms have become resistant to the antibiotics and antimicrobial agents used so far. For this reason, there is an intensive search for new compounds, which show adequate microbiocidal activity and may be an alternative to those currently used. A new solution may be titanium(IV) oxo-complexes (TOCs), which can prevent the spread of bacteria. The aim of our researches is synthesis of TOCs consisted of Ti4O2 cores as a result of titanium(IV) isobutoxide reaction with 4-aminobenzoic acid (1) or 9-fluorenecarboxylic acid (2). Isolated TOCs have been dispersed in polycaprolactone (PCL) matrix, forming in this way PCL + TOCs composite system. The obtained materials can be used as antibacterial surfaces in medical instruments and public places.

Titanium(IV) oxo-complexes were syntesized under an inert atmosphere, by mixing titanium(IV) isobutoxide with a carboxylic acid (1 or 2) in an organic solvent. Composite materials were dispersed (5 wt.% or 20 wt.%) in a polymer matrix. The obtained composites were examined by IR and Raman spectroscopy, Raman mapping and also subjected to thermal analysis by TG and DSC methods. SEM EDX analysis was also performed, which confirmed the presence of TOCs in the polymer matrix. The photocatalytic activity was investigated by observing the degradation of methylene blue (MB) under VIS light. Microbiological tests were carried out for the following bacteria: Escherichia coli, Staphylococcus ureus and Candida albicans yeasts.

The photocatalytic activity is related to the used TOCs concentration. Better results are obtained for a concentration of 20%, but in microbiological tests, a lower concentration does not affect the obtained results so much. Obtained compounds can be used as a antibacterial agents in the future.

Biography

Barbara Kubiak graduated in cosmetic chemistry and forensic chemistry. Since 2019 he is a PhD student at the Department of Inorganic and Coordination Chemistry at the Nicolaus Copernicus University in Toruń. He deals with the preparation of titanium oxo-complexes as well as the study of their properties, primarily photocatalytic and microbiological.

Mechanical properties of bi-layer and dispersion coatings composed of several nanostructures

D. Rogala-Wielgus, B. Majkowska-Marzec and **A. Zieliński**
Gdansk University of Technology, Poland

For use in biomedical applications the mechanical properties of the composite coatings were evaluated. Six coatings electrophoretically deposited on Ti13Nb13Zr alloy and Ti Grade II substrate were studied: the coating composed of multi-wall carbon nanotubes (MWCNTs),the dispersion coating consisting of MWCNTs and nanocopper and the bi-layer coating comprised of titanium dioxide, electrophoretically deposited on MWCNTs layer. Optic microscopy, scanning electron microscopy, X-ray electron diffraction spectroscopy and nanoindentation were applied to study the chemical and phase composition, roughness, wear resistance, plastic and elastic properties. The best mechanical, plastic, and elastic properties in terms of biomedical application were achieved for the MWCNTs coating with titania layer deposited on Ti Grade II substrate, while the coating composed of MWCNTs and copper turned out to be more brittle when deposited on Ti alloy than on Ti grade II. Generally, both the addition of nanocopper and titania improved the mechanical properties of the base MWCNTs coating deposited on Ti grade II, but for Ti alloy, which served as a substrate for MWCNTs coatings the additions just improved the capability of the MWCNTs coating to accommodate substrate deflection under applied load. This could be explained by the fact that more homogenous coatings generally form on pure metals than on its alloys, which chemical and phase composition is more complex.

Biography

Dorota Rogala-Wielgus is a Ph.D. student in the field of Material Engineering at the Gdańsk University of Technology, Biomaterials Group, Poland. She has graduated B.Eng. in Nanotechnology at faculty of Applied Physics and Mathematics and an M.Sc.Eng. in Material Engineering at the Faculty of Mechanical Engineering. Her research is focused on studying mechanical and biological properties of coatings based on elemental carbon, mostly carbon nanotubes electrophoretically deposited on titanium and its alloys substrate.

Ecotoxicological study of fine-recycled aggregate

K.A. Mocová[1], D.Mariaková[2] and **T. Pavlů[2]**
[1]*University of Chemistry and Technology, Czech Republic*
[2]*University Centre for Energy Efficient Buildings of Technical University, Czech Republic*

Construction sector is one of the largest consumers of mineral resources, which is also related to the subsequent production of waste. The production of the most widely used products in this sector, such as bricks and concrete, is currently dependent on the constant extraction of primary materials from non-renewable resources. The reuse of recycled materials in the construction industry has considerable potential for saving of the primary resources. Besides the importance of mechanical and chemical features of the materials, it is appropriate to assess the degree of impact on the environment. One option is to perform leaching tests and subsequent ecotoxicity tests with aquatic organisms.

In this study, four types of waste construction materials were examined – recycled aggregate (RA) from four different sources. The natural aggregate was examined as well as used as the reference sample. The basic chemical reactions in the view of ecotoxicology were investigated and measured based on both international and Czech standards. Chemical analysis, duckweed growth inhibition test, freshwater algae, and water flea acute toxicity test were performed and discussed. Plant growth and viability of water flea exposed to leachates was compared with both standard growth media and distilled water to determine both toxicity and nutrients lack in the tested samples.

Results showed differences among the samples. Masonry-derived aggregate and RA prepared from reinforcement concrete showed no toxicity, while RA originated from highway and ground floor had inhibitory to mild toxic effect. Because of the ecotoxicity observed in selected leachates, landfilling of these materials is not appropriate. A more suitable variant seems to be the use in concrete because of the new assumption that the use of waste materials in concrete leads to their immobilization. This assumption will be verified in a follow-up research.

Biography

Klára A. Mocová studied first biology at Charles University Prague. After obtaining Master's degree she continued in doctoral studies at University of Chemistry and Technology Prague (UCT Prague) with a thesis "Phytotoxicity Tests and Their Application for Evaluation of Solid Samples". Recently she is an assistant professor at the Department of Environmental Chemistry of the Faculty of Environmental Technology at UCT Prague. She is a lecturer of Biology, Ecology and Ecotoxicology courses. Her scientific fields of interest are soil and aquatic phytotoxicity assessment; methods of digital image analysis in environmental sciences. Her latest experimental work has been focused on the ecotoxicological impact of wood leachates, construction materials and waste.

MWCNTs decorated with Ag nanoparticles through pulse reversed current electrodeposition using a deep eutectic solvent for energy storage applications

Ana T. S. C. Brandão[1], **Sabrina Rosoiu**[2], **Renata Costa**[1], **Oana Andreea Lazar**[2], **A. Fernando Silva**[1], **Liana Anicai**[2,3], **Carlos M. Pereira**[1] and **Marius Enachescu**[2,4]

[1]*University of Porto, Portugal*
[2]*Politehnica University of Bucharest, Romania*
[3]*OLV Development SRL, Romania*
[4]*Academy of Romanian Scientists, Romania*

The massive demand for energy and the urgent need to reduce the consumption of fossil fuels has been attracting the interest of the scientific community to develop materials with even better electrochemical properties. Carbon-based materials, such as carbon nanotubes (CNTs), graphene, activated carbon, among others have received attention due to their remarkable thermal, electrical and mechanical properties. Both electrode materials and electrolyte play a significant role in any electrochemical device. Any improvement in the performance of existing electrochemical devices requires further research in both fields. CNTs are receiving special attention due to their extraordinary thermal, electrical, and mechanical properties. Combining the CNTs with metallic nanoparticles have attracted the attention of the scientific community for technological applications such as energy storage.

The present work reports a ground breaking synthesis procedure to decorate MWCNT swith silver nanoparticles (Ag-NPs) via pulsed reverse deposition technique using a deep eutectic solvent (DES) based on choline chloride and glycerol as an electrolyte at room temperature, not involving any previous surface modification of MWCNTs.

The Ag-MWCNTs composites were characterized by Raman spectroscopy, SEM/EDX analysis, ultrahigh-resolution STEM, in which the Z – Contrast image was collected and AFM was performed to evaluate the conductivity of the Ag-MWCNTs composites. Ag-MWCNTs composites characterization allowed to prove the successful attachment of the Ag-NPs to the MWCNTs surface.

Electrochemical studies were performed using cyclic voltammetry and charge/discharge measurements using a three-electrode system. All the composite materials presented higher specific capacitance than commercial MWCNTs and the best performing material showed a 6 time increase in specific capacitance (28.50 F. g-1, against 4.70 F. g-1).

In this presentation, it will be shown the most relevant results regarding the characterization of the Ag-MWCNTs composites, and its application to energy storage devices.

Biography

Ana T. S. C. Brandão obtained her MSc degree in Chemical Engineering from Faculty of Engineering of University of Porto. She is currently a Chemistry PhD student at Faculty of Sciences of University of Porto under the supervision of Professor Carlos M. Pereira. She participated in research involving preparation and characterization of carbon materials and the usage of deep eutectic solvents for the electrodeposition of metals and metallic alloys (NanocoatIL and Novtinalbest M-ERA.NET projects). Her current research focuses on electrochemical characterization of ionic liquids analogues (deep eutectic solvents) for energy storage applications using high surface area carbon materials. The main research interests are metal electrodeposition using ionic liquids and analogues as electrolytes, including metallic nanoparticle deposition on carbon materials; carbon materials synthesis and modification for the increase of surface are surface characterization through atomic force microscopy, scanning electron microscopy and Raman spectroscopy.

Nanostructured surface modification of coarse-grained and ultrafine-grained Ti-13Nb-13Zr alloy for biomedical application

Marko Rakin, Dragana Barjaktarević and **Veljko Djokić**
University of Belgrade, Serbia

In the last decade electrochemical methods, that enable surface modification are extensively used in the production of implants, among others electrochemical anodization (anodic oxidation) which enables the obtainment of a nanostructured oxide layer on the surface of metallic biomaterial composed of nanotubes. The advantage of this surface treatment is the ability to obtain adequate surface modulus of elasticity, hardness, corrosion resistance and biocompatibility.

Ultrafine-grained (UFG) Ti-13Nb-13Zr (TNZ) alloy, obtained by high pressure torsion (HPT) (pressure 4.1 GPa, 5 rotations), was subjected together with coarse-grained (CG) alloy to surface modification, using the electrochemical anodization at a voltage of 25V in 1M H3PO4+0.5wt.% during 90 minutes. Characterization of the morphology of nanostructured surfaces was done using scanning electron microscopy (SEM), while the topography and surface roughness of the materials were determined using atomic force microscopy (AFM). Corrosion resistance was examined using the potentiodynamic method in artificial saliva and Ringer's solution at a temperature of 37°C with a pH of 5.5. Examination of the surface modulus of elasticity and hardness was performed using the nanoindentation test. Cytotoxicity of tested materials and cell culture viability were assessed using the tetrazolium salt colorimetric test (MTT test) with mouse (L-929) and human lung (MRC-5) fibroblasts in a liquid medium. Morphology and adhesion of cells on the surface were analyzed using SEM.

Surface nanostructure modification has led to the formation of an oxide layer on the surface of all tested materials. The obtained results indicate the influence of the HPT process on the homogeneity of the nanostructured oxide layer. Also, electrochemical anodization led to an increase in surface roughness. An electrochemical test has shown increase of corrosion resistance in a solution of artificial saliva after surface nanostructure modification. On the other hand, recorded was a decrease in corrosion stability obtained in Ringer's solution. Characterization of the materials surface using nanoindentation showed a decrease in the values of modulus of elasticity and hardness, for materials with a nanostructured oxide layer, which are close to the values of bone tissue in the human body. The result of the MTT test showed that CG and UFG TNZ alloys before and after surface nanostructure modification were not cytotoxic. The obtained results showed that the materials before and after the surface nanostructure modification were adequate in their biocompatibility for use in implantology.

Biography

Marko Rakin is a Full Professor in University of Belgrade, Faculty of Technology and Metallurgy. His R&D activities are applied mechanics in materials science including micromechanical analysis of damage and fracture of heterogeneous materials and structures (mainly welded joints). Ti-based biomedical materials: development, modification, characterization, application. Experimental, analytical and numerical analysis of components and structures in the processing industry.

Fast and in-plane only retardation switching of a certain type of smectic liquid crystal

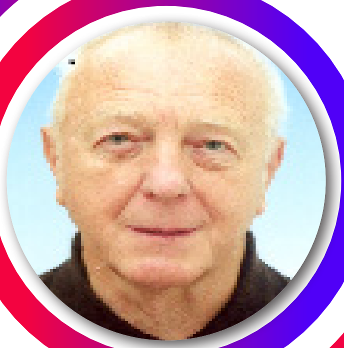
A. Mochizuki
i-CORE Technology, USA

A certain type of the smectic single domain or SSD liquid crystal shows some unique characteristic properties including fast optical response such as ~ 100 microseconds, applied electric field polarity dependent response, and in-plane only retardation switching. Dynamic switching behavior of retardation switching of an SSD liquid crystal has revealed some interested phenomena. In plane only and amixture between in plane and out of plane retardation switching behaviors are highly related to the initial smectic liquid crystal molecular stacking configurations and their consecutive liquid crystal driving torque origin. With uniformly stacked configuration, a completely symmetric retardation switching, as well as light throughput behavior was obtained. With a slight twisted stacking configuration, the retardation switching behavior is dependent on the applied electric field strength, which may change the initial molecular stacking configuration, resulting in either symmetric or asymmetric retardation switching. When the molecular stacking has twisted heavily, the obtained retardation switching showed asymmetric behavior regardless of the applied electric field strength. When an SSD liquid crystal shows completely in-plane only retardation switching, the SSD liquid crystal molecules always move perpendicular to the externally applied electric field, and switching direction either clockwise, or counter-clockwise is dependent on applied electric field polarity. For instance, when applied electric field is downward to the SSD liquid crystal layer, each SSD liquid crystal molecule swings to clockwise direction as a corrective manner. When the applied electric filed is upward, the swing direction is counter-clockwise. Such always switching perpendicular to the applied electric field direction suggests the primary driving torque of the SSD liquid crystal originated from quadrupole momentum. An original smectic liquid crystal molecular stacking configuration is assumed to give some significant influence on commensurate effect of quadrupole moment origin. Fast optical response with in-plane only retardation switching of an SSD liquid crystal would be good for high diffraction efficiency devices, beam steering devices, and some photonics devices.

Biography

Akihiro Mochizuki has 40+ research experiences on molecular crystal materials and their device application. He graduated from The University of Tokyo in Japan with BA natural Science in 1980. During his research works at Fujitsu Laboratories, he was given Dr. of Applied Physics from the Tokyo University of Agriculture and Technology in 1991. He moved to Boulder, Colorado USA in 1998, and worked for an LCoS (Liquid crystal on Silicon) device development firm. In 2003, he founded a startup firm focusing on intellectual properties development and licensing in Boulder, Colorado. Since 2011 till present, he has been engaging as an independent technical consultant. His expertise includes liquid crystals, molecular crystal devices, organic materials sensors and so on. He is a member of SPIE, American Chemical Society, American Optical Society, Society for Information Display.

.



Present and future photovoltaic modules –Trends and limits

V. Benda
Czech Technical University in Prague, Czech Republic

Photovoltaic solar energy (PV) is expected to play a key role in the future global sustainable energy system. PV systems consist of many components: photovoltaic modules converting sunlight into DC electricity, inverters changing the electric current from DC to AC, and other accessories to set up a working system (constructions, cabling, monitoring).

PV conversion can be done with a wide range of materials, device architectures and technologies. The key components are PV modules that represent basic devices, which are able operate for a long time in outdoor conditions. PV modules can be realized from different materials by different fabrication technologies. The main criteria supporting or limiting a successful placement of particular technologies in the market is the cost of electricity produced by PV systems. The Levelized Cost of Energy (LCOE) method takes into account the investment cost the operating costs, and the total energy produced during the system service life. The influence of price, efficiency and service life of PV modules and other PV system components on LCOE (together with the availability of materials) sets limits for applicable technologies.

Improvements in the module efficiency and service life demand a higher technology level that increase the production costs, but decrease the cost of other parts (BOS) of the system. The influence of efficiency, service life and costs on the technology of PV modules with regard to the costs of the entire PV system on LCOE is discussed.The presented analyses show that any PV module technology for future PV power generation should meet the criteria: efficiency higher than 14%, price below 0.4 USD /Wp, service life of more than 15 years. At the same time, it must ensure the availability of materials for annual production in excess of 500 GWp. Technologies that do not meet all the criteria would find only limited application in the market.

Biography

Vitezslav Benda graduated at MSc level in Solid State Physics at the Czech Technical University in Prague in 1967. From 1967 to 1973 he worked in the R&D department of CKD Semiconductors. Since 1973, he has been at the Faculty of Electrical Engineering of the Czech Technical University in Prague, where he was awarded a doctoral degree in Electrotechnology (PhD) in 1976. Since 2001 he has been a Professor in Materials and Technology for Electrical and Electronics Engineering at the Department of Electrotechnology of the Czech Technical University in Prague. He specialises in electronic materials and devices, especially in the physics, technology and diagnostics of power semiconductor devices and in photovoltaics.

Novel composite materials for electromagnetic shielding applications

M. Suchea[1,2], I.V. Tudose[1,3], K. Muratis[1], O.N. Ionescu[2,6], C. Romanitan[2], M. Popescu[2], V. Khomenko[4], O. Butenko[4], O. Chernysh[4], G. Kenanakis[5], V. Barsukov[4] and **E. Koudoumas[1]**

[1]*Hellenic Mediterranean University, Greece*
[2]*National Institute for Research and Development in Microtechnologies (IMT-Bucharest), Romania*
[3]*University of Crete, Greece*
[4]*Kyiv National University of Technologies and Design, Ukraine*
[5]*Institute of Electronic Structure and Laser, Greece*
[6]*Petroleum and Gas University, Romania*

Electromagnetic interference (EMI) can cause problems to electronic devices, equipment and systems. With the new generation of communications, especially the 5G technology, EMI shielding becomes more important and new challenges appear regarding EMI and the requirement of electromagnetic shielding, since, electromagnetically active devices must not affect the operation and the safety of other systems in their environment. The classical methods of shielding by using metallic plates or coating need to be improved, therefore, there it is a need for materials capable to provide dielectric characteristics at lower frequencies and conductive characteristics at high frequencies.

With increasing frequencies and further miniaturization of devices, EMI shielding is key to this new technology. Therefore, extensive research activities are required to develop lightweight, easy to use, effective EMI shielding materials in daily and specific cases. This presentation regards recent results on C-polymer composites in the form of paints for use in EMI shielding in a wide frequency range, from 50 MHz to 30 GHz. The paints formulations are based on a combination of different carbon-based materials, having different morphology (graphite, graphitized carbon black, etc.), and the investigation is focused in getting a good conductivity, and other synergistic effects for shielding efficiency, in connection with achieving homogeneous, uniform, opaque layers, that can dray fast in air at room temperature. Improvement of graphene powder based paints was achieved by its combination with conducting polymers (PANI, PEDOT), an approach that led to novel composite materials in the form of thin layers with an improved shielding efficiency, this approaching -30% in the above-mentioned frequency range, for coatings consisting of three layers.

Biography

Mirela Suchea is affiliated to CEMATEP, Hellenic Mediterranean University, Heraklion, Greece and National Institute for R&D in Microtechnologies - IMT Bucharest, Romania. She is a scientist with research experience in the field of nanostructured materials synthesis and applications. She works in materials science and nanotechnology since 2002.

I Support

PEERS ALLEY MEDIA

GLOBAL SUMMIT ON FUTURE OF MATERIALS SCIENCE AND RESEARCH

July 29-30
2021

Scientific Abstracts

Day 2

Theme: To codify revamping innovations in Materials Science and Engineering

VIRTUAL EVENT
GLOBAL SUMMIT ON
FUTURE OF MATERIALS SCIENCE AND RESEARCH
July 29-30, 2021

Architecture of copper sulfide compound boosting thermoelectric performance

X. Q. Chen
Hubei University of Education, China

Based on the development of high-performance necessity and urgency of the thermoelectric conversion material, copper sulfide has been regarded as a promising thermoelectric material with relatively high thermoelectric performance and abundant resources. The low intrinsic thermal conductivity and high electrical transport of these materials are born out of the "phonon-liquid electron-crystal" structure between the copper and chalcogens. However, three thermoelectric parameters, Seebeck coefficient, electrical conductivity, thermal conductivity, are interrelated with each other. To further improve the thermoelectric properties of copper sulfides must be decoupled these parameters.

We discuss the strategies for designed architecture to improve the thermoelectric performance of copper sulfides based on reducing lattice thermal conductivity of single-component material and tuning compositions for optimizing thermoelectric properties. Copper sulfide compound, including the compound structure of multiscale architecture-engineered $Cu_{2-x}S$ at different mass ratios and carbon-encapsulated $Cu_{2-x}S$, synthesized by a room-temperature wet chemical method. The observed electrical conductivity in the multiscale architecture-engineered $Cu_{2-x}S$ is four times as much as that of the $Cu_{2-x}S$ sample at 800 K, which is attributed to the potential energy filtering effect at the new grain boundaries. Moreover, the multiscale architecture in the sintered $Cu_{2-x}S$ increases phonon scattering and results in a reduced lattice thermal conductivity of 0.2 W•m^{-1}•K^{-1} and figure of merit (zT) of 1.0 at 800 K. The electrical conductivity of $Cu_{2-x}S$@C compound increases by approximately 50% compared to that of the pure $Cu_{2-x}S$ sample, and can be attributed to an increase in carrier concentration. Phonon scattering interface formation and superionic phase of $Cu_{2-x}S$@C results in very low lattice thermal conductivity of 0.22 W•m^{-1}•K^{-1} and maximum thermoelectric *zT* of 1.04 at 773 K. The results confirmed that these two strategies are effective for the enhancement of thermoelectric performance.

Biography

Chen studied Condensed Matter Physics at Central China Normal University, China and graduated as MS in 2012. She received her PhD. degree in nanomaterials engineering at the Institute for Superconducting and Electronic Materials (ISEM), University of Wollongong, Australia in 2016. Then she worked the School of Physics and Mechanical & Electrical Engineering, Hubei University of Education, China and carried out her research of copper chalcogenide thermoelectric materials in State Key Laboratory for Modification of Chemical Fibers and Polymer Materials, College of Materials Science and Engineering, Donghua University as a post-doctorate from March 2017 to December 2019. Her research focuses on the design and synthesis of novel copper chalcogenides nanostructures for energy conversion and storage. She undertook the National Natural Science Foundation of China (51702091), the Natural Science Foundation of Hubei Province, China (2017CFB192), and the China Postdoctoral Science Foundation (2017M621320).

Insights into the predicted Hf_2SN and Ti_2CdN in comparison with their synthesized carbide counter parts

A.K.M. A. Islam[1,2] and **M.A. Hadi**[2]
[1]International Islamic University Chittagong, Bangladesh
[2]Rajshahi University, Bangladesh

In this study, density functional theory (DFT) methods are employed to explore some physical properties (structural, elastic, electronic charge density distribution, Fermi surface topology, Mulliken bond overlap population, thermal conductivity, Vickers hardness and optical properties) of the two predicted nitride MAX phases Hf_2SN and Ti_2CdN to reveal their few macroscopic behaviours. The obtained results are compared with those calculated for their carbide counterparts Hf_2SC and Ti_2CdC. The lattice constants a and c of both nitride phases are smaller compared to their carbide counterparts. All the elastic constants and moduli of Ti_2CdN are larger than those of Ti_2CdC while the maximum elastic constants (except C_{12} and C_{13}) and all moduli of Hf_2SN are smaller than those of Hf_2SC. The nitride phase Hf_2SN is ductile while the carbide phase Hf_2SC is brittle in nature. Conversely, the nitride phase Ti_2CdN is brittle in nature while the carbide phase Ti_2CdC lies on the broader line between ductility and brittleness. Investigation of phase stability via enthalpy calculations shows that the predicted nitrides are stable. Between the two predicted nitride MAX phases, Ti_2CdN is structurally more stable than Hf_2SN since the Fermi level of Ti_2CdN is closer to the pseudogap compared to Hf_2SN. Both sets of MAX phases may be used as coating materials to minimize solar heating. Due to ductility (i.e., machinability) the predicted phase Hf_2SN seems to be more useful than its carbide counterpart Hf_2SC in some technological applications. Again, the predicted phase Ti_2CdN appears to be more useful than the already synthesized Ti_2CdC in several engineering applications since it is found to be stiffer than Ti_2CdC. But the Cd containing phases should preferably be used under controlled environment in possible technological devices. The predictions will hopefully stimulate the experimentalists to synthesize Hf_2SC and Ti_2CdN.

Biography

A.K.M. Azharul Islam is Professor Emeritus and former Vice-Chancellor of International Islamic University Chittagong, Bangladesh. He successfully pursued DIC from Imperial College of Sci. & Tech., London in the year 1969. He was awarded Ph. D. in 1972 from London University. He is a Fellow of the Institute of Physics (UK) as well as Bangladesh Academy of Sciences. His field of research was Elementary particle physics during 1967-1978. His research interest now spans the fundamental aspects of Condensed matter, which include Superconductivity, defects of solids, electronic structure of materials, MAX phases, nanomaterials. He has received several national and international awards for his research activities.

Dynamic mechanical performance of cornhusk film reinforced epoxy laminate composite

Harwinder Singh and **Arobindo Chatterjee**

Dr. B.R. Ambedkar National Institute of Technology, India

The current study explores the potential of cornhusk film (CHF) as reinforcement in epoxy matrix. The aim is to produce sustainable and economical polymer composite structures with enhanced composites' properties. CHF/epoxy composites (CHFEC) are formed with hand layup technique by varying the CHF % by weight (3%, 6% and 9%) as well as by the angle of orientation (00, 450 and 900) with respect to its ridges along the direction of mould. The interphase between alkali treated CHF and epoxy matrix is charchterized by Scanning electron microscopy (SEM) as well as Dynamic mechanical analysis (DMA). The best results for the viscoelastic properties of the composites are obtained at 6wt% CHF. The damping factor of the composites decreased with increase in CHF% and there is positive shift in tan δ peak at 6wt% CHF loading and 450 angle of orientation. Storage modulus is increased by 75.47% and retained four times its value in rubbery zone compared to neat epoxy. The value of coefficient of effectiveness is lowered with addition of CHF. Cole- Cole plots show that composites retained the homogeneity with addition of CHF. The impact of different frequencies is also studied. The maximum moisture absorption of the composites is around 1% for 9wt% CHF loading. These results can be used to engineer CHF based epoxy laminate composite structures for inner lining of the doors of the auto mobiles, partitioning panels, decking and similar applications.

Biography

Harwinder Singh is working as Senior Research Fellow in the Department of Textile Technology, NIT Jalandhar, Punjab, India. His area of interest is lignocellulose based polymer composites with special emphasis on dynamic mechanical behavior of the composites. He worked as Assistant Professor at NIT Jalandhar. He is having industrial experience as well in production and quality control department in textile spinning division.

Hybrid organic-inorganic architectures: Blue and red shift in optical properties

Senthil A. Gurusamy Thangavelu, Ananthanarayanan Krishnamoorthy and **Dinesh K. Chelike**
SRM Institute of Science and Technology, India

The progress in organic-inorganic hybrid materials towards the development of new materials of intriguing optical properties can be potential due to its optical responses of organic units with inorganic counterpart, paves new avenue to study innovating optical systems.

In the present work, a new assembly of luminescent hybrid inorganic-organic molecule was synthesised via condensation of six units of 10-octyl-10H-phenothiazine-3-carbaldehyde (R-PTZ-CHO, R- octyl chain) with hexakis cyclotriphosphazene hydrazide (CTP-Hyd). Herein, the synthesis of new inorganic heterocyclic hydrazideprecursor, CTP-Hyd has been developed to append the PTZ units on the periphery of robust inorganic CTP ring. The luminescent hybrid material obtained by the facile synthesis was characterized at each step by battery of analysis such as FT-IR, multi-nuclear NMR including 1H, 13C and 31P spectra as well as HRMS/MALDI-TOF data. Moreover, the photophysical properties of the above hybrid material were characterized by UV-vis absorption, photoluminescence and time resolved photoluminescence spectral data. Indeed, the hybrid molecule shows extraordinary solvent compatibility and depicts tunable emission around yellow-green region. To extend our studies on above type of structures, phenothiazine moietyconjugated with(4-aminobenzoyl) hydrazidehas been assembled on periphery of CTP core with aromatic spacer unit. Conversely, optical absorption data of the same molecule was occurred to exhibit the blue shift rather than red shift. The above data has been compared with control substrate of aromatic molecule to deduce the observed blue shift in photophysical properties. Also, the characterization by physicochemical studies was found to deduce the proposed structure of new molecule with good thermal stability.

Biography

Senthil A. Gurusamy Thangavelu has acquired his bachelor, master and M. Phil. degree from Department of Chemistry, VHNSN College, Virudhunagar, India. In the year of 2001, he graduated his PhD in main group organometallic chemistry from Prof. V. Chandrasekhar research group at IIT Kanpur. He moved to USA for pursuing postdoctoral research from Iowa State Univ., Ames (Organometallic macrocycles, 2001–2003), Univ. of California Riverside, CA (N-heterocyclic carbene complexes and catalysis, 2003–2007), Northwestern Univ. IL (Sugar synthesis, 2007–2010) and Centre for Sustainable Polymers, Univ. of Minnesota Minneapolis (Sustainable polyurethanes, 2010–2012). He occupied as quick hire scientist in polymer division at CSIR-CLRI, Chennai (Biodegradable polymer composites, 2013– 2016). Since 2016 onwards, he is working as associate professor in department of chemistry at SRM IST, Kattankulathur. Currently, his research interest is focused on hybrid organic-inorganic materials, catalysis, organometallic complexes and sustainable/biodegradable polyurethanes.

Materials processing through microwave energy: A review

Sarbjeet Kaushal
Gulzar Group of Institutions, India

In the today's era every industry needs a material processing technique, which is economical, fast and energy efficient. Microwave material processing has emerged as a fast growing technique which processes the materials at low cost and at less time than conventional material processing techniques. Volumetric heating feature of microwave heating results in the better properties of the microwave processed material. Microwave processing of materials has been successfully used in the domain of sintering, cladding, casting of various kind of metal, metal ceramic based composite materials. Apart from this in the recent years feasibility studies of microwave heating have been carried out in the field of processing of functionally graded materials and drilling of glass and other brittle materials. In this study a brief review about different microwave material processing techniques have been covered.

Biography

Sarbjeet Kaushal did his PhD in the domain of microwave processed functionally graded materials from Thapar University (Thapar IET), India in 2019.

PEERS ALLEY
MEDIA

About us

A confluence of Erudite and Knowledge-Seeker

Peers Alley Media

A global consortium of the scientific fraternity, scholars, educationists, industry leaders and entrepreneurs to collaborate, share ideas and knowledge to resolve challenges across medicine, science, technology and business

Our Vision

"We aim to bring the research and innovations happening across the parts of the globe to facilitate interaction, knowledge sharing and exchange. We also aim to inspire university professors, students, researchers, clinicians and entrepreneurs from across the disciplines including but not limited to clinical, medical, business, technology, healthcare and pharmaceutical fields. Our dream is to bring advancements in the Science and Technology to the mankind through our scientific gatherings and deliberations. We believe in introducing novel methods and innovative techniques in science, business and technology to provide understanding on the developments".

Our Mission

How do we serve our target groups in the scientific & business community?

- We bring the untold research accessible for many.
- Our events meet the research needs of the target groups across the academia, industry, corporates, the government, non-government agencies and public bodies.
- We Engage. Enlighten. Empower people deprived of information.
- We connect the international giants towards finding simple solutions to the complex medical and healthcare challenges of the globe.
- We unveil the unlimited research opportunities to the sections of population that is away from the developments in science and technology.
- We encourage Young and emerging researchers and scholars.
- We extend continuous education credits to boost the career and academic progress.
- We encourage start-ups in science, technology and business for the social and economic empowerment of the enthusiastic entrepreneurs.

Peers Alley Media
1126 59 Ave East, V5X 1Y9, Vancouver BC, Canada
Ph : +1-778-766-2134 / Contact us: contact@peersalley.com

INDEX

BOOKMARK YOUR DATES

4TH GLOBAL SUMMIT ON FUTURE MATERIALS SCIENCE AND RESEARCH

PARIS, FRANCE | 2022

https://materialsscience.peersalleyconferences.com/