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3rd Edition of International Conference on

MATERIALS SCIENCE AND ENGINEERING

21-22 SEPT 2022

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BOOK OF ABSTRACTS

3RD EDITION OF INTERNATIONAL CONFERENCE ON

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Welcome Message

Dear Distinguished Scholars, Engineers and Colleagues!

It is my great honour and pleasure as a Committee Member to invite you to join with a contribution to the 3rd Edition of International Conference on Materials Science and Engineering, planned as a Hybrid Event in September 21-22 in Paris, France. The Conference will include Plenary and Keynote Speeches and Invited Talks which will be given by Distinguished Scholars and Experts from academic institutions and industry, and oral presentation by delegates and poster presentations by young junior participants.

The conference runs on the theme "Inquisition of Material Science for Better Perspective", and it aims to provide scientists and experts with once-in-a-lifetime opportunity to stay abreast of this rapidly changing field by offering a comprehensive overview of the recent findings in the field of minerals, metallurgy, and materials. MAT 2022 covers all aspects of Materials Science and Engineering, Nanomaterials and Polymers and serves as a bridge between scientists, researchers, and experts in research, development, and production. International scientific activities are big scientific platforms for the scientists, academicians, and young academicians from all over the world, to interact and communicate with each other. I believe that MAT 2022-Conferenc will provide this opportunity for delegates from different cultures and countries.

Also, this conference will be performed successfully, in favour of the qualified scholars and experts and will be very beneficial for young delegates by encouraging them and improving their confidence of presenting research in an international platform.

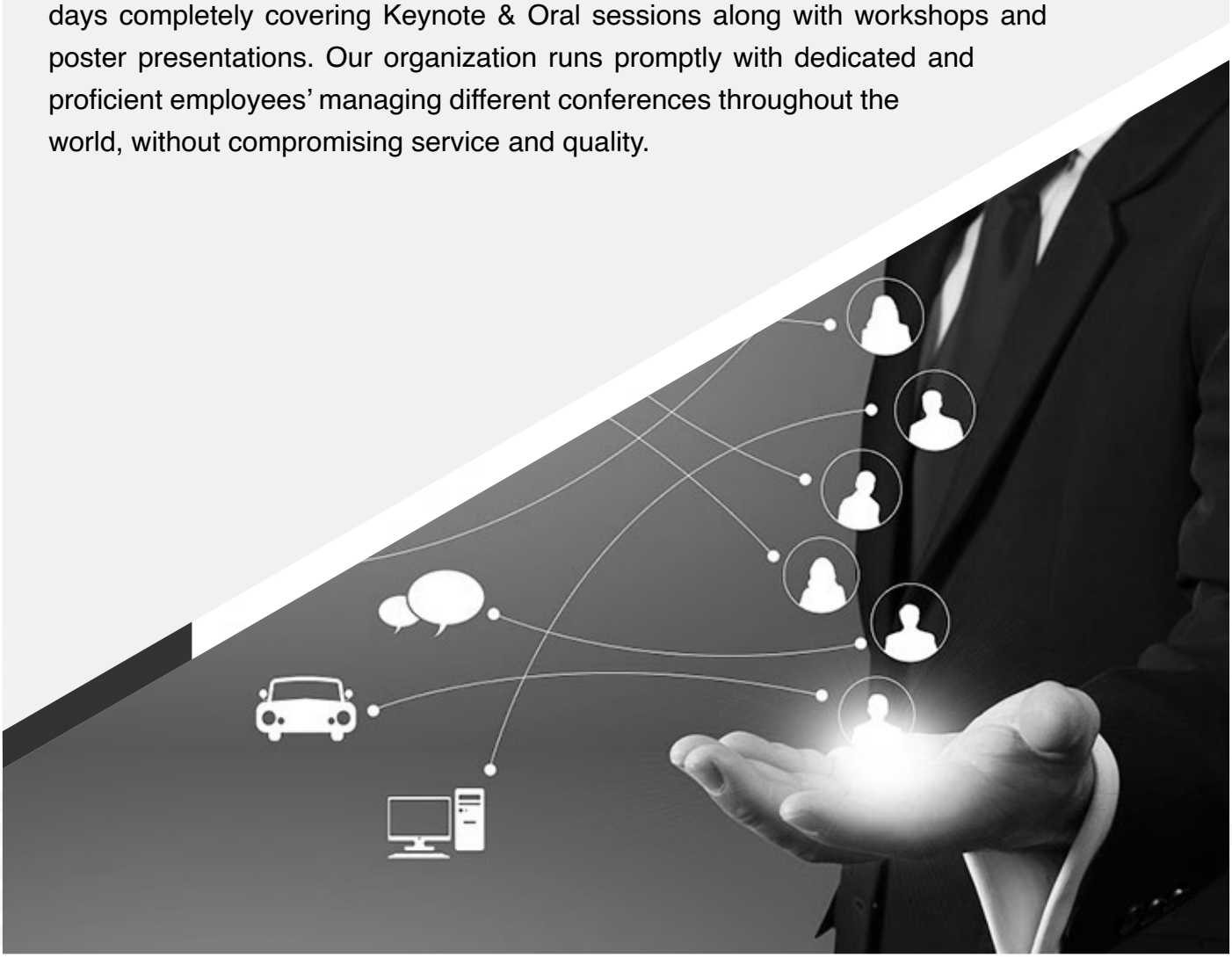
I am pleased to invite prospective scholars, academicians, and engineers, to submit their original contributions to this important conference, where you are sure to have a meaningful experience with scholars and experts from different cultures and different countries, from all around the World.

Yours truly,
On Behalf of Organizing Committee,
Dr. Osman Adiguzel,
Retired Professor of Physics, Firat University,
Elazig, Turkey

ABOUT MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.



ABOUT MAT 2022

We solicit your gracious presence at the “3rd Edition of International Conference on Materials Science and Engineering” (MAT 2022) which is scheduled Online during September 21-22, 2022. The global summit is centred on the theme “Inquisition of Material Science for Better Perspective”.

MAT 2022 establish a platform for exchanging cutting-edge research findings and advanced research methods in material science. This congress strives to provide a valuable forum for encouraging worldwide experts including researchers, scientists, material science experts, practitioners, chemists, engineers, healthcare professionals, clinicians and industry representatives for a multidisciplinary exchange of knowledge. Over the course of three-days, internationally recognised speakers will discuss how their research has progressed in response to current challenges: inspiring lessons and innovation.

The experts and industry partners will get a terrific networking opportunity. MAT 2022 will re-unite over 200 experts from the world’s finest research and professional institutes to discuss not only their expertise, but also their discoveries in the field. The colloquium also aims to foster synergistic collaboration between academics and industry, as well as to demonstrate the rapid advancement of cutting-edge technology in the field of Material science and engineering in recent years with an earnest international audience.

We are confident that our conference will provide you with an incredible chance to explore new horizons in your field and we hope to see you at our upcoming MAT 2023 conference during September 25-27, 2023 in Hybrid Format at Valencia, Spain.

KEYNOTE FORUM

DAY 01

3RD EDITION OF INTERNATIONAL CONFERENCE ON

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Dror Malka

Faculty of Engineering, Holon Institute of Technology (HIT), Holon, Israel

An optimal design of dilicon PIN phase-shifter for high-speed communication applications

Silicon (Si) based optical connection is an attractive solution for next generation high-speed data transmission and can be used to satisfy the desire for low cost, low power consumption, and high bandwidth. Si photonics integrated circuits have been used for both intra or inter chip links, and long-haul telecom links. For these implementations, broadband electro optic modulators are critical devices for encoding light by either intensity or phase modulation. The carrier depletion-based Si Mach-Zehnder modulator (MZM) is a promising device that has direct matching with CMOS or bipolar CMOS technology. This kind of modulator use phase shifters as PN diodes placed in the middle or around the waveguide rib to modulate the light by utilizing the free carrier dispersion effect. The numerical optimizations of Si PIN-PS based on forwarding biased PIN diode using a commercial 220 nm SOI rib waveguide technology has been reported. This study shows how to design a PS that can fulfill the high-speed MZM conditions with a very low optical and electrical energy consumption. The optimal parameters of the PS design are rib waveguide width is 500 nm, etching depth and slab thickness are 110 nm, the distance between the rib waveguide core to the doping areas is 2 μm, and the holes and electrons doping concentration are 1017 $^{cm-3}$. Results show that the optimal PS can obtain a phase shift of π using a forward biasing of 1.629 v with a very low loss of 28.985 dB/cm using a short length of 0.5mm.

Audience Take Away:

- How to design high-Speed PIN phase-shifter
- It will help to people which are dealing with silicon photonics field

Biography:

Dror Malka received his BSc and MSc degrees in electrical engineering from the Holon Institute of Technology (HIT) in 2008 and 2010, respectively, Israel. He has also completed a BSc degree in Applied Mathematics at HIT in 2008 and received his Ph.D. degree in electrical engineering from Bar-Ilan University (BIU) in 2015, Israel. Currently, he is a Senior Lecturer in the Faculty of Engineering at HiT. His major fields of research are nanophotonics, super-resolution, silicon photonics and fiber optics. He has published around 4 refereed journal papers, and 45 conference proceedings papers.

Govind Gupta[1,2]

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[2]Academy of Scientific, Innovative Research, (AcSIR), CSIR-HRDC Campus, Ghaziabad, Uttar Pradesh, India

Semiconductor heterostructure based detectors for optical communication

Heterostructure based devices has shown great potential in optoelectronic field especially in optical communication. Heterostructure optoelectronic devices have been fabricated with unique morphology which exhibit higher photocurrent generation and significantly enhanced responsiveness towards UV illumination. The fabricated device display substantial low dark current and fast time-correlated transient response and very high photo responsivity in self-powered mode of operation. Further, chemically synthesized novel quantum dots have been utilized as sensitizer alongwith various metal selenides for the fabrication heterostructure. The fabricated device exhibits broadband optical response with state-of-the art performance parameters. I'll discuss these findings in details with possible mechanism.

Biography:

Dr. Govind Gupta is Senior Principal Scientist & Head, Sensor Devices & Metrology Group, CSIR-NPL, New Delhi, India and Professor, Academy for Scientific & Industrial Research. His core area of expertise is growth of III-Nitrides, metal-oxide and TMDCs, fabrication of smart optical & gas sensors, etc. He has published ~270 research articles in SCI journals. He is a Fellow of The Royal Society of Chemistry (FRSC), Institute of Electronics & Telecommunication Engineers (FIETE), Senior Member- IEEE, USA and Associate Academician-APAM. He has received numerous awards & fellowships including MRSI medal, Young Scientist Medal-National Academy of Sciences, India, BOYSCAST fellowship, etc.

Osman Adiguzel

Department of Physics, Firat University, Elazig, Turkey

Crystallographic basis of thermal and mechanical reversibility in shape memory alloys

Some materials take place in class of advanced smart materials with adaptive properties and stimulus response to the external changes. Shape memory alloys take place in this group, due to the shape reversibility and capacity of responding to changes in the environment. These alloys exhibit a peculiar property called shape memory effect, which is characterized by the recoverability of two certain shapes of material at different temperatures. Shape memory alloys have dual characteristics called thermoelasticity and superelasticity, from viewpoint of memory behavior. Two successive structural transformations, thermal and stress induced martensitic transformations govern shape memory phenomena in crystallographic basis. Thermal induced martensite occurs along with crystal twinning in self-accommodating manner on cooling and ordered parent phase structures turn into twinned martensite structures. Stress induced martensitic transformations occur along with crystal or lattice detwinning reaction by stressing material in low temperature condition. Superelasticity is performed mechanically by stressing and releasing material at a constant temperature in parent phase region, and shape recovery is performed simultaneously upon releasing the applied stress. Superelasticity is performed in non-linear way; stressing and releasing paths are different in the stress-strain diagram, and hysteresis loop refers to energy dissipation. The elementary processes involved in such martensitic transformations are lattice invariant shear, lattice twinning and detwinning. It is well known that crystal twinning and detwinning reactions play a considerable role in shape memory effect and superelasticity. Thermal induced martensitic transformation is lattice-distorting phase transformation occur with the cooperative movement of atoms by means of shear-like mechanism, and martensite variants occur. Martensitic transformations occur by two or more lattice invariant shears on a {110} -type plane of austenite matrix which is basal plane or stacking plane of martensite. Copper-based alloys exhibit this property in metastable beta phase region. Lattice invariant shear is not uniform in these alloys, and cause to the formation of long-period layered martensitic structures with lattice twinning.

In the present contribution, electron diffraction and x-ray diffraction studies performed on two copper- based CuZnAl and CuAlMn alloys. Electron diffraction patterns and x-ray diffraction profiles show that these alloys exhibit super lattice reflections in martensitic condition. Specimens of these alloys aged at room temperature in martensitic condition, and a series of x-ray diffractions were taken duration aging at room temperature. Reached results show that diffraction angles and peak intensities change with aging time at room temperature. Some of the successive peak pairs providing a special relation between Miller indices come close each other, and this result leads to the rearrangement of atoms in diffusive manner.

Keywords: Lattice Twinning And Detwinning, Martensitic Transformation, Shape Memory Effect, Superelasticity, Thermoelasticity

Audience Take Away:

- Shape memory alloys are sensitive materials to the external conditions, and they are used shape memory elements in many fields from biomedical application to the aeronautical industry. In principle, I introduce the basic terms and definitions related to the shape memory, reversibility, and crystallographic transformation at the multidisciplinary conferences, and tell the experimental results.

Biography:

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has been retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Also, he joined over 70 online conferences in the same way in pandemic period of 2020-2021.

SPEAKERS

DAY 01

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Huichao Jin
Key Laboratory of Bionic Engineering, Ministry of Education, Jilin University, Changchun, China

Novel marine antifouling coatings inspired by corals

Biofouling refers to the attachment of fouling organisms (e.g., bacteria, algae, and barnacle) on wetted surfaces. This is a significant problem globally because fouling organisms that grow on marine vessels promote surface deterioration, damage propellers, and increase drag, leading to high fuel consumption and excessive maintenance costs. To reduce the impact of biofouling, antifouling coatings have been developed and applied to marine vessels since ancient times. Traditional antifouling coatings consist of chemically active compounds, such as silver, copper and tributyltin (TBT). These coatings lack specificity, exhibit high toxicity to both fouling organisms and nontarget marine life, and lead to contamination of waterways. Owing to such negative environmental impacts, these coatings have been gradually banned worldwide. Hence, the development of environmental-friendly and efficient antifouling coatings has been identified as a pressing need. As an alternative, the antifouling coatings inspired by corals have attracted a great deal of attention over these years. within the marine environment, corals have evolved an excellent antifouling capability. There are several major antifouling strategies applied by corals, including natural antifoulants, soft tentacles, and fluorescence effect. This keynote will show how these strategies work to prevent marine biofouling. Inspired by these strategies, several antifouling coatings were fabricated and tested to show their antifouling capability. The fabricating processes and fouling attachment tests are highlighted. Moreover, a discussion is conducted about the existing problems with the three strategies and the direction of their further development is indicated.

Audience Take Away:

- This presentation can satisfy the audience's scientific curiosity
- The audience can learn that we can steal good ideas from nature for serving human beings
- Nature-inspired materials can bring great innovation to current technology
- We can learn sustainable strategies from nature systems

Biography:

Dr. Jin received his Ph. D degree in 2019 from Jilin University. He then joined Jilin University as an assistant researcher. In recent three years, he has published 15 papers in SCI journals, including Prog. Mater. Sci., Small Struct., and Mater. & Des. His research was reported by plenty of medias, including Phys.org, AskNature.org, International Society for Bionic Engineering (ISBE), and MaterialsViewChina.com. He won the first prize of National Commercial Science and Technology Progress Award of 2020 Science and Technology Award of China Chamber of Commerce.

Zhenghao Chen[1,2*], Keke Du[1,2], Hongnian Yin[1,2], Fei Li[1,2], Kaiqiang Zhang[1,2], Mustapha BOUKHIR[1,2], Hui Li[3], Shuangbao Zhang[1,2], and Wei Song[1,2]

[1]MOE Key Laboratory of Wooden Material Science Application, College of Materials Science, Technology, Beijing Forestry University, Beijing, China

[2]Beijing Key Laboratory of Wood Science and Engineering, College of Materials Science and Technology, Beijing Forestry University, Beijing, China

[3]Composite Materials and Engineering Center, Washington State University, Pullman, United States

Green and highly efficient method for improving interfacial behavior of bamboo fiber reinforced poly-β-hydroxybutyrate biocomposites using mussuel-inspired polydopamine with biological enzyme-catalyzation

As the "green" production trend has increased worldwide, it is popular and necessary to manufacture durable, eco-friendly and sustainable materials such as plant fiber reinforced biodegradable thermoplastic composites. However, the poor interfacial compatibility between plant fibers and matrices is a major problem to overcome. In order to improve interfacial compatibility in biocomposite made of bamboo fiber (BF) and biodegradable Polyhydroxybutyrate (PHB), this work, Inspired by mussel super adhesion and the "green enzyme" concept, creates a facile, highly efficient and enviromental friendly route based on laccase-catalysed dopamine in situ polymerization under natural environment. The results of the study indicate that polydopamine was not just deposited on the surface of BF by laccase catalysis but also chemically grafted onto BF lignin, forming a more stabilized coating. Meanwhile, the BF's natural weak acidic environment keeps it from undesired chemical degradation during the abovementioned modification. Optimal composition of biocomposite with BF treated by polydopamine under 1U/ml concentration of laccase shows improvement on the impact strength, tensile strength, tensile modulus, bending strength, and modulus of elastic by 33.93%, 9.27%, 31.74%, 11.76%, and 12.92%, respectively, compared to the unmodified PHB biocomposite. In addition, the polydopamine modified BF with laccase enhances the thermal stability of the fiber and its biocomposite. Moreover, modification of BF via laccase-catalyzed polydopamine is superior to the conventional method of polydopamine under alkaline condition regarding the interfacial compatibility improvement of BF and PHB. Overall, this work provides an insightful understanding of the mechanism and benefits of laccase-catalyzedf polydopamine modification of BF in a natural environment and contributes to the efficient and environmentally friendly utilization of polydopamine for fabricating high-performance plant fiber reinforced composites.

Audience Take Away:

- Bamboo fiber (BF) reinforced Polyhydroxybutyrate (PHB) can reduce the utilizing cost of PHB and produce a promising biomass composite with durable and better mechanical performance, promoting the PHB in a sustainable material manufacturing that well protect the environment. However, this could only be achieved after overcoming the interface incompatibility between the hydrophilic surface of BF and the hydrophobic surface of PHB. Inspired by the natural mussel super adhesion, the in situ polymerization of dopamine onto plant fiber has become a desirable and highly effective surface modification strategy to promote interfacial adhesion of BF reinforced thermoplastics in recent years. Despite the advance of dopamine adoption in modifying BF surface, the

convention method of in situ polymerization of dopamine onto BF under an alkaline environment (pH=8.5) could involve some significant drawbacks. Specifically, the process method has a long duration (more than half a day for oxidation) and a large alkali consumption that not only has an adverse effect on the alkali-sensitive BF, but also produces polluted spent alkaline solutions after treatment

- My work proposed a more facile, highly efficient, and environmentally friendly route of in situ laccase-catalyzed polymerization of dopamine onto BF. Compared with the conventional method, this strategy improves the compatibility of PHB and BF interface more effectively, and it successfully solves the technical deficiency of dopamine utilization under the alkaline environment in the BF surface modification
- Furthermore, the milled wood lignin (MWL) of BF was extracted for further investigation of the modification effect of lignin under pure laccase catalysis, laccase-catalyzed polymerization of dopamine grafted lignin, and alkaline environment, respectively. These findings provide more valuable support for revealing the mechanism of in situ laccase-catalyzed graft copolymerization of dopamine onto the BF surface lignin. And it may help the audience deeply understanding how poly-dopamine coat on the BF surface under laccase catalysis, which may give them a new inspiration for their future develop on adhesives for plant based composite

Biography:

Mr. Zhenghao Chen studied Wood Science and Engineering at the Beijing Forestry University, China and graduated as BS in 2018. He then joined the research group of Prof. Shuangbao Zhang of Plant Based Composite and Adhesive at the College of Materials Science and Technology, Beijing Forest University. He is in a successive master-doctor program since 2018. He peruse his study as a visiting scholar and doing in International Bamboo and Rattan Center, China during his years in PhD. He has published 15 research articles, and has applied for 13 national patents as the inventor.

Idurre Kaltzakorta[1,3,*], Teresa Gutierrez[1], Roberto Elvira[2], Pello Jimbert[3], and Teresa Guraya[3]

[1]TECNALIA, Basque Research and Technology Alliance (BRTA), Parque Científico y Tecnológico De Bizkaia, Derio, Spain

[2]Sidenor I+D, Barrio Ugarte s/n, Basauri, Spain

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Ingot size effects during manufacturing and forging low density steels.

To comply with strict policies on improving fuel economy and reducing CO2 emissions, the automotive industry is working to reduce car weight without penalising passenger safety. One of the strategies used to achieve this is to use lighter materials, and one option in this strategy is low-density steels. Low density steels are Fe-C-Mn-Al steels to which a relevant amount of aluminium is added to reduce the overall density of the steel. Due to their good combination of mechanical properties and density reduction, low density steels can be considered as good candidates in the lightweighting strategy and have attracted great interest in the automotive industry. This paper describes the fabrication of two low density steels: one austenitic and one duplex-austenitic, showing the difficulties encountered during the production and transformation of these steels depending on the scale of work. On a small scale, both manufacturing and subsequent forging were carried out without problems, but as the working scale increased, problems appeared. Possible causes of this scale dependence are proposed on the basis of the experimental results obtained, as well as the thermodynamic simulations and the hot axial compression tests carried out.

Audience Take Away:

- Different lightening strategies for the automotive industry
- Low density steels properties and characteristics
- Manufacturing and Forging issues of these low density steels
- In this presentation we are going to show the problems we have encountered when manufacturing and forging low density steels at larger scales and we propose some possible recommendations to try to improve them. The audience will be able to become aware of the problem and may be able to think of possible solutions to the problems faced
- As will be seen in the presentation, there is still a lot of work and research to be done in the field of low density steels, so this presentation may give ideas for further research development to other groups

Biography:

PhD in Chemistry from the University of the Basque Country (EHU-UPV) in 2010, BsCHonours in Chemistry at Strathclyde University in Glasgow (Scotland) in 2002, and Chemistry degree from the University of the Basque Country in 2003. Lecturer at the University of the Basque Country since March 2022.

More than fifteen years of experience in material science research at Tecnalia. Author of a patent (PCT/ES2010/000419) and several ISI scientific publications in international journals, and with different contributions to national and international congresses.

Debashis Mahato[1*], Tamilselvi Gurusamy[2], Kothandaraman Ramanujam[2], Prathap Haridoss[1] and TijuThomas[1]

[1]Department of Metallurgical and Materials Engineering, Indian Institute of Technology Madras, Chennai, Tamilnadu, India

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CuO-ZnO based hybrid system: A durable and efficient electrocatalyst for oxygen reduction reaction

Energy security and environmental pollution are the two most discussed topics in recent times in the research community. Environmental degradation is a significant concern nowadays due to the extensive use of fossil fuels. Also, the depletion of fossil fuels is a matter of concern in energy demand in human society.Given these circumstances, there is an urgent need to develop clean and sustainable energy technology to solve the shortage of fossil fuel-based energy sources and environmental pollution. In this context, among thedifferent energy conversation and storage technology, fuel cell and metal-air batteries have gained enormousinterest in recent times. They are known for their high energy density, high efficiency, and clean operation. But the major bottleneck associated with these technologies is oxygen reduction reaction (ORR) which is known for its sluggish nature. The sluggish nature of oxygen reduction reaction and the current use of expensive precious metals (Pt, Pd, etc.) are barriers to the commercialization and scale-up of fuel cell and metal-air battery technologies. Given this, the development of low-cost non-precious metal-based electrocatalysts with high activity and durability is an area that requires attention. In this study, we report CuOmodified ZnO supported on nitrogen-doped carbon (CuO/ZnO/NC-600) as a desirable electrocatalyst given its activity in alkaline medium, durability, and low cost. The CuO/ZnO/NC-600 catalyst shows excellent ORRactivity with an onset potential and half-wave potential ($E1/2$) of 0.91 V and 0.80 V vs. RHE, respectively, with outstanding limiting current density of 5.34 mA cm^{-2}. The catalyst also displays excellent methanol tolerance, outstanding stability (90 % current retention after 24 h), and durability (only 18 mV half-wave potential shift after 2000 CV cycles). The excellent activity and durability of the catalyst are attributed to thesynergistic effect of CuO/ZnO and nitrogen-doped carbon. The structure formation (CuO/ZnO/NC-600) provides the advantages associated with excellent conduction of electrons and a large specific surface area (220 m^2 g^{-1}). These, along with the desirable interfacial charge transfer between CuO and ZnO, aids in obtaining the observed ORR activity in CuO/ZnO/NC-600.

Keywords: Electrocatalyst; Oxygen Reduction Reaction; Nitrogen-doped carbon; Heterostructure; CuO- ZnO.

Audience Take Away:

- It will give a broad overview of the importance of green sustainable energy technologies in the current times. Then I will discuss the importance of fuel cell and metal air batteries technologies in current times. The major bottlenecks (sluggish oxygen reduction reaction (ORR)) associated with these two technologies will be discussed, and the possible solutions to how we can resolve the issues to a great extent. This presentation, through our study, will explore the role of the interface of two metal oxides in ORR. In the ORR research field, even though metal oxides are promising materials, especially stability pint of view, the effect of binaryoxides is rarely explored. So, in this presentation, I will be discussing the CuO/ZnO-based hybrid metal oxides for the oxygen reduction reaction.

Here we report CuO/ZnO based heterostructure supported on nitrogen- doped carbon (CuO/ZnO/NC-600) as a desirable electrocatalyst. We show this by demonstrating its activity in alkaline medium, durability, and low cost. The usual limitations associated with both low activity and insulating behavior of ZnO are overcome through a combination of appropriate heterojunction formation andthe use of nanocarbon support

- The reported CuO/ZnO/NC-600 catalyst shows excellent ORR activity with an onset potential and half-wave potential ($E1/2$) of 0.91 V and 0.80 V vs. RHE, respectively. This is comparable with the benchmark Pt/C. The CuO/ZnO/NC-600 catalyst shows an outstanding limiting current density (5.34 mA cm^{-2}). The CuO/ZnO/NC 600 catalyst shows excellent kinetics with the Tafel slope 68 mV dec^{-1}. The catalyst shows excellent methanol tolerance, outstanding stability (90 % current retention after 24 h), and durability (only 18 mV half-wave potential shift after 2000 CV cycles). The excellent activity and durability of the catalyst are attributed to thesynergistic effect of CuO, ZnO and nitrogen-doped carbon (NC). The structure formation (CuO/ZnO/NC-600) provides the advantages associated with excellent conduction of electrons and a large specific surface area (220 m^2 g^{-1}). These, along with the desirable interfacial charge transfer between CuO and ZnO, aids in obtaining the observed ORR activity in CuO/ZnO/NC-600. Hence, we expect this to open up further avenues for researchers working in this class of materials for electrocatalytic applications

Biography:

Mr. Debashis Mahato studied B.Sc. in Physics at the Burdwan University, West Bengal, followed by M.Sc. in Physics. After that, he studied M. Tech. in Materials Science and Engineering at the Indian Institute of Technology Kharagpur, West Bengal, India in 2018. He then joined the Indian Institute of Technology Madrasto pursue a Ph.D. Currently, he is a senior research scholar in the Department of Metallurgical and MaterialsEngineering IIT Madras. He has published 1 research article SCI(E) journal and presented in 240th ECS meeting. Currently, he is actively involved in electrocatalyst research for energy conversion and storagedevices.

M L Aparna[1,2,3*], G Ranga Rao,[2,3], Tiju Thomas[1,3]

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[3]DST Solar Energy Harnessing Centre, Indian Institute of Technology Madras, Chennai, Tamil Nadu, India

Bitter gourd pericarp derived porous activated carbon for high energy density supercapacitor devices

The rapid growth of the human population and the ever-increasing demand for energy resources have resulted in massive consumption of fossil fuels. This has also led to associated harmful impacts on the environment. Current energy demand has triggered a shift towards environmentally friendly and sustainable energy sources. Intermittent energy storage is an alternative to current scenarios, where energy available from fluctuating primary sources can be stored and used as needed. Therefore, scientific efforts are now focused at developing better and new energy storage systems.

Common electrochemical energy storage devices include batteries, supercapacitors, fuel cells and hybrid supercapacitors. Among them, batteries and battery-supercapacitors have gained remarkable attention in recent years owing to their excellent electrochemical performance. Even though batteries exhibit appreciable energy density in the range of 150-300 Wh kg^{-1}, supercapacitors dominate batteries in terms of displaying better cyclability (>100000 cycles), faster charging and discharging rates, higher power density (>10000) Wkg^{-1}, longer longevity, least maintenance requirement, better deformability and flexibility, wider operating temperatures, zero memory effect issues and more importantly bridges the gap between rechargeable batteries and conventional dielectric capacitors.

Porous structured activated carbon has attracted a great deal of attention for supercapacitor applications because of their viability, sustainability and environmental friendliness. In particular, decentralized and sustainable production of materials related to energy technologies would be enabled through bio-source derived materials. Numerous biomass precursors have been explored to date to obtain activated carbon.

In this work, we explore a bio-source not used till date to derive KOH activated porous structured activated carbon towards supercapacitor application. The pericarp of *bitter gourd,* scientifically called *Momordica Charantia*, available widely is used as the bio-source here. The bio-derived activated carbon shows an excellent surface area of 1125 m^2g^{-1} at an activation temperature of 900°C. It exhibits a specific capacitance of 186 F g^{-1} at 1 A g^{-1}. Symmetric supercapacitor device fabricated delivers a power density of 750 W kg^{-1} at an energy density of 8 Wh kg^{-1} with 98% capacitance retention after 5000 cycles in 1M H_2SO_4. A further improvement of energy density to a maximum of 23 Wh kg^{-1} and a maximum power density of 6000 W kg^{-1} is achieved using dual redox mediators (KI + HQ) in H_2SO_4 due to the redox activity of the I_2/I^- and Q/HQ redox species at the positive electrode.

Keywords: *bitter gourd pericarp, activated carbon, energy density, supercapacitors, dual redox additive electrolyte.*

Audience Take Away:

- Supercapacitor device fabricated using bitter gourd pericarp derived activated carbon as electrodes shows 98% stability after 5000 cycles in 1M H_2SO_4 electrolyte. And the device shows a maximum energy density of 23 Wh $kg^{-1}$and power density of 6000 W kg^{-1}
- The potential of AC derived from BGP as an electrode material for supercapacitor application is demonstrated. Our work thus opens up opportunities for further work to improve the
- Stability of the device with dual redox mediators
- Voltage window of the device and
- Coulombic efficiency of the supercapacitor device made using bitter gourd based activated carbon
- Also, efforts will need to be directed to identify appropriate redox mediators which can bring about Faradaic reactions at both electrodes simultaneously to improve charge storage performance further

Biography:

Miss. Aparna M L studied B.Tech in Electrical and Electronics Engineering (2010-2014) and M.Tech in Nanotechnology. She worked as Assistant Professor @ Adi Shankara Institute of Engineering & Technology,Kalady, Kerala, India for a period of 10 months (3rd October 2017 – 24th July 2018). Aparna joined for PhD at Indian Institute of Technology Madras, India under Dr. Tiju Thomas and Dr. G. Ranga Rao in 2018. Presently she is a senior research fellow at Department of Metallurgical and Materials Engineering and Department of Chemistry. Her research work is on nanomaterials for energy storage devices, focusing primarily on supercapacitors. As of now she has published 6 research articles in SCI(E) journals.

Bhardwaj Payal[1*], S. Srikantaswamy[1]

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Electrical impedance analyzer: Recent technique for biomaterial characterization

The development of new biomaterials and their understanding and characterization in terms of greater quality is an important area of concern and also new methods and tools to characterize biomaterials that are cost effective, have always been on researchers focus. Application of appropriate, inexpensive, easyto handle characterization tools will not only save time to evaluate different biomaterials, it can also make contribution to the manufacture of biomedical devices. Electrical impedance analyzer is one such tool, which can provide detailed information on the biomaterial like the microarchitecture of the material, thereby helpful in characterizing biomaterials. The technique is non-invasive and the measurements are based on voltage and current excitation which are technically not difficult, thus making this technique quite inexpensive.

To evaluate the potentiality of electrical impedance analyzer in providing information of the structure of material, a comprehensive study of correlation between the structural properties of hydroxyapatite crystal with varying crystallite size and dielectric parameters has been carried out. The effect of variation in the crystallite size of hydroxyapatite crystal and dielectric parameters has been established.

Audience Take Away:

- They might get a better understanding of how the changes in material composition or architecture would cause a change in the electrical properties
- Societal intervention of this particular technique if established, would enable us to diagnose the bone porositywith much ease and in a very economical manner. Of primary importance is understanding the changes in dielectric parameters with the change in structural properties

Biography:

Dr Payal Bhardwaj has completed her PhD from the Department of Biophysics, Panjab University, Chandigarh, India.Currently, she is working as a Women Scientist/Department of Science and Technology in University of Mysore, Department of Materials Science, Mysore, Karnataka. She has almost twelve years of research and over five years of experience in teaching undergraduate and graduate students at the department of Biophysics.

T S Murugesh
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Government College of Engineering Srirangam, Sethurappatti, Tiruchirappalli, Tamil Nadu State, India

Design of a wearable for suppression of hand tremors

Across the globe, it is estimated that millions of people are affected by several forms of degenerative neurological disorders; many of them being incurable. Parkinson's disease is one such progressive neurological disorder that incurs tremors, slowness of movement, gait and balance issues allied with speech/sensory instabilities, sleep issues, decline in cognitive skills as well as psychological issues. The majority of this will straightaway strike a telling impact on the day-to-day activities of the individuals concerned resulting in increased dependence, possibly leading to social isolation. Symptoms start gradually, sometimes starting with a barely noticeable tremor in just one hand. While there is much research going on into finding an effective treatment for them, lack of viable solutions to immediately improve their lives, make their day-to-day activities possible and be self-reliant aren't readily available. This lecture outlines the methodology of building a viable and versatile wearable globe for suppression and nullification of hand tremors. The proposed wearable makes use of electroactive polymers, cutting edge AI technology along with cloud connectivity that offers real time feed and analysis. An algorithm predicts the trend in the vibrations while identifying patterns in tremors for further optimization thereby envisaging the tremor before it actually happens. The proposed wearable simulates the tremors, counteracts and reduces the vibrations. The proposed solution aims to improve the quality of life for the end users especially the people concerned and to create a positive impact in their lives.

Audience Take Away:

- The audience/other faculty in their job can use the lecture to expand their research or avenues of teaching. The audience can understand the impacts as well as the related methodology explained in the lecture with ease
- The lecture indeed provides a practical solution to the common degenerative neurological disorder faced bythe concerned people all across the globe
- This proposed solution will not cause any side effects for the users and over a period of time, prediction can be made related to the occurrences when the tremor would get high
- The proposed methodology develops innovative devices for the healthcare monitoring while ensuring immediate treatment, as well aids in patient health improvement
- The proposed methodology could simplify or make a designer's job definitely more efficient
- The notion has been to showcase how the simple and frugal design can improve the lives of almost all the elders to manage their disorder irrespective of their socioeconomic status
- Moreover, the viability of transforming this prototype into a potential, lucrative and affordable commercial product in healthcare solution is the means by which we mark our earnest attempt to pay homage to all our elderly mentors
- It aids to improve the design accuracy, while also providing new information to assist in a design problem

Biography:

Dr. T S Murugesh possesses a vast experience of 22+ years in academia in Analog and Digital Electronics, Automation and Control, IoT, System design, Instrumentation and Computational Bio-engineering fields. He has delivered many invited lectures, has around three-dozen peer-reviewed indexed publications, organized a one-week AICTE Training And Learning (ATAL) Academy sponsored FDP, conducted few workshops at national level, reviewer in IEEE and few other peer-reviewed journals, etc. He has acted as a Primary Evaluator for Government of India's Smart India Hackathon 2022 as well as Toycathon 2021 and also as a Judge in the Grand Finale for the "Toycathon 2021". He is a hackathon enthusiast and his team has won the second Prize in the IFG x TA Hub Hackathon 2022. He has authored 2 books for CRC Press, Taylor & Francis Group (UK) and authoring a book for Nova Science Publishers, USA. He also holds the professional body membership of Institution of Engineers (India).

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IIT Jammu, India

Numerical study of iron ore reduction in MIDREX Shaft

Traditional ironmaking is responsible for the emissions of greenhouse gases, leading to major environmental problems caused by the enormous amount of CO_2. Reducing CO_2 emissions and energy consumption is one of the most important issues in recent decades. It has been proven that hydrogen may be accountable as a reductive agent and an environment-friendly material that can sustain production processes using alternative fuels. MIDREX furnace is one such alternative ironmaking process, in which direct reduced iron (DRI) is produced in a counter-current gas-solid moving bed reactor, using natural gas as fuel. MIDREX furnace is a counter-current gas-solid reactor bed that converts solid iron ore pellets into sponge iron using natural gas reforming gas. The present study demonstrated a MIDREX process based on the governing differential equations representing material and heat balance in the solid and gaseous phases. In this work, ordinary differential equations in an iterative method have been solved using MATLAB program to estimate the concentrations and temperature profile of all the species and the reduction behavior of the pellets along the length of the furnace. In the present work, a mathematical model has been developed to study the reduction zone of the MIDREX furnace, which effectively predicts the variation in the reaction extent and reacting gas composition along the length of the reactive zone. Our model predictions are in good agreement with plant data. The validated model can be used to estimate the variations of CO_2 content in the top gases for the given production rate concerning the inlet gas temperature and compositions with the desired level of metallization

Audience Take Away:

- To understand the reduction behavior of iron ore in the MIDREX Shaft
- To study the influences of different gas compositions of the reduction property
- To provide the specific parameter to further improve the production rate and metallization

T S Murugesh
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Design of a smart wearable for human fall detection

This lecture addresses a potential concern faced by the majority of aged ones left unaccompanied at home.Nowadays the majority of the people are in a position to go for work leaving behind their aged parents all alone at home. Even at their work location, they continue to brood about them that may cause distress affecting their throughput. If any untoward fall owing to poor health conditions or slippery floors happen, it usually goes unnoticed and the aged ones are deprived of the potentially lifesaving "golden hour" treatment. Even though unprecedented fallscan occur both to youngsters and the elderly, it is more prevalent among the elders. To address and assuage such sort of problems faced by the elderly, a wrist-wearable fall detection system is designed that employs a machine learning model for movement tracking and to detect a fall just in case. During a fall, an automated call is generated to the emergency services as well as to a caretaker through a GSM module. Two datasets are collected, trained and tested onseven different machine learning models, and the results discussed.

Audience Take Away:

- Falls are usually unexpected and happen to be a common public health issue of concern for all age groups. This crucial fall detection problem is addressed to offer a positive impact and to mitigate the patients' post- traumatic disorders. The consequences of falls are even more dangerous which might even lead to partial/full disability, the need for permanent care, reduced activity, and serious psychological issues like fear of falling, decreased self-confidence, and increased dependence on others to carry out even simple routine day-to-day chores. The proposed methodology develops innovative devices for the healthcare monitoring while ensuring immediate treatment, as well aids in patient health improvement
- The audience/other faculty in their job can use the lecture to expand their research or avenues of teaching. The audience can understand the impacts and understand the methodology explained in the lecture with ease
- The lecture indeed provides a practical solution to the common problem faced by elderly all across the globe
- The proposed methodology could simplify or make a designer's job definitely more efficient
- It aids to improve the design accuracy, while also providing new information to assist in a design problem
- It also has the possibility of making this a viable lucrative product in healthcare solution

Biography :

Dr. T S Murugesh possesses a vast experience of 22+ years in academia in Analog and Digital Electronics, Automation and Control, IoT, System design, Instrumentation and Computational Bio-engineering fields. He has delivered many invited lectures, has around three-dozen peer-reviewed indexed publications, organized a one-week AICTE Training And Learning (ATAL) Academy sponsored FDP, conducted few workshops at national level, reviewer in IEEE and few other peer-reviewed journals, etc. He has acted as a Primary Evaluator for Government of India's Smart India Hackathon 2022 as well as Toycathon 2021 and also as a Judge in the Grand Finale for the "Toycathon 2021". He is a hackathon enthusiast and his team has won the second Prize in the IFG x TA Hub Hackathon 2022. He has authored 2 books for CRC Press, Taylor & Francis Group (UK) and authoring a book for Nova Science Publishers, USA. He also holds the professional body membership of Institution of Engineers (India).

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Biomaterial functionalized graphene-magnetite nanocomposite: A novel approach for simultaneous removal of anionic dyes and heavy-metal ions

Despite of immense application potential of graphene in wastewater treatment, the colloidal stability, aggregation and recyclability remains a major challenge. To address this issue, we report biomaterial functionalized graphene-magnetite (*Bio*-GM) nanocomposite as a novel recyclable material for treatment of wastewater containing dyes and heavy metals. The integration of biomaterial including living cells of *Shewanella oneidensis* with graphene-magnetite nanocomposite was characterized through UV–vis, FTIR, FESEM and fluorescent microscopic studies. The contact angle measurement depicted the hydrophilic property (water contact-angle 27.93°), whereas VSM result demonstrated super paramagnetic behavior of the nanocomposite with saturation magnetization value of 30.2 emu/g. The *Bio*-GM nanocomposite exhibited excellent adsorption capacity toward dyes and Cr^{6+} in both single and multicomponent system with removal capacity of 189.63 ± 7.11 and 222.2 ± 8.64 mg/g of dyes and Cr^{6+}, respectively, suggesting selective binding capacity and high adsorption efficiency of *Bio*-GM nanocomposite. In the adsorption coupled redox reaction, the Cr^{6+} was reduced to Cr^{3+} through biocatalytic activity of *Bio*-GM nanocomposite. The nanocomposite could be easily regenerated and reused for multiple cycles of adsorption–desorption studies without release of graphene and magnetite, and thus eliminating the potential hazardous risk of nanomaterial to the environment. The proposed biomaterial functionalized graphene-magnetite nanocomposite thus offers a novel way for sustainable, affordable, and efficient removal of coexisting toxic pollutants of dyes and heavy metals.

Audience Take Away:

- Preparation of magnetically water soluble separable graphene
- Functionalization of live bacterial biofilm without using high cost equipment or chemicals
- Characterizations of Bionanomaterials
- Study of the adsorption coupled biocatalytic reduction of toxic pollutants
- Simple recycle and reuse

Biography:

Dr. Ramalingam studied his B. Tech Biotechnology and M. E. Environmental Engineering from Anna University, India. Then joined CSIR-CLRI and published 10 research articles and one patent in the field of nanomaterials for environmental applications and completed his PhD on 2022. Currenty he is working as a Environmental Engineer at KB Environmental Services, India.

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Magnetization thermal stability in magnetic nanowires for nanodevices memory

The domain wall (DW) random switching in planar magnetic nanowires is one of the crucial problems for storage data applications. Hence, a micromagnetic simulation was used to investigate the transverse domain wall (TDW) nucleation in the thinner and narrower nanomagnetic devices and the vortex domain wall (VDW) nucleation for the thicker and wider nanowires due to the device temperature. The TDW thermal creation was examined based on magnetic properties such as uniaxial magnetic anisotropy energy (Ku) and saturation magnetization (Ms). The thermal stability of TDW switching in nanowires is strongly dependent on the improvement of magnetic properties, whereas the TDW thermal nucleation decreases by increasing Ku or Ms. In addition, the TDW and VDW thermal creation in storage nanodevices such as nanowires could be controlled by nanowire geometry manipulation like width and thickness. Reducing the nanowire width or increasing its thickness helps both domain wall types (TDW and VDW) switching to be more stable against nanodevice temperature. TDW thermal switching was found to be stable under a device temperature of up to 500 K, which is higher than the room temperature. However, the VDW shows higher thermal stability switching reaches up to 900 k, which are good candidates for storage applications. Furthermore, the TDW dynamics in nanowires were affected by device temperature, whereas the TDW moves faster by increasing nanodevice temperature. All these findings will help to maintain the storage memory in nanodevices from failure due to device temperature.

Audience Take Away:

- Use the simulation in their work based on the experimental work
- In the future, this work will help to develop storage memory with high storage density, low power consumption and non-volatility

Biography:

Dr. Mohammed Al Bahri, is presently working as an assistant professor in Physics at A'Sharqiyah University in Oman. He has worked in the Ministry of Education in Oman for around 20 years in Monitoring and evaluating student learning. He got his Ph.D. degree from Sultan Qaboos University in Oman in 2018. He is working as a researcher in nanoscience magnetic materials, especially magnetic nanowires and magnetic domain walls. He has 13 papers published in various Web of Science journals 126 citations in Google scholar. He had been awarded the best presenter in International Conference on Magnetism and Magnetic Materials(ICMMM 2020), Spain, Barcelona, 17-18 August 2020. He had been assigned different responsibilities in his current institution, like a chair of the learning and teaching committee, the chair of the community service committee, and a member of different committees.

Srabanti Ghosh[1,2]

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Conducting polymer nanostructures for visible light-driven photocatalysis: Mechanisms, challenges, and design strategies

Energy harvesting from solar light employing nanostructured materials offer an economic way to resolve environmental issues.[1] In the last decades, photocatalysis has been demonstrated to be one of the most promising approaches to environmental remediation as well as in the fuel production (hydrogen, methanol) from water and carbon dioxide. However, preparation, and application of catalytic nanostructure are still at the foreground of research activity. Recently, conducting polymer nanostructures (CPNs) have demonstrated its capability in solar light harvesting, a promising breakthrough in photocatalytic application.[2-4]As an alternative to conventional catalytic materials such as TiO_2, CPNs shows high photocatalytic activity under visible light for the degradation of pollutants without the assistance of sacrificial reagent or precious metal co-catalyst. Polymer nanostructures can be directly synthesized through soft template mediated approach and modulate the size, morphology, and structure of polymer for example, polypyrrole nanofibers (PPy), poly (3,4 ethylene dioxythiophene) nanospindles (PEDOT) etc. Notably, CPNs offer the perspective of development of a new generation of efficient photocatalysts which can be reused after repeated cycling without appreciable loss of activity for environmental protection.[5] Moreover, conducting polymers have the unique feature of hybridization with other classes of nanostructures (for example, semiconductors or plasmonic nanoparticles) to produce novel hybrid materials with multifunctional properties. Interestingly, the metal oxide/conducting polymer heterostructures exhibited higher charge carrier density, low resistivity and greater photocurrent density compare to metal oxides and CPNs. A p-n junction may be formed between polymer and metal oxide interfaces which further improves the catalytic activity by creating an internal electric field. Notably, the separation and transfer of photoexcited charge carriers have been greatly improved between metal oxide and polymer nanostructures manifested by femtosecond transient absorption spectroscopy. The emerging understanding of photoelectrochemical processes, materials fabrication, mechanisms, as well as challenges may helpful for solar fuel production and water purification.

Audience Take Away:

- Twenty years after the discovery of conjugated polymers, the concept of conjugated polymer in nano dimension emerged in recent decades and continues to attract scientific community with the objective of tuning the intrinsic properties or integrated systems with multiple functionalities for the application in energy domain. Recognizing the importance of conjugated polymers with their unique nanostructures and beneficial characteristics of low cost, good environmental stability, high conductivity, high carrier mobility, good mechanical properties, large specific surface area have drawn considerable attention for renewable energy conversion and storage applications. The presentation will give a comprehensive description of synthesis and characterization of conjugated polymer nanostructures and hybrid or composites materials for energy conversion applications such as water

splitting or degradation of organic pollutants, and solar fuel production. The main objective is to present the state of art of interesting conjugated polymer-based nanomaterials for energy conversion technologies, including fundamentals, functionalities, challenges. Also highlights the photocatalytic activity of the polymer nanostructure and nanohybrid catalysts for pollutants removal, water disinfectant and solar water splitting

- The presentation will address a variety of topics such as materials and fabrication, characterization, as well as challenges which includes in-depth discussions ranging from comprehensive understanding, to engineering of materials and applied devices. It covers the advances in synthesis, characterization of conjugated polymer nanostructures, and the measurement of their applicability in energy harvesting application. The presentation will be of interests to multidisciplinary audiences in the fields of academia and industry. Specifically, conjugated polymer nanostructures with interesting and unanticipated properties have drawn attention across the scientific community including synthetic chemist, material scientist, organic chemist, as well as theoretical and experimental physicists. The presentation will provide better understanding of the current state of conjugated polymer nanostructures fabrication and its possible applications in energy domain

Biography:

Srabanti Ghosh received PhD degree in Chemistry from UGC-DAE Consortium for Scientific Research, Kolkata Centre, and Jadavpur University, India and completed postdoctoral programs at the University of Paris SUD, France (Marie Curie Cofund). She worked as GOT ENERGY TALENT Cofund Marie Curie Fellow Researcher in UNIVERSIDAD DE ALCALA, Spain. She co-authored 85 publications in SCI(E) journals., 2 patents, edited 6 books and contributed 19 book chapters covering the large fields of photocatalysis, conjugated polymer. She presently working as Senior Scientist, Energy Materials & Devices Division, in CSIR - Central Glass and Ceramic Research Institute, Kolkata, India.

Gunadhor Singh Okram
UGC-DAE Consortium for Scientific Research, University Campus, Khandwa Road, Indore M.P, India

Thermoelectrics near room temperature

Major challenge today is the global warming apprehensions due to the destruction of the earth's ecosystem from the harmful gases such as CO_2 or SO_2 and by-products released from numerous human activities. The global efforts today in this are to decrease systematically the use of polluting sources of energy while encouraging to use non-polluting sources of energy/ devises such as solar energy, hydroelectric power and thermoelectricity, which in turn attracts lots of overall interest. Towards this endeavour, we also have investigated extensively on thermoelectricity near room temperature in our laboratory. For this, we have designed several new materials with exciting results on polyol method-prepared nanocomposites of non-toxic, naturally abundant and inexpensive elements through introduction of n-type $Bi_{4.8}Cu_{2.94}S_9$ in n-type Bi_2S_3, semi-metallic Bi in n-type Bi_2S_3, n-type Ag_2S in p-type CuS and metallic Ag in n-type Ag_2S, thermal decomposition method-prepared Bi_2Te_3-BiTe nanocomposites of different particle sizes and so on. They are likely to open up new vistas for development of near-room temperature yet non-toxic and solution-processed thermoelectric. Some of these shall be discussed.

Audience Take Away:

- The audience can learn how these nanocomposites be easily prepared in laboratory, yet non-toxic, naturally abundant, low cost and in versatile manner
- The audience can start their research with less budget yet with high quality
- This research could be used to expand their research or teaching
- This will provide a practical solution to a problem that could simplify their problems or make a designer's job more efficient
- It will improve the accuracy of a design, or provide new information to assist in a design problem such as control of the composition of the nanocomposites, particle size, particle shape and structure by simply changing the reaction conditions as reactant quantity, surfactant, reaction temperature and so on

Biography:

Dr. G. S. Okram did his PhD from Indian Institute of Technology, Bombay (1995). He worked at National Institute of Materials Science, Tsukuba, Japan as an STA Fellow (1996-98) and other two research institutes before joining the UGC-DAE Consortium for Scientific Research, Indore in Madhya Pradesh of India in 2001. He guided four PhDs, 6 MPhils, 4 M Tech, 54 MSc and 5 BSc project students, delivered over 88 invited lectures at different national and international (web) conferences, reviewed several reputed journal papers, published over 144 peer-reviewed (reputed) journal papers and 117 conference proceeding presentations with 2126 times citations.

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Tribo-corrosion analysis of composite coating for mechanical applications

Steels are the most widely used material in all industries that undergoes wear and corrosion. Further, rusting of material has caused many adverse effects and even fatal in some cases leading to machine failure and breakage. Therefore, it is necessary to reduce the corrosion and wear of steel that are widely used in industries. Hence, in this study, hexagonal Boron Nitride (hBN) was used as an additive material that is blended in phenolic paint i.e., widely available in market. The hBN was ball-milled to activate their surface energy and characterized using XRD, SEM and FTIR followed by dispersion in paint using ultrasonication. The developed nanopaint was coated over a standard mild steel panel and pin for corrosion and wear tests using pin-on-disc (PoD) tribometer and Electrochemical impedance spectroscopy (EIS), respectively. The EIS results reveal that higher concentration (above 0.5wt%) of nano additives increases the corrosion. It might be due to conduction of a large amount of particle distribution in a paint. Whereas lowering the additive amount to 0.5wt% increases the corrosion resistance. Furthermore, the PoD test was performed for the best and poor samples for corrosion resistance. The result reveals that the higher concentration of additive in paint shows better than lower concentrated additive paint.

Keywords: coating, milled hexagonal-boron nitride, paints, mild steel protection.

Audience Take Away:

- Method to reduce the corrosion and wear of steel that are widely used materials in machinery
- Method to develop the stable nanocomposite paint for coating
- Necessity of ball milling of powder
- Necessity of characterization methods

Biography:

Dr. Jitendra Kumar Katiyar, presently working as a Research Assistant Professor, in Department of Mechanical Engineering, SRM Institute of Science and Technology Kattankulathur Chennai, India. He obtained his bachelor's degree from UPTU Lucknow with Honors in 2007. He obtained his masters, from the Indian Institute of Technology Kanpur in 2010 and Ph.D. from the same institution in 2017. He has authored/ co-authored/ published more than 40+ articles in reputed journals, 35+ articles in international/national conferences, 15+ Book Chapters, 10+ books published in Springer and CRC Press USA. He is serving as a guest editor for special issue in Tribology Materials, Surfaces and Interfaces, Journal of Engineering Tribology Part J, Journal of Process Mechanical Engineering Part E, Arabian Journal for Science and Engineering, Industrial Lubrication and Tribology, Material Science and Engineering Technology, and Frontier in Mechanical Engineering: Tribology. Further, he is Member Editorial Board in Tribology Materials, Surfaces and Interfaces and Review Editor in Frontier in Mechanical Engineering.

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Application of reactive Metal Organic Framework (MOF) in high temperature bismaleimide based thermoset polymers

Bismaleimides (BMI) is a high-performance thermosetting resin system that has a variety of characteristics, including strong thermal and mechanical stability, chemical resistance, water resistance, corrosion resistance and a comparatively cheap price. BMI is utilized in a multitude of applications, the majority of which are for airplanes and missiles, due to its exceptional epoxy qualities. Metal Organic Frameworks (MOFs) have been developed and designed at an exponential rate as a result of their increasing complexity and use. The benefits of MOFs are numerous and they have biological as well as several smart domain applications. The 4,4'-bismaleimido diphenylmethane (BMIM) is synthesized using maleic anhydride and diamine. The chain extension for BMIM is done by 4,4'-diamino diphenylmethane (DDM) and the resultingmaterial is coded as BMIM_M. The effect of nanoporous aluminum fumarate (Al_FA_A) metal organic framework (MOF) as reactive filler in BMIM and BMIM_M is focused. The Fourier Transform Infrared Spectroscopy (FTIR) has been used to confirm the structure of the synthesized compounds. The presence of distinct bands at 1400 and 1706 cm^{-1}, which are responsible for the C=C and -OC-N-CO- groups, respectively, confirmed the structure of BMIM. Increase in the aliphatic C-H band intensity is observed over the range of 2900–2940 cm^{-1}, which indicates the increased CH group in BMIM_M due to the Michael addition of the aromatic primary amine to the maleimido double bonds. The thermo physical properties are studied using Differential Scanning Calorimetry (DSC) and Thermogravimetry (TGA). The BMIM showed melting at 144 ˚C and the enthalpy of fusion was found to be 19.8 J g^{-1}. The chain extended BMIM (BMIM_M) was to melt considerably at a lower temperature (71 ˚C) and the enthalpy of fusion was found to be 2.8 J g^{-1}, much lower than the enthalpy of fusion of BMIM. Thermal degradation of polymerized BMIM (PBMIM) and BMIM_M (PBMIM_M) show two stages of degradation. The first stage of degradation falls at 455 and 400 ˚C for PBMIM and PBMIM_M respectively. The second stage of thermal degradation lies at the same temperature 553 ˚C for both the materials. The polymerized Al_FA_A MOF blended BMIM (PBMIM_AL_F_A) and BMIM_M (PBMIM_M AL_F_A) show single stage of thermal degradation and the rate of degradation was found to be maximum at 428 and 469 ˚C respectively. The volatile products obtained during the thermal degradation of these polymers were analyzed investigated using thermogravimeter coupled to a Fourier transform infrared spectrophotometer (TG-FTIR). The detailedthermal studies of the monomers, blends and polymers are studied and reported in this work.

Audience Take Away:

- To highlight the most important thermoset materials used in industry, such as BMIM
- Understanding the thermal behavior of BMIM and its chain-extended BMIM
- To know the modifications in thermal behavior brought about by the use of MOF as a reactivefiller

Biography:

Dr. S. Shamim Rishwana is working as an Assistant Professor in the Department of Chemistry at Kamaraj College of Engineering and Technology, India. She finished her Bachelor of Science degree (Chemistry- 2005) in VVV College Virudhunagar, India, finished her Master of Science degree (Chemistry-2007) in VHNSN College, Virudhunagar, India and she finished her Master of Philosophy (Chemistry-2008) in VHNSN College, Virudhunagar, India. She received her Ph.D. – Synthesis and Characterisation of Polybenzoxazine (2016) under the guidance of Dr. Dr(mont.) C.T.Vijayakumar, from Anna University Chennai, India. The Investigator is experienced in the synthesis of compounds and well trained in handling the DSC and TGA instrument. She has experience working as a co-investigator in the DRDO-DEBEL CARS project. She has 10 years of teaching and research experience along with reputed journal publications. She is also guiding students for a Doctor of Philosophy (Ph.D.) at Anna University.

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New lead-free perovskite materials on the base of sodium-potassium niobate and sodium-bismuth titanate oxides

Lead-free perovskite oxides based on perovskites $(K_{0.5}Na_{0.5})NbO_3$ (KNN) and $(Na_{0.5}Bi_{0.5})TiO_3$ (NBT) were intensively studied last ten years in order to develop materials promising for applications in capacitors, piezoelectric, electrocaloric and other devices.

We studied structure, microstructure, dielectric and ferroelectric (FE) properties of compositions from Morphotropic Phase Boundary (MPB) in the KNN-BT and NBT-BT systems additionally modified by various acceptor and donor cations in A- and B-sublattices (Li^+, Ag^+, Ba^{2+}, Ca^{2+}, La^{3+}, Co^{2+}, Fe^{3+}, Zr^{4+}, Sb^{5+}, W^{6+}) and using overstoichiometric additives with low melting temperatures (LiF, NaCl, KCl).

Ceramic samples prepared by the two-step solid-state reaction method were characterized by the X-ray Diffraction, Scanning Electron Microscopy, Second Harmonic Generation (SHG), and Dielectric Spectroscopy methods.

Unit cell parameters changes were observed in modified ceramics depending on radii of substituting cations.

In KNN-based systems characteristic FE polymorphic phase transitions were reveled using the SHG and dielectrics methods near T_{PT}~450 K and Curie temperature T_C ~650 K. The T_C values increased in Li- modified samples, decreased in K- and Ag-modified samples, while T_{PT} values decreased, and both T_C and T_{PT} decreased in La and Sb-doped samples.

In NBT-based samples anomalies in dielectric permittivity near ~450 K and peaks at Tmax ~ 600 K were revealed. The phase transitions near ~450 K exhibit well-defined relaxor behavior, characteristic of NBT and due to the presence of polar FE nanoregions in the nonpolar matrix.

Some compositions are characterized by increased values of dielectric permittivity and spontaneous polarization at the room temperature confirming prospect of their functional properties improvement.

Nonmonotonous dependences of the dielectric and ferroelectric properties of the samples studied were revealed. The increased values of dielectric permittivity and spontaneous polarization at the room temperature of some modified compositions confirm prospect of their piezoelectric and electrocaloric properties improvement.

Keywords: Perovskite Structure, Dielectric Materials, Ferroelectrics.

Biography:

Ekaterina Politova, Leading Researcher, Professor

E.D. Politova finished Physical faculty of the Lomonosov Moscow State University and received her PhD and Habiliate (Doctor of Science in Physics and Mathematics) degrees and Professor title in the Karpov Institute of Physical Chemistry (Moscow, Russia). Now she works in N.N. Semenov Federal Research Center for Chemical Physics, Russian Academy of Sciences.

She published more than 150 papers in scientific journals.

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Effect of Ni/Mn ratio on magnetostructural coupling and magnetocaloric effect in MnCoGe alloys

The magnetostructural coupling in off-stoichiometric MnCoGe alloys is realized through tuning the Mn/Co ratio, and it results in a significantentropy change (up to -30.8 $J \cdot K^{-1} \cdot kg^{-1}$) and wide Curie-temperaturewindow (up to 96 K). Two scenarios have been studied, *i.e.*, the Co-rich and Mn-rich compositions, respectively. In both scenarios, the orthorhombic-hexagonal structural transition temperature (Tt) can be shifted into the temperature range between the Curie temperatures of the orthorhombic and hexagonal phases,enabling the magnetostructural coupling between two phases. Although the magnetostructural coupling can be achieved in both scenarios, the Co-rich alloys show much higher entropy change and wider Curie- temperature window than the Mn-rich alloys. Based on the systematic structural and magnetic analyses, the composition-dependent phase diagrams for both scenarios have been constructed.

Audience Take Away:

- Magnetostructural Coupling, Magnetocaloric effect, Magnetic refrigeration
- The materials showing magnetostructural coupling) exhibit various multifunctional phenomena such as magnetocaloric effect (MCE), exchange bias (EB), magnetothermal conductivity (MC) and magnetoresistance (MR). This coupled transition is obtained around the MT temperature
- The MCE is a magneto-thermodynamic phenomenon in which temperature is changed in the material when exposed to the external-non-constant magnetic field
- Magnetic refrigeration is a best alternate conventional gas cooling technology, showing many, such as environment friendly, high refrigerant efficiency, low cast, occupying less space, low mechanical vibration, and harmlessness

Biography:

Dr. Hassan is working as Assistant Professor at Department of Physics, Division of Science & Technology, University of Education, Lahore, Pakistan. Before this he has worked as Assistant Professor of Physics at department of Physics, University of Central Punjab, Lahore, Pakistan. He has published more than25 research papers in well-known International journals of Physics & Materials Science. He has also served as committee member, reviewer and keynote speaker in various International Conferences/Symposiums.

Dr. Hassan did his Ph.D. in Materials Science & Engineering from Nanjing University of Science & Technology, Nanjing, China. Before commencing his doctoral degree, he has worked as subject specialist inHigher Education Department, Punjab Province, Pakistan.

Ali Mianehro
Textile Department, Amirkabir University of Technology, Center of Excellence in Textile, Tehran, Iran

Optimization of the synthesis process of the nanomaterials onto the various substrates

Following nanomaterials ordinary synthesis methods for synthesis on the substrates render high amount of the free-standing nanoparticles in the solution and low attachment efficiency onto the substrates. In addition, some synthesis methods need severe acidic-basic or thermal conditions that are not tolerable for substrate. Therefore, the synthesis prosses should be optimized to enhance the attachment while considering the substrate susceptibility. While optimizing the synthesis method, it should be considered how could we make the conditions favourable for nucleation of the nanoparticles on the substrate surface and how could we make the conditions unfavourable for the synthesis of the free-standing nanoparticles in the solution without attachment to the substrate. In this paper I explain how to do this regarding various substrates.

Audience Take Away:

- By optimizing synthesis processes
- Yes, it is multidisciplinary
- Yes, By designing efficient synthesis processes
- Yes, by designing optimized efficient synthesis processes. Using less chemicals

Debashis Mahato[1*], Tamilselvi Gurusamy[2], Kothandaraman Ramanujam[2], Prathap Haridoss[1] and TijuThomas[1]

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S, N co-doped graphene quantum dots modified TiO2: An excellent lectrocatalyst for oxygen reduction reaction

Energy security and environmental pollution are the two most discussed topics in recent times in the research community. Environmental degradation is a significant concern nowadays due to the extensive use of fossil fuels. Also, the depletion of fossil fuels is a matter of concern in energy demand in human society. Given these circumstances, there is an urgent need to develop clean and sustainable energy technology to solve the shortage of fossil fuel-based energy sources and environmental pollution. In this context, among the different energy conversation and storage technology, fuel cell and metal-air batteries have gained enormous interest in recent times. They are known for their high energy density, high efficiency, and clean operation. But the major bottleneck associated with these technologies is oxygen reduction reaction (ORR) which is known for its sluggish nature. Currently, Pt/C is the state of art catalyst for these technologies. But the high cost, catalyst stability, and durability are the primary concerns associated with Pt/C. So, there is extensive research that has been going to develop a durable, active, low-cost catalyst. This study reports S, N doped graphene quantum dot modified TiO_2 supported with carbon (S, N-GQD/TiO_2/C- 800) as an excellent electrocatalyst for the oxygen reduction reaction. Even the prepared catalyst is purely nonprecious metal-based S, N-GQD/TiO2/C-800 is synthesized using a facile two-stage hydrothermal method. The catalyst shows an excellent electrocatalyst performance with an onset potential of 0.91 V vs. RHE and a half-wave potential of 0.82 V vs. RHE in an alkaline medium. The Tafel slope is 61 mV dec-1 indicates excellent kinetics of the catalyst. ORR happens on the catalyst surface close to the 4 e- transfer process with 20% H_2O_2 productions. The catalyst shows 80 % current retention for 15 h, which offers good stability of the catalyst. The catalyst S, N-GQD/TiO_2/C-800 is also highly methanol tolerant. The enhanced ORR performance is attributed to the strong synergistic effect between S, N-GQD/TiO_2, and carbon. Along with unique structure, formation helps to get high electrical conductivity, high surface area with desirable charge transfer across the interface of S, N-GQD, and TiO_2.

Keywords: *Oxygen reduction reaction; Doped graphene quantum dots; TiO_2; Electrocatalysis*

Audience Take Away:

- Based on recent reports, it is evident that there is a need to discover non-noble metal electrocatalysts for oxygen reduction reaction (ORR), especially for fuel cell and metal-air battery applications. Both these energy technologies are considered promising for creating a cleaner energy future. The major bottlenecks (sluggish oxygen reduction reaction (ORR)) associated with these two technologies will be discussed, and the possible solutions to how we can resolve the issues to a great extent. Transition metal oxide-based materials have huge potential as ORR catalysts because of their high chemical activity, good anti-corrosion resistance, and earth abundant nature of the constituents. But major problems exist with respect to the performance of electrocatalysts due to the inherent insulating properties of transition metal oxides

- We observe that use of appropriate nanocarbons can help. Hence, there is value in exploring GQD/metal oxide composites for oxygen reduction reaction applications. In this work, we report S, N doped GQD /TiO2 based nanocomposites for oxygen reduction reaction catalysis. Hence, we expect this to open up further avenues for researchers working in this class of materials for electrocatalytic applications.

Biography:

Mr. Debashis Mahato studied B.Sc. in Physics at the Burdwan University, West Bengal, followed by M.Sc. in Physics. After that, he studied M. Tech. in Materials Science and Engineering at the Indian Institute of Technology Kharagpur, West Bengal, India in 2018. He then joined the Indian Institute of Technology Madrasto pursue a Ph.D. Currently, he is a senior research scholar in the Department of Metallurgical and MaterialsEngineering IIT Madras. He has published 1 research article SCI(E) journal and presented in 240th ECS

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Synergistic behavior between the nanounits of gold nanoparticles/2-D matrix of layered double hydroxides heterostructures for facilitating plasmonic catalysis

Solar-to-chemical energy conversion by plasmon-driven photocatalysis is one of the sustainable approaches for energy production. Plasmonic metal nanoparticles (NPs) are characterized by their strong interactions with electromagnetic radiation (for example, photons) through an excitation of localized surface plasmon resonance (LSPR). By engineering the LSPR response on a catalyst-molecule interface a surface electronic state with an optimized energy can be created at will to selectively modulate solar-to-chemistry conversion capabilities. Recent investigations have shown that it is possible to broaden the functionality of LSPR characteristics in heterostructured catalysts formed by close junctions of a plasmonic nanounit, which amplifies and concentrates the photons energy within the material and, a non-plasmonic nanocomponent that is able to play the role as support and further to extract the plasmon energy in the form of electronic excitations to perform a targeted catalytic function [1]. This work presents heterostructures of AuNPs/LDH revealing their synergistic functionalities of the coupled nanounits and how this can be tuned to effectively harvest light in plasmonic hybrid catalysis. The ease of the synthesis strategy of AuNPs/LDH was exploiting the manifestation of LDH "structural memory" in $AuCl_3$ aqueous solution, at room temperature. By this "green" strategy the LDH contributed not only to confine and stabilize AuNPs on its larger nanoplatelets but was directly involved in the synthesis of AuNPs. The characteristics of the plasmonic induced charge separation (PICS) and/or co-catalytic effects in targeted photocatalytic processes were studied by XPS and EXAFS measurements. Moreover, results revealed that the metal-support interactions (MSI) in the coupled nanounits are influenced by the type of light used for irradiation. The irradiation by solar light promoted the manifestation of the plasmonic effect of AuNPs and increased the performance of plasmonic catalysis for AuNPs/LDH heterostructured catalysts. We found that the composition of LDH was directly entangled to the tailored electron transfer and the performances of the catalysts.

These results show that 2D matrix of LDH is more than merely an inert support and its tailored functionalities can be applied to obtain advanced nano-heterostructures with plasmonic metals for targeting performance in plasmonic catalysis.

Audience Take Away:

- The ease of preparation and effective cost strategies to design the fabrication of heterostructured nanoarchitectonics
- Specific interactions with the support, that are entangled to the rearrangement of electrons, modulated by harvesting the light energy on a plasmonic/non-plasmonic catalytic interface
- The synergistic multifunctionality of the heterostructured nano-units enhances the performances in plasmonic catalysis
- The ease of the fabrication strategy of the novel heterostructures, capable of enabling interesting applications in different wavelength ranges, is a sustainable approach to obtain highly performant catalysts for energy production by exploiting hybrid plasmonic catalysis

Biography:

Gabriela Carja is Professor of Physical Chemistry in the Department of Chemical Engineering of Technical University "Gheorghe Asachi" of Iasi and received her Ph.D. in industrial catalysis in 1999. She was UNESCO research Fellow at Tokyo Institute of Technology Japan in 2000 and did a postdoctoral stage at Institute Superior Technique of Lisbon, Portugal. She was awarded the medal of Tokyo Institute of Technology and received the Romanian Academy award in 2009. She was DC Rapporteur at European Cooperation in Science and Technology Commission. Dr Carja co-authored over 130 scientific publications. Her focus is on the fabrication of novel nanoarchitectonics for catalysis targeting new energy production and environmental remediation.

Guilherme Ascensão[1*], Adriana Figueira[1], Filipe Rebelo[1], Helena Paiva[1], António Figueiredo[1], Romeu Vicente[1]and Victor M. Ferreira[1]

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Self-leveling screeds with enhanced thermal properties for radiant floor systems

Radiant floor heating systems have become increasingly popular over the last decade and demand is forecasted to continue to grow driven by evermore stringent construction codes, increasing demand for energy-efficient building materials, and need to reduce buildings' operating costs while providing high comfort levels to its inhabitants.

The SEERFLOOR project (**S**uper **E**nergy **E**fficient **R**adiant **Floor** Systems) covers four main research topics relatedto radiant floor systems design: i) development of construction materials with enhanced thermal properties, ii) geometric configuration and optimization of execution aspects, iii) experimental testing, monitoring, and validation, and iv) numerical modelling for optimal operating conditions using smart sensoring, AI algorithms, and predictive controls.

Here, a brief overview of the SEERFLOOR project will be firstly presented, followed by a detailed discussion covering the findings made on development of building materials with enhanced thermal properties gathered after the first year of the project. The development of building materials with adequate thermal properties is particularlycritical as thermal and energy efficiency of radiant floor heating systems largely depend on heat transfer properties (thermal conductivity). Screed mortars used to embed piping systems in sub-base layers largely dictate energy transferconditions and are a well-known bottleneck for increasing the technical, environmental, and economic performance ofradiant floor systems.

Self-levelling screeds with improved thermal properties have been developed using highly dense metallurgical slag aggregates ($\rho_{true} \approx 3500$ kg/m^3) as natural sand surrogates. Screed mortars formulations were characterized in terms of workability, strength development, bulk density, capillarity, water absorption and thermal conductivity, and optimized to exhibit self-levelling behaviour (max. spread value ≈ 230 mm) and maximum bulk density after curing ($\rho_{max} \approx 2400$ kg/m^3), while complying with existing standards for screed mortars. The experimental results gather will be now served as input data to numerically model the thermal performance of radiant floor heating systems constructed with different materials and configurations.

Audience Take Away:

- Understand the basic principles of design, advantages, and main problematics of radiant floor heating systems
- Comprehend the design phases and effects of the different aggregates and additives on the properties ofself-levelling screed mortars
- Grasp how the materials developed can be technically feasible, competitive, and a circular solution for sustainable construction markets, while providing an added-value outflow for metallurgical by-products

Biography:

Dr. Ascensão is a civil engineer specialized in sustainable building materials. Ph.D. in Material Eng., KU Leuven, andPh.D. in Civil & Environmental Eng., U. Padova, 2020. Researcher at RISCO- Research Center for Risks and Sustainability in Construction, U. Aveiro, since 2022. Researcher at Cecolab: Co-Lab Towards Circular Economy, 2021. Research Scientist at the Heidelberg Cement, 2016 to 2020. Research fellow at CICECO: Center for Ceramics and Composites, 2014 to 2016. Dr. Ascensão is the author/co-author of over 25+ scientific publications, over half of them in SCI journals, with 650+ citations on: concrete, mortars, screeds, ceramics, and alkali activated materials.

Gabriela Rivera-Hernández,[1,3*] Marilena Antunes-Ricardo,[1,4] Patricia Martinez-Morales[2], Mirna L. Sánchez[1]

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Injectable hydrogels as drug delivery systems for cancer treatment

Cancer is one of the leading causes of death in the world, their treatment includes a combination of surgery, chemotherapy, and radiotherapy. Unfortunately, this combination is limited due to the heterogeneous manifestations of the disease, dose-related toxicity, and side effects. A promising strategy to limit the adverse effects of these treatments is the implementation of a targeted therapy through the use of injectable hydrogels, which provide localized sustained release of the chemotherapeutic. They reduce the toxicity in non-tumoral tissues, by avoiding systemic circulation of the chemotherapeutics. Recently, their use has been proposed for hepatic, gastric, and bladder carcinoma. Additionally it had been used for the treatment of melanoma, glioblastoma and subcutaneous tumors. Although proofs of concept and *in-vitro* trials about delivery, toxicity and effectiveness show encouraging results, there also exists a lot of experimental evidence needed before its clinical implementation.

The injectable hydrogels are characterized by perform a sol-gel transition *in-situ* by chemical,physical and radiation crosslinking methods. This transition is associated as a response to some stimuli suchas temperature, pH and UV-light. Thermosensitive hydrogels the most investigated, due to its convenient and easy application, since they are injected in liquid state and gelificate around the target tissue at body temperature. In addition, it has been proved that depending on the material used, both hydrophobic and hydrophilic drugs, can be encapsulated and release in a controlled manner. Which provides a large number of options of molecules to be used and even allows the combination of drugs, which has been proven to increase the effectiveness of chemotherapy

Nowadays different polymers such as polyethylene glycol (PEG), Polylactic Acid (PLA), polylactic-co-glycolic acid (PLGA), Polyvinyl alcohol (PVA) and Pluronic F127 has been explored alone and in conjunction with other materials such as micelles and liposomes, in order to obtain formulations increasingly stable and durable. However, since that main *in-vivo* model consists of ectopic tumors in rodents, it makes it difficult to measure the specific response because of the absence of a tumor-specific microenvironment. Therefore, testing injectable hydrogels in conditions similar to those to which they will be subjected is one of the main highlights in their development. In our research we had synthesized injectable hydrogels composed of PVA and PF127 and we had studied the change in gelation and degradation time according to the process of synthesis and percentage of compounds used. Also theinjectable hydrogels have been subjected to different simulation's media in order to evaluate their delivery and degradation under extreme and physiological conditions. Until now, although the results are promisingit is still necessary to extend the period of degradation as well as improve the delivery dosage in order to accomplish with the appropriate standards so, the injectable hydrogel became a competitive alternative of cancer treatment.

Audience Take Away:

- The importance of injectable hydrogels as emerging drug delivery system in cancer treatment
- Injectable hydrogels main characteristics, their advantages and challenge to solve
- The main polymers and methods used for the synthesis of injectable hydrogels

Biography:

Gabriela Rivera Hernandez is studying a PhD dual degree focus in biotechnology and materials development between UNQ-ITESM. Her fields of interest are nanomedicine, bioprocess techniques and molecular biology of cancer. She obtained the degree of Master of Science. During her Master's degree, shegot a certificate on "Legislation of GMO´ s" from Universidad de Quilmes (UNQ)/ Ministerio de Agroindustria, Ganaderia y Pesca, in Argentina .Gabriela achieved her Bachelor's Degree in Biotechnology engineering focusing on Bioprocess from Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), Mexico.

Laura Crociani
Institute of Condensed Matter Chemistry and Technologies for Energy, ICMATE, Italian National Council of Research, CNR, c.so stati Uniti 4, Padova, Italy

Confinement of antifouling substances in SiO2 nanocontainers

The degradation of stone materials is a challenging issue in the cultural heritage field: in particular microorganisms are among the most common agents of stone damage and great efforts have been made to improve the efficacy of antifouling treatments and at the same time to reduce the environmental impact caused by the use of biocides in high concentration. Actually, biocides are applied directly on the surfaces or diluted into coating formulations but because of biocides degradation or to their rapid release and immediate effect such coatings have a quite short-lived antifouling action what could be partly solved by using big amounts of biocides. However, an innovative strategy for controlling the release of bioactive species and reducing their concentration consists in the use of nanocontainers where to introduce the biocides. In order to satisfy ecological requirements and EU regulations in this work two different green biocides, zosteric acid sodium saltand usnic acid, have been selected: zosteric acid sodium salt is a Natural Product Antifoulants (NPAs) derived by Zostera marina (eelgrass), while usnic acid is a lichen secondary metabolites (LSM), wellknown as potential natural antimicrobial substance. Zosteric acid sodium salt was synthesized whileusnic acid is commercially available: they have been tested in SiO_2 nanocontainers differing for theirmorphology. In this work it is reported the preparation and characterization of the empty SiO_2 nanocontainers, the one loaded with zosteric acid sodium salt and usnic acid along with their antifouling activity evidencing the possibility to tune the antifouling efficiency by combining the twoin different proportions.

Biography:

Crociani Laura, degree in chemistry (laurea *cum* laude) and PhD in Chemical Sciences at the University of Padua, Italy; since the end of 2001 chemical scientist at ICMATE, CNR in Padua. Shehas published articles in ACS, Wiley and Elsevier, being also reviewer for some journals and part ofeditorial board of Journal of Chemistry and Materials. She is also author of an Italian and US patent about the synthesis of $Mg(BH_4)_2$. Her interests regard synthesis and characterization of inorganic, metallorganic complexes and nanomaterials with application in the field of chemical vapour deposition, energetics, olefin oligomerization, electrocatalysis and cultural heritage.

Naveen Kumar Reddy Bogireddy* and Raul Herrera Becerra
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Pyridinic N anchored Ag and Au hybrids for detoxification of organic pollutants

The development of highly reusable, non-toxic catalyst for the effective removal of 4-nitrophenol (4-NP) from marine water is a key challenge due to its diverse effects on living organisms. Herein, *in situ* green fabricated pyridinic N anchored Ag_2O/Au decorated porous silica (CG-Ag_2O/Au-SiO_2) using spent coffee grounds (CG) powder is introduced as a reusable catalyst to mitigate 4-NP, Methylene blue (MB), Rhodamine 6G (R6G) and their mixture in the spiked deionized, river and marine water samples. Exceptionally high structural activity and excellent reusability of catalyst up to 15 cycles have been demonstrated due to the accessibility of a large number of active sites from pyridinic N anchored Ag_2O and Au particle surfaces. CG-Ag_2O/Au-SiO_2 with the lower Ag and Au contents of 0.59 and 0.11 wt% (ICP-MS) of active catalytic sites exhibit a superior activity parameter of 6000 $s^{-1}g^{-1}$ (4-NP), 6357 $s^{-1}g^{-1}$ (MB), and 2892 $s^{-1}g^{-1}$ (R6G) than chemically synthesized and reported, bare and hybrid structures. Furthermore, the CG-Ag_2O/Au-SiO_2 shows excellent stability in marine water with promising reusability performance (≈93% after 15 successive cycles). Density functional theory (DFT) studies reveals that the observed high catalytic efficiency originates from the pyridinic N presence on the Ag_2O/Au structures. This study opens the pathway for the rational design of hybrid catalysts utilizing abundant waste to effectively remove toxic pollutants in fresh, river, and marine water environments.

Audience Take Away:

- Necessity for developing such outstanding catalysts with use of sustainable support and reducing/stabilizing agents such as biogenic silica, and coffee grounds extract to fabricate hybrid structures (as catalysts), where suspended contaminants can be removed and makes the process economical and sustainable
- Use of mesoporous support such as biogenic silica facilitates in-depth filtration (where the suspended contaminants are smaller than the pore volume), where suspended contaminants are trapped within the porous structure at various depths
- The influence of two widely deployed techniques, namely chemical and greener synthesis for the catalytic reduction of 4-nitrophenol (4-NP) and degradation of organic dyes (methylene blue and rhodamine 6G) in spiked deionized, *river and marine water* samples
- The effect of pyridic N in the catalytic activity

Biography:

Dr. Naveen Kumar Reddy Bogireddy obtained his Ph.D. in Engineering and Applied Sciences with First Class Honors at the Autonomous State University of Morelos. Currently, he is doing a postdoctoral stay at the Institute of the Physics-National Autonomous University of Mexico. His work on advanced nanomaterials for environmental applications is going to be consolidated. He has published several articles in Nature, Cell press, ACS, RSC, Elsewhere, IOP, Frontiers, etc., on the fabrication and characterization of metallic nanoparticles/ carbon dots and their application for the detection and mitigation of toxic organic pollutants in aqueous media.

Atefeh Golbang[1*], Mozaffar Mokhtari[2], Alistair McIlhagger[1], Edward Archer[1], Eileen Harkin-Jones[1]

[1]Engineering Department, Ulster University, Jordanstown, Newtownabbey, United Kingdom

[2]University of Manchester, England, United Kingdom

Improving interlayer bonding and strength in 3D-printed thermoplastics

One of the biggest drawbacks in additive manufacturing of thermoplastic parts using Fused Deposition Modeling (FDM) is the relatively low mechanical properties such as strength and Young's modulus compared with parts manufactured using conventional methods such as injection moulding. This is mainly due to the weak layer bonding between the consecutive printed layers. Hence, industries such as aerospace and medical sector are reluctant to use FDM for development of parts which require high loading capability. In this work we have used a combination of strategies to enhance the interlayer bonding through changes in printing conditions as well as material composition. For this purpose, IF-WS2 nanoparticles and ZnO tetrapods with adhesion promoting properties were incorporated into high performance Polyether ether ketone (PEEK) in different loading ratios using a twin screw extruder to develop filaments for FDM 3D-printing of samples. IF-WS2 nanoparticles act as solid lubricants which assist polymer chain diffusion and simultaneously improve the mechanical performance of polymer. ZnO tetrapods have adhesion promoting properties which can help with the interlayer bonding in FDM. To evaluate the effectiveness of these approaches, samples were prepared and characterized using SEM, DSC, and mechanical testing. A good distribution of nanoparticles was observed in PEEK based on SEM images. The DSC data showed a small increase in polymer melting point and crystallization upon addition of IF-WS2 and ZnO particles. Based on the tensile testing results, significant improvement in Young's modulus and Ultimate tensile strength in FDM 3D-printed PEEK samples containing both IF-WS2 and ZnO particles of up to 50%, whereas the improvement was less visible when the additives were added separately. This synergic improvement can be ascribed to the improvement in polymer melt flowability and bonding of polymer chains.

Audience Take Away:

- I believe that the audience would benefit from this presentation as it discusses additive manufacturing of high performance polymers and some of the challenges surrounding it (i.e. lack of strength and anisotropic properties, lack of repeatability, etc)
- Additive manufacturing (AM) or 3D printing is becoming popular for producing parts from thermoplastic polymers as it can create complex geometries without the need for sophisticated tooling, resulting in cost-effective and sustainable manufacturing
- High performance thermoplastic polymers, such as polyether ether ketone (PEEK) are becoming increasingly attractive in competition with metals and ceramics for load bearing applications under harsh operating conditions due to their high thermal and chemical stability, exceptional
- A novel approach and a practical solution is offered in this work to overcome some of this issues which would help designers, researchers and industries to use 3D-printing more effectively for producing parts with more uniform properties and higher strength from high performance thermoplastic polymers such as PEEK. These products can be applied in aerospace or medical applications
- Also, the topic discussed here can be applied in teachings in academia to inform students about the challenges
- and possible solutions related to processing of high performance polymers, nanocomposites, characterization and additive manufacturing strength-to-weight ratio, and recyclability

Biography:

Dr Atefeh Golbang studied chemical engineering during her bachelor and after completing a Masters degree, she received her PhD in polymer engineering from Tarbiat Modares University (Iran). After one and a half years postdoctoral fellowship in Additive Manufacturing of high-performance polymer nanocomposites for aerospace application, supervised by Professor Eileen Harkin-Jones in the mechanical engineering department at Ulster University (Northern Ireland), she obtained the position of an Associate Professor at the same university. Her expertise are in the fields of polymer processing, nanocomposite formulation and characterization and additive manufacturing.

KEYNOTE FORUM

DAY 02

3RD EDITION OF INTERNATIONAL CONFERENCE ON

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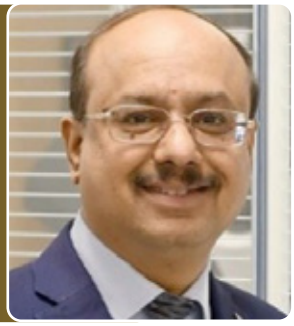
21-22 SEPT



Bala Vaidhyanathan*

Department of Materials, Loughborough University, United Kingdom

2D/3D Manufacture of advanced ceramics for demanding applications

The processing of advanced functional ceramic powders and suspensions into useful engineering components has been investigated via a series of research projects each focusing on a different stage of the manufacturing route viz., (i) the ability to control the agglomerates present in the ceramic powder resulting in the production of a free-flowing and crushable powders, (ii) the formation of low viscosity but high solids content nanoceramic suspensions suitable for 2D and 3D additive layer manufacturing (Screen Printing and 3D printing) and (iii) the use of novel field assisted sintering techniques (FAST). This holistic approach helped to transfer the developments achieved in each stage of the manufacturing process to the next and resulted in the ability to form fully dense advanced ceramic components whilst restricting the grain growth to a minimum.

The methodology has been employed to develop various advanced functional ceramic components such as Multilayer X8R Ceramic Capacitors, 3D printed $BaTiO_3$ based light-weight PTCR heaters for automotive and aerospace applications that surpasses existing commercial counterparts, ultra-low loss microwave dielectrics for beyond 5G communication devices, additively manufactured (AM) zirconia based biomedical components exhibiting vastly superior hydrothermal ageing resistance and mechanical performance suitable for use in biomedical implants (eg., hip/knee prosthesis, finger joints, dental and jaw repairs), petro-chemical valve parts as well as for ballistic armour applications. Significant sustainability advantages were noted with AM compared to conventional subtractive manufacturing methods in terms of reduction in material wastage and process efficiency. 3D printing of hydrothermally immune nanostructured dental implants was regarded as one of the six best modern technological developments in materials science by a recent BBC documentary (Materials of the Modern Age: The Secret Story of Stuff). These novel advancements are covered by a series of patents and papers and this talk will provide an overview of some of these developments.

Audience Take Away:

- The researchers, academics and industrial colleagues will learn the state-of-the-art developments in the rapidly growing field of additive manufacturing of ceramics
- It will help the audience to understand the parameters that control the 3D printing of advanced ceramics, the challenges associated the ink formulations and post processing of printed parts
- They will be able to understand the advantages of using field assisted sintering methods for the rapid densification of advanced ceramic components and how to effectively employ them to minimize grain growth whilst maximizing densification

Biography:

Bala Vaidhyanathan is a Professor of Advanced Materials and Processing and was the Associate Dean for Enterprise at the School of Aeronautical, Automotive, Chemical and Materials Engineering at Loughborough University. He leads the Advanced Ceramics Research Group in the Materials Department, won 45 research grants worth >£30.2M and has over 200 peer reviewed publications, named inventor on 17 patents, delivered >60 Plenary/keynote/invited presentations, organizing committee member for >10 global conferences and written six book chapters. He is the Editor of Advances in Applied Ceramics, and on the Editorial Board for many International Materials' Journals. He had been a research staff at the Pennsylvania State University, USA, and a Lead Scientist at General Electric.

Yarub Al-Douri

Engineering Department, American University of Iraq, Sulaimani, Kurdistan, Iraq

A correlation between nanotechnology and renewable energy

The 21st century calls for nanotechnology researches. However, the potential for the technologies today is limited by high capital costs, low production rates and limited control. Breakthroughs in nanotechnology research could accelerate the development and implementation of the promised technology, it is the quantum dots, principles, research and applications. Our research team has achieved a series of works focused on elements-, compounds- and alloys-based quantum dots to explore the feasibility of fabricating small-size devices, little of energy consumption and friendly-environmentally to keep our globe clean and save bright future for the coming generations.

Audience Take Away:

- Learn more about alloys nanoparticles
- Take more knowledge for optoelectronic application
- Distinguish between toxic and non-toxic nanoparticles

Biography:

Prof. Dr. Yarub Al-Douri is from American University of Iraq, Sulaimani. Al-Douri has initiated Nanotechnology Engineering MSc Program and Nano Computing Laboratory. He has received numerous accolades including World's Top 2% Scientists by Stanford University, USA 2021 & 2020, OeAD Award, Austria 2020, JSPS Award 2019, AUA Award 2019, IFIA 2019, TWAS-UNESCO Associateship (Twice) Award 2015 & 2012, the total is 69 awards. Al-Douri is Associate Editor of Nano-Micro Letters (Q1), Editor-in-Chief of Experimental and Theoretical NANOTECHNOLOGY, Editor-in-Chief of World Journal of Nano Science and Engineering,

Ephraim Suhir

Department of Mechanical and Materials Engineering, Portland State University, Portland, OR, USA

Probabilistic design for reliability concept in electronics and photonics materials science: Role, significance, attributes, challenges

The probabilistic design for reliability (PDfR) concept in electronics and photonics (EP) materials science and engineering is addressed. It is based on 1) highly focused and highly cost-effective failure oriented accelerated testing (FOAT), aimed at understanding the physics of the anticipated failures and at quantifying, on the probabilistic basis, the outcome of FOAT conducted for the most vulnerable element(s) of the product of interest considering its most likely applications and the most meaningful combination of possible stressors (stimuli); and on 2) simple and physically meaningful predictive models (PM), both analytical and computer-aided, such as, e.g., multi-parametric Boltzmann-Arrhenius-Zhurkov (BAZ) equation, aimed at bridging the gap between the FOAT data and the most likely field conditions. The PDfR concept proceeds from the recognition of the fact that nothing is perfect and that the difference between a highly reliable and an insufficiently reliable product is "merely" in the level of the never-zero probabilities of their failure.

Audience Take Away:

- Learn how to use analytical ("mathematical") modeling, in addition to computer-aided evaluations, in the design-for-reliability of electronic and photonic systems
- Understand the incentive for applying a probabilistic approach in the electronic and photonic materials science and engineering
- Be able to organize and conduct, when developing a new electronic or a photonic technology, highly focused and highly cost effective failure oriented accelerated testing (FOAT)
- Learn, using the Boltzmann-Arrhenius-Zhurkov (BAZ) constitutive equation, how to predict the probability of failure in the field from the FOAT data

Biography:

Ephraim Suhir is Life Fellow of the IEEE, the ASME, the SPIE, and the IMAPS; Fellow of the APS, the IoP (UK), and the SPE; and Associate Fellow of the AIAA. He has authored about 500 publications, presented numerous keynote and invited talks worldwide, and received many professional awards. His most recent awards are 2019 IEEE EPS Field award for seminal contributions to mechanical reliability engineering and modeling of electronic and photonic packages and systems and 2019 IMAPS Lifetime Achievement award for making exceptional, visible, and sustained impact on the microelectronics packaging industry and technology.

POSTERS

DAY 02

3RD EDITION OF INTERNATIONAL CONFERENCE ON

MATERIALS SCIENCE AND ENGINEERING

21-22 SEPT

Parth Mehta[1,2*], Vedasri Bai Khavala[1], Prabhu Rajgopal[2] and Tiju Thomas[1]

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Stability optimization of $NaBH_4$ via pH and H_2O:$NaBH_4$ ratios for large scale hydrogen production

There is an increasing need for alternative clean fuels, and hydrogen (H_2) has long been considered as promising solution with high calorific value (142MJ/kg). However, storage of H_2 and expensive processes for it generation have hindered its usage. Sodium borohydride ($NaBH_4$) can potentially be used as an economically viable means of H_2 storage. Thus far, there have been attempts to optimize the life of $NaBH_4$ (half-life) in aqueous media by stabilizing it with sodium hydroxide (NaOH) for various pH values. Other reports have shown that H_2 yield and reaction kinetics remained constant for all ratios of H_2O to $NaBH_4$ > 30:1, without any acidic catalysts. Here we highlight the importance of pH and H_2O: $NaBH_4$ ratio (80:1, 40:1, 20:1 and 10:1 by weight), for $NaBH_4$ stabilization (half-life reaction time at room temperature) and corrosion minimization of H_2 reactor components. It is interesting to observe that at any particular pH>10 (e.g., pH = 10, 11 and 12), the H_2O: $NaBH_4$ ratio does not have the expected linear dependence with stability. On the contrary, high stability was observed at the ratio of 10:1 H_2O: $NaBH_4$ across all pH>10. When the H_2O: $NaBH_4$ ratio is increased from 10:1 to 20:1 and beyond (till 80:1), a constant stability (% degradation) is observed with respect to time. For practical usage (consumption within 6 hours of making $NaBH_4$ solution), 15% degradation at pH 11 and $NaBH_4$: H_2O ratio of 10:1 is recommended. Increasing this ratio, demands higher NaOH concentration at the same pH, thus requiring higher concentration or volume of acid (e.g., HCl) for H_2 generation. The reactions are done with tap-water to render the results useful from an industrial standpoint. The observed stability regimes are rationalized based on complexes associated with $NaBH_4$ when solvated in water, which depend sensitively on both pH and $NaBH_4$: H_2O ratio.

Audience Take Away:

- Potential of $NaBH_4$, towards point-of-use hydrogen production, even at relatively high concentrations is demonstrated
- Sufficient stability of $NaBH_4$ solution is possible due to non-linear association between stability, solution concentration and pH
- The above-mentioned results can be used for H_2 reactor design and parameter optimization

Biography:

Parth Mehta studied Mechatronics in Mahatma Gandhi Institute of Technology, India in 2020. He then joined the MS Research under Prof. Prabhu Rajagopal (Center for Nondestructive Evaluation and Department of Mechanical Engineering) and Prof Tiju Thomas (Department of Metallurgical and Materials Engineering) at the Indian Institute of Technology, Madras,(IITM) India. Currently, he is working on hydrogen generation and connecting it to fuel cell to run surface water vehicles.

Bahnariu Theodor[1*], Benhiti Ridouan[2], Chiban Mohamed[2], Gabriela Carja[1]

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[2]Laboratory of Applied Chemistry, Environment, Faculty of Sciences, Ibn Zohr University, Agadir, Morocco

Engineering layered double hydroxides- based catalysts for photocatalytic water remediation

Solar photocatalytic decontamination, as an environmentally friendly technology, has been regarded as a good approach to eliminate water pollutants. To date, various photocatalysts have been developed for the purpose of water remediation. Layered double hydroxides (LDH) are mesoporous 2D lamellar anionic clays that emerged as very promising candidates for constructing highly efficient semiconducting photocatalysts[1].

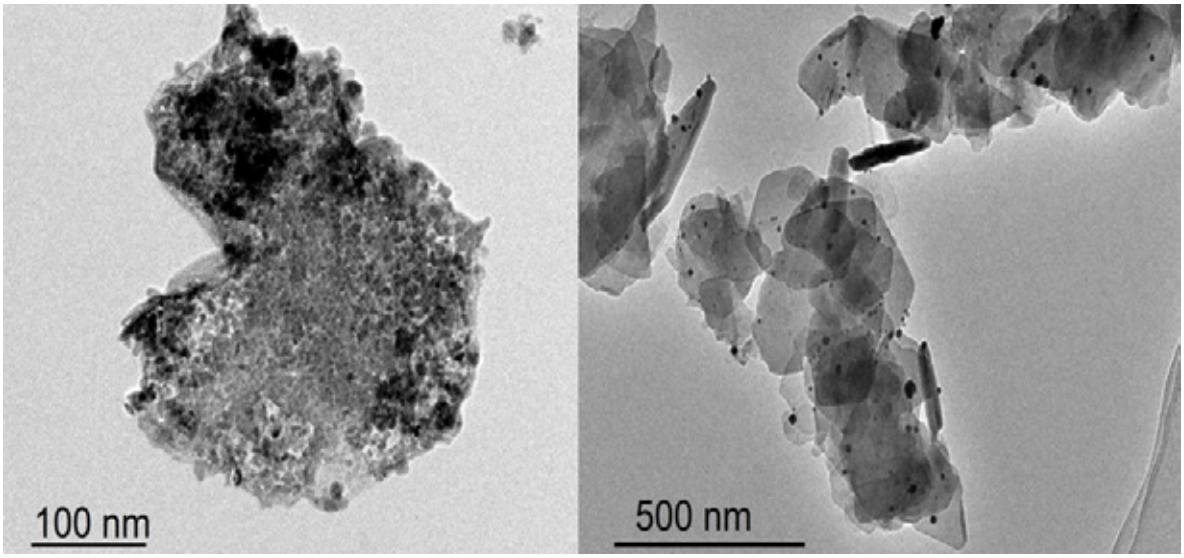

Figure 1 TEM images of Au/ZnAlLDH.

Heterostructures composed of optical responsive nanounits of LDH and metal plasmonic nanoparticles (MeNP) display increase solar-light harvesting efficiency that is derived from the close conjunction and synergistic interactions between the optical active nanounits. Herein, we report the design, synthesis, unique physical-chemical properties and applications in plasmonic catalysis of LDH (e.g.: ZnAlLDH and MgAlLDH) heterostructured with plasmonic nanoparticles (e.g.: AuNP; AgNP). Advanced characterization techniques (XRD, HRTEM, XPS, FTIR, UV-VIS) have been used to describe the physical-chemical properties and the plasmonic features of MeNP/LDH. Results point that the performances of the photocatalysts to remove toxic compound in water purification treatments by using solar light energy, are due to the congruent role of the plasmonic metal nanoparticles and the anionic clay optical response.

Acknowledgements. This work was supported by the grant of the Romanian National Authority for Scientific Research, CNCS-UEFISCDI, Project number PN-II-ID-PCE-75. R. B and M.C. greatly acknowledge for financial support of an Erasmus grant mobility between Romania and Morocco.

Audience Take Away:

- Preparation of layered double hydroxides nanomaterials
- Heterostructures composed by layered double hydroxides and metal nanoparticles (AgNPs)
- Performances of the photocatalysts to remove toxic compound in water purification treatments by using solar light energy

Biography:

My name is Theodor Bahnariu and I am PhD student at Physical Chemistry in the Department of Chemical Engineering of Technical University “Gheorghe Asachi” of Iasi, Romania from 2019 till now. I have a degree in Biology with specialization in Biochemistry in 2017 at ”Alexandru Ioan Cuza” University, Faculty of Biology, Iasi, Romania. Also, I have a master’s degree in Microbial and Cellular Biotechnologies in 2019 at ”Alexandru Ioan Cuza” University, Faculty of Biology, Iasi, Romania .

Goverdhan Reddy Turpu* and Neha Sahu
Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Koni, Bilaspur C.G. India

Photodegradation of methylene blue dye by hydrothermal prepared V_2O_5 – rGO composite

Degradation of Methylene Blue (MB) dye in 8 minutes upto 94 % is manifested in the present manuscript by using a reduced graphene oxide (rGO) – V2O5 composite, synthesized by hydrothermal method. rGO - V_2O_5 (1:0.5, 1:1, 1:2, and 1:3) composites were studied for photodegradation of MB dye. The synthesized compounds were studied for structural, morphological and optical properties through X – ray diffraction, Raman spectroscopy, SEM / TEM and UV – Visible absorption spectroscopic techniques. Individually, rGO and V2O5 show less degradation of methylene blue (MB) dye with 51 % degradation in 135 minutes and 15 % in 22 minutes, respectively. The composite of these materials with 1:1 ratio shows an excellent degradation of MB upto 94 % in 8 min. The degradation efficiency of rGO-V_2O_5 for 1:2, 2:1 and 1:3 compositions are 58 % in 120 min, 46% in 40 minute and 53 % in 65 minutes respectively. The calculated rate constants of dye degradation for rGO-V_2O_5 (1:1) is almost two orders high as compared to other specimens. Scavenger based experiments in combination with band gaps evaluated were carried out to understand the degradation scheme of the composite, where the superoxide ion role has been found superior to other elements present in the reaction.

Audience Take Away:

- The process of Photocatalysis for the degradation of dyes and water purification
- This talk will help audience to extend their work by understanding various synthesis methods for nano particles and their applications

Biography:

Dr Goverdhan Reddy Turpu studied Physics from Osmania Unviersity, Hyderabad, India and completed Ph.D. in 2005. Later on, Dr Turpu worked in various fields at Indiana Univeristy, USA, IIP-UFRN, Brazil , Sejong Unviersity, Seoul, Republic of Korea as postdoctoral fellow. Dr. Turpu joined Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur, India. He works in the field of development of nano structures using various methods and their composites with reduced graphene oxide / other carbonaceous materials. He has published more than 40 paper in journals.

SPEAKERS

DAY 02

3RD EDITION OF INTERNATIONAL CONFERENCE ON

MATERIALS SCIENCE AND ENGINEERING

21-22 SEPT

Sadia Ameen
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Multi-dimension metal oxides and organic electronic catalysts for environmental remediation

Metal oxides and organic semiconducting (electronic materials) remain of vital interest in the field of electrochemistry for their flexibility in chemical and electrochemical behavior. Electrochemical sensors are becoming popular, owing to their good detection performances, ease of operation, less expensive, fast, and selective analytic technique. The sensing performance is highly influenced by the electrode materials for enhancing the catalytic effects and elimination of interferers thus, it is of great importance to design new electrode materials. For developing electrode materials, we can hardly ignore metal oxides nanomaterials and conjugated organic semiconductors due to their high electrical conductivity, highly efficient, tailorable charge transport characteristics, and rapid signal transduction. Due to associate π-conjugation in the backbone of conjugated organic semiconductors, they exhibit a direct interaction with the analyte in a redox process and thus, help in increasing the selectivity and sensitivity. So far, metal oxides of different morphologies and dimensions are promising as sensing electrode materials for the detection of various harmful chemicals. S. Ameen et al. fabricated hexagonal ZnO nanopyramids (NPys) modified disposable screen printed electrode (SPE) chemical sensor which showed a good sensing behavior with a sensitivity of ~293.5 μA/μM/cm2 and limit of detection (LOD) of ~17.3 μM toward the detection of dichloromethane. In other work, S. Ameen and co-workers reported Indandione oligomer@graphene oxide functionalized nanocomposites for enhanced and selective detection of trace Cr2+ and Cu2+ ions. In this work, we present the multi-dimensional metal oxide nanomaterials and conjugated organic semiconductors as electrode materials towards the detection of hazardous chemicals. The advantages of utilizing multi-dimensional metal oxide nanomaterials and conjugated organic semiconductors as electrode materials are

These high yield materials are prepared by a facile and accessible low-cost processes

These materials display a large surface area and thus, show enhanced electrochemical properties towards chemical sensing applications

Most importantly promising sensing parameter i.e, a high sensitivity with wide linear response range are obtained by using these electrode materials.

Biography:

Professor Sadia Ameen is working as Associate Professor at Department of Bio-Convergence Science, Jeongeup Campus, Jeonbuk National University, Republic of Korea. Her current research focuses on Perovskite solar cells, Field emission transistors (FETs), Organic solar cells, Sensors (Chemical and Biosensors), Catalysts, and Optoelectronic devices. She is preoccupied with supervising and advising students in the domains of energy conversion, clean energy materials and catalysis, undertaking research that results in regular publication in internationally rated journals, developing core curriculum and teaching course material effectively. Professor Sadia Ameen's recent accomplishments are witnessed in published research papers, invited talks in conferences and seminars, contributions to book chapters, edited books, and authored national and international patents. She is proud recipient of honors and accolades in science to include a few: 1. Certificate of Excellence (2022), 2. Asia's Top-50 Scientist Award (2021), 3. Excellence in Research Award (2021), 4. Outstanding Scientist Award (2021), 5. Named among TOP 2% scientists in the world (2020, 2021), 6. Best Researcher Award (2016), 7. Awarded by National Research Foundation of Korea (NRF) Postdoctoral Fellowship for Foreign Researchers (2011), Jeonbuk National University, South Korea, 8. Awarded by Jeonbuk National University Post Doctoral Fellowship (2008-2010), South Korea, 9. Selected for Marquis Who's Who, 28th Edition, (2011), 10. Best Paper Presentation Award, KIChE (Korean Institute of Chemical Engineers), South Korea (2010), 11. Gold Medal Winner in Academics, and Merit Scholarship and Certificate Holder (2003).

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First-principles study of vacancy defects in TiVTa and TiVTaNb concentrated solid-solution alloys

The formation and migration energies of vacancy defects are studied systematically by first-principal calculations method in three concentrated solid-solution alloys (CSAs), namely as equimolar TiVTa and TiVTaNb alloys, and $TiVTa_{50}$ alloy with Ta content increased to 50%. It is found that the vacancy formation and migration in TiVTaNb alloy are more difficult than that in TiVTa and $TiVTa_{50}$ alloys. The TiVTa alloy has the larger local lattice distortion than $TiVTa_{50}$ and TiVTaNb alloys, which would lead to an irregular energy landscape and make it easier to form vacancies. Vacancies are easily formed in Ti-rich environments and the trend reverses for in V-rich environments in these three alloys. The addition of Nb enhances the electron interactions between atoms in TiVTaNb alloy. Compared to TiVTa and $TiVTa_{50}$ alloys, the migration barrier of atoms diffusing into vacancies in TiVTaNb alloy is improved due to the combination of strong electron interactions between atoms and lattice distortion. These results provide fundamental insights into the defects evolution of CSAs with body-centered cubic (bcc) structure and supply the scientific basis for the composition design of bcc CSAs.

Keywords: Concentrated Solid-Solution Alloy, Vacancy Defects, First-Principal Calculations

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Self-assembled hematite-based core-shell nanostructured arrays as photoanodes for water splitting

Significantly boosting the water splitting performance of the hematite-based photoanodes is highly challenging but desirable for realizing their practical applications. Self-assembly of water oxidation catalysts on hematite to form core-shell structures could be a promising strategy. Our group has previously developed various effective WOR catalysts and demonstrated their applications for electrochemical water splitting. We have also fabricated various TiO_2 and ZnO-based composite photoanodes for enhanced photoelectrochemical (PEC) water splitting utilizing the effects of sensitizers and n-p heterojunctions. Based on these achievements, we are recently exploring the self-assembly of hematite-based core-shell heteronanostructured array for PEC water splitting. In this presentation, I will introduce our work on the design, self-assembly, PEC water splitting applications, and enhancement mechanism of the hematite-based core-shell nanostructured arrays. This study could not only provide novel strategies for developing highly efficient hematite-based photoanodes for water splitting, but shed light on the mechanism for self-assembly and for synergistic effects of the core-shell structures, which can be further extended for broad applications in the fields such as sensing, energy, and environment.

Audience Take Away:

- The audience will learn new approaches to prepare core-shell nanostructured arrays
- The audience will learn design principles for obtaining high-performance hematite-based photoanodes for waters splitting
- This study will provide scientific insights into mechanisms for self-assembly and for high photoelectrochemical water oxidation performance

Biography:

Prof. Yuan receive his Ph. D degree from Nanyang Technological University, Singapore, and now he works in Zhejiang University, China as an Associate Professor. His research is focused on molecular/nanoscale self-assembly and its applications in energy conversion and storage, including electrochemical/photoelectrochemical water splitting and fuel cells. He has published over 90 high-quality papers (with an h-index of 32), among which over 50 are first or corresponding-authored, 12 are published in journals with impact factors >12.

A S Gouralnik[1]*, I M Chernev[1], Eugene Yu Subbotin[1], A G Kozlov[2], A V Gerasimenko[3]

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[2]Far East Federal University, Vladivostok, Russia

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Mg_2Si film growth paradigm: How and Why. Perfect Mg_2Si films for light and heat conversion into electricity

The narrow band silicide Mg_2Si attracts attention of researchers because it has good perspectives for applications in solar cells and thermoelectric elements, consists of ecologic, abundant and rather cheap components. However, the UHV synthesis of Mg_2Si films on Si surface is problematic: at low T magnesium does not intermix with Si but at high temperatures (HT) the deposited Mg re-evaporates without formation of the film. Basing on the analysis of the deposition kinetics and Mg-Si convex hull, we explain how and why Mg_2Si can be grown on Si at HT. The films obtained by ultra-fast (pulse-type) deposition at T ≈ 400 °C have the best to date quality.

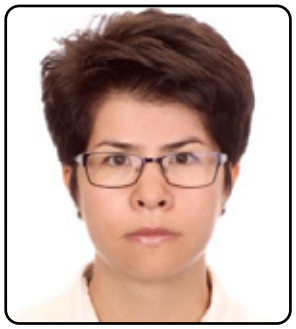
In addition, we demonstrate the rational method of investigation of various temperature-dependent processes on surface or interface. If the sample has a wedge-shaped temperature distribution on the surface, the processes can be studied in the whole T range simultaneously, in a single experiment. Thus, the number of experiments necessary for achieving the result can be radically reduced. As an example, we demonstrate that for the deposition rate of ~ 10000 nm per second the Mg_2Si film forms only on the sample area where T < 484 °C. The mean residence time of a Mg atom on Si(111) at 480 °C is estimated as ~ 10^{-6} s. The approach used in our experiments can be suitable for investigations of many T-dependent processes in other systems.

Audience Take Away:

- Analyses of ab initio calculated convex hull can be useful for creating perspective experimental paradigms and technological approaches
- The delivered simple method of ultra-fast (pulsed) deposition makes it possible to deposit highly volatile elements on Si surface at high temperatures. Moreover, such films can have better crystal quality
- The demonstrated method of ultra-fast deposition of Mg onto a Si sample with a temperature gradient immediately yields the precise T limit above which the film does not grow at such deposition rate
- The paradigm of samples with T gradient can be widely used for studying various temperature-dependent processes on surfaces and interfaces. It allows radical reducing of the time and resources consumed for obtaining the necessary result

Biography:

Alexander Gouralnik studied physics in Leningrad (St. Petersburg) State University, Russia, and graduated as MS in 1976. He then joined the research Laboratory of Microstructure Control Growth at the Institute of Automation and Control Processes, Far East Branch of the Russian Academy of Sciences (IACP FEB RAS). Now he is studying optics and electro-physics of silicide films and nanostructures on the Si surface. He has published more than 30 research articles in SCOPUS and WOS journals.



Yuliya Bespalko[1]*, Dinara Altynbekova[2], Konstantin Valeev[1], Mikhail Simonov[1], Vladislav Sadykov[1]

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Simple approaches to the fabrication of materials (oxides, alloys, nanocomposites) using supercritical isopropanol

Rare-earth orthoniobates are compounds with high stability in H_2O- and CO_2-containing atmospheres and perspective proton conductivity can be used as promising materials for creating membranes, fuel cells, etc. Many efforts have been made to improve the conductivity of orthoniobates by doping in A- and B- sublattice. Another way to increase the conductivity and stability of proton-conducting membrane materials is the creation of nanocomposites containing both complex oxides and metals or alloys. Introduction metal component into the composite provides mechanical strength high electronic conductivity which to avoid permeation limiting by coupled electron-proton transport across the membrane.

Lanthanum orthoniobates , alloys (Ni-Co, Ni-Cu, Co-Cu, Ni-Cu-Ag) and nanocomposites were synthesized by the solvothermal method in an alcohol medium. The synthesis was carried in a flow reactor out at parameters exceeding the critical ones for isopropanol. For the first time, $La_{0.99}Ca_{0.01}NbO_{4-\delta}$ and nanocomposites with NiCu and NiCo nanoparticles were synthesized using alcohol solutions of salts of the corresponding metals. This method allows us to obtain single-phase complex oxides of $La_{0.99}Ca_{0.01}NbO_{4-\delta}$. Nanocomposites were obtained by two methods: one-pot synthesis and mechanical mixing of the oxides in isopropanol with surfactants.

Calcined powders and gastight pellets of orthoniobates and nanocomposites were characterized by X-ray phase analysis, SEM, TEM. Transport characteristics were investigated by Van der Pauw techniques varying measurements temperature in wet H_2 atmosphere. High-density ceramics by sintering of powders at 1100 ◦C using the hot pressure technique were developed and nanocomposite show high electronic and ionic conductivity. Their total electrical conductivity is high, up to 10^{-3} S/cm.

Audience Take Away:

- Listeners will learn about the universal, environmentally friendly method of obtaining various types of materials

Biography:

Dr. Bespalko graduated as MS in 2002 Chemical Faculty of Tomsk State University. Then she joined the research group o Prof. Sadykov at the Laboratory of Catalysts of Deep Oxidation, Boreskov Institute of Catalysis, Russia. She received her PhD degree in chemistry (kinetics and catalysis) in 2008 at the same institution. Now she continues to work in Boreskov Institute of Catalysis and since 2021 teaching at the Faculty of Physics at Novosibirsk State University. She has published more than 60 research articles in SCI(E) journals. She is the member of American Ceramic Society.

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Utilization of untreated acacia caesia fiber particle as novel filler in natural rubber

In latest years, natural based fibers own a significant position worldwide. The target of utilizing natural based fibers is to be biodegradable, low cost, simple to acquire and on the similar time gliding strength to weight ratio. This work focuses on the use of powder obtained from Acacia Caesia fibers as filler in natural rubber. This Acacia, commonly known as the wattles or acacias, is a large genus of shrubs and trees in the subfamily Mimosoideae of the pea family Fabaceae. Acacia caesia fiber particle (powder) is widely available and is used for ayurvedic medicine purposes to reduce the skin issues, and therefore in the wider context of cosmetics. The acacia caesia fiber particles were extracted from the untreated acacia caesia fiber by ball milling process and the particle size distribution was characterized by particle analyzer (Shimadzu SALD – 2300), and also Fourier-Transform Infrared Spectroscopy (FTIR) analysis measures a sample's absorbance of infrared light at various wave lengths to determine the material's functional groups of composition. Untreated acacia caesia fiber particle–natural rubber composites were prepared by two roll mill-mixing technique and developed a composite sheet by compression moulding method. The Monsanto Rheometer is used to determine the composites' processing characteristics and curing behaviour. The technological performance of mechanical and hardness characterization carried out using various amount of filler weight content, namely 3.33, 5, 6.67, 8.33 and 10% of acacia caesia fiber particles reinforced with natural rubber composites, were determined as per ASTM standards. From this work, it was found that the 3.3wt. % samples showed better tensile strength, slight improvement in tear strength was offered by 10wt. % ones, and the best hardness was yielded by the introduction of 8.33 wt. %. In order to determine the failure criteria, composite tensile fracture surfaces were studied using scanning electron microscopy (SEM). Based on the results, it's clear that the Acacia caesia fibre particle could be used in the future to strengthen green composites.

Keywords: untreated acacia caesia fiber particles, particle size, natural rubber, two roll mill, mechanical properties, hardness, sem.

Biography:

I am working as an Associate Professor in Dilkap Research Institute of Engineering and Management Studies at Maharashtra as well as working a researcher at Kalasalingam Academy of Research and Education, Srivilliputhur, Tamilnadu. I have published many articles in reputed International journals, books and book chapters in the research field of Natural fiber reinforced polymer composites and Elastomer (Rubber) composites

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Hierarchical 2D and 1D transition metal sulfide nanostructures for energy storage application

The ever-growing demand for energy resources, depletion of conventional energy resources, and the constant rise in global warming have driven scientists to move towards carbon-free energy storage systems. Supercapacitors and batteries are some electrochemical energy storage (EES) devices essential in storing clean energy. The latest advances made with EES devices, especially supercapacitors' high power density values, have created a paradigm shift in our society's usage of advanced electronic gadgets. Transition metal sulfides with two-dimensional layered structures (MoS_2) and a one-dimensional chain-like structure (VS_4) with intriguing physical and chemical properties are ideal for supercapacitors. However, these materials' morphology, surface area, porosity, pore sizes, and functionality must be fine-tuned to attain many folds in their storage capacity. Here, we discuss the strategies that have been carried out to achieve high-performance hierarchical 1D or 2D nanomaterials. The nanostructures were systematically analyzed for their physicochemical and electrochemical properties. These electrodes deliver excellent cycling performance with high-capacity retention. The cyclic voltammetry studies indicate that MoS_2 and VS_4 nanomaterials follow pseudo capacitance behavior rather than electrochemical double layer capacitance nature. In addition, the capacity values are highly dependent on the nanomaterials' morphology, surface area, and porosity values. Energy and power density values of as high as 94Wh/Kg and 400K/kg, respectively, have been obtained for the 1D VS4 with excellent cycling stability up to 10000 cycles in a symmetric solid state device configuration, promising it to be a high potential candidate for the future energy storage devices. The work presented here also could widen the application of these sulfide nanomaterials to many flexible thin film devices.

Audience Take Away:

- From this talk, the audience would be able to learn the crystal structure of Transition metal chalcogenides and their charge storage mechanism as electrodes for supercapacitors. The various strategies followed in synthesizing/ designing the hierarchical nanomaterials can be explored for their material of interest
- This presentation would provide an idea of the requirements of EES systems and their types
- Synthesis and material activation methods can be extended to achieve different classes of materials with high surface area
- The knowledge acquired from various electrochemical measurements would help teach and understand their material's energy storage capacity

Biography:

Dr. Helen Annal Therese is a Professor in the Department of Chemistry, SRM Institute of Science and Technology, Kattankulathur, Chennai, India. Priorly, she was a post-doctoral fellow in the research group of Prof. W. Tremel, Institute of Inorganic and Analytical Chemistry, Johannes Gutenberg University Mainz, Germany. She joined Prof. P. V. Kamath's research group, Department of Chemistry, Bangalore University, Bangalore, for her Ph.D. and received her degree in the year of 1999. Currently, she is doing her research on materials for electrochemical energy storage devices. She has published more than 70 research articles in many reputed journals.

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Physical, chemical and mechanical characterization of Natural Bark Fibres (NBFs) reinforced polymer composites

Fibers extracted from bark, which are normally by-products if not waste from other sectors using bark, especially to extract chemicals, or discard it, are receiving massive attention in the last few years. Therefore, chemical composition (cellulose, hemicellulose, and lignin content), thermal degradation, and mechanical characterization studies are increasingly carried out, also in view of their potential application as short random fibers in polymer composites. This study aims at reviewing the current state of studies, trying to elicit which bark fibers might be most promising amongst the potentially enormous number of these. These could be tested for the purpose of further use, also in competition with other expressly produced fibers not from bark, in the production of composites.

Biography:

I am working as an Associate Professor in Dilkap Research Institute of Engineering and Management Studies at Maharashtra as well as working a researcher at Kalasalingam Academy of Research and Education, Srivilliputhur, Tamilnadu. I have published many articles in reputed International journals, books and book chapters in the research field of Natural fiber reinforced polymer composites and Elastomer (Rubber) composites

R K Dwivedi

[1]Department of Physics, Materials Science, Engineering, Jaypee Institute of Information Technology, Noida, Uttar Pradesh, India

Compositionally driven polarization and structural transitions in PZT substituted $BiFeO_3$ ceramics

In recent years, $BiFeO_3$ has shown fascinating properties due to its multistage data storage characteristics and PbZrTiO3 is already known to be one of the best piezoelectric materials so far. In view of this, an effort has been made to synthesize solid solution formation between $PbZr_{0.52}Ti_{0.48}O_3$ (PZT) and $BiFeO_3$ (BFO). X-ray diffraction studies have revealed the solid solution formation over the entire range of compositions with the intermediate structural phase transitions from Rhombohedral (R_{3C}) for x = 0.0 to 0.10, Monoclinic (C_C) for x = 0.20 to 0.40, Monoclinic (C_m) for x = 0.50 to 0.70, co-existence of Monoclinic and Tetragonal (C_m+P_{4mm}) for x = 0.70 to 0.90 and Tetragonal for x = 1.0. It is further envisaged that with substitution of PZT, the polarization vector P_s oriented along <111> for x = 0.0 (R_{3C} symmetry), rotates along <100> direction (P4mm symmetry) for x = 1.0 via <110> direction for intermediate values of x i.e. monoclinic phases of C_c and C_m types. Dielectric constant vs temperature plots have shown multiple anomalies at different temperatures with increasing x. The low temperature anomalies are found to occur due to complex defect dipoles formation in these materials and high temperature anomaly is attributed to the intrinsic characteristic of the end members. Dielectric constant has been found to increase and dielectric loss has been found to be decreased with increasing x. A significant decrease in current density with x within the applied electric field up to 4kV/cm has witnessed reduced losses in these materials. Remanent polarization has been found to increase with x, however, remanent magnetization increases with x up to x = 0.30 and thereafter decreases. The decrease in magnetization beyond x = 0.30 may be attributed to the annihilation of spiral spin structure of BFO due to foreign element of d^o character at Fe sites in BFO.

Audience Take Away:

- Concept of polarization rotation with structural changes. Structure and property correlation in multiferroics
- Faculty can learn to use the concept to carryforward the research in this. Since work is pure experimental, so it is a practical solution for them. It may definitely help in designing new problems

Biography:

Dr. R.K. Dwivedi did M. Tech. in Materials Technology in 1994 followed by Ph.D. in Materials Science and Technology in 1999 from Indian Institute of Technology Banaras Hindu University, India. After completing Ph.D., Dr. Dwivedi joined the group of Prof. D. Bahadur, as a post doct fellow in the Department of Metallurgical Engineering and Materials Science, IIT Bombay India. Dr. Dwivedi has joined JIIT Noida India as a faculty in 2005. He has published more than 80 quality papers and has delivered more than two dozen talks in national and international conferences.

Uroosa Ejaz

[1]Department of Biosciences, Shaheed Zulfikar Ali Bhutto Institute of Science and Technology, Karachi, Pakistan

Utilization of halophytic plants for the formation of biodegradable plastic

Every piece of plastic that's ever been created still exists in our world. Plastic pollution poses a significant threat to our environment. Therefore, now there is a focus on formation of biodegradable plastic. As biodegradable products break down naturally, they eventually decompose and are consumed by soil and other natural components. Currently, fruits and vegetables waste are used for the formation of biodegradable plastic. Therefore, growing demand for bioplastics creates competition for food sources. On the other hand, saline soils occupied more than 20% of the world's irrigated area by the mid-1990s. Due to edaphic factors, agricultural land is also converting into saline land and causing depletion of fertile land; coastal and arid areas are under prone zones. Hence, there is need to use saline wasteland to complete future demands of increasing population. Looking the current scenario, it has become very essential to resolve this issue by identifying crops which can grow on wasteland without compromising end product. Halophytes are salt loving plants and grow on high total dissolve solids. The halophytic plants are not currently utilized for any other commercial product and are native to coastal areas of Karachi. Therefore, these plants can be targeted for the formation of biodegradable plastic. In this study, biodegradable plastic was formed using the halophytic plants, *Phragmites karka, Cressa cretic*a and *Saudea fructicosa*. Plastic formed by using halophytic plants was found to be biodegradable in soil. Biodegradable plastic formation using the cell wall components such as lignin, hemicellulose, and cellulose extracted from halophytic plants has the potential to become a sustainable source in future for the formation of biodegradable plastic replacing currently used food sources such as fruits.

Audience Take Away:

- The weathering of plastics results in formation of microplastics which are now being detected in the snow of remote areas such as Antarctica region and in the guts of fishes. It is an alarming situation and must be solved by replacing it with sustainable biodegradable plastic which completely degrades in the soil. Moreover, the biodegradable plastic currently is made by using fruits, however, switching to a reed grass for the production of biodegradable plastic is more feasible in future
- Biodegradable plastic is non-toxic since they have no chemicals or toxins. Recycling helps to lessen landfill problems, and besides, the recycled bio-waste can be used as compost or as renewable energy for biogas
- Extraction of cell wall components such as lignin, hemicellulose and cellulose from the three common halophytic plant species namely *Phragmites karka*, *Cressa cretica* and *Saudea fructicosa*. Plastic formed by using halophytic plant components can easily be degraded by soil microorganisms and will also help in improving the fertility of soil
- Audience will learn about the usage of halophytic plants for the formation of biodegradable plastic

Biography:

Uroosa Ejaz is a highly motivated researcher with a MPhil in Microbiology and over 06 years of research experience. She has published 18 research articles in well reputed International Journals and also wrote 05 book chapters sponsored by Springer and Elsevier. She has work experience from Agha Khan University and Hospital, Patel Hospital, Bahria University and University of Karachi. She also worked as a research assistant in HEC funded NRPU project. Currently, she is serving as a Lecturer at SZABIST and she is also a PhD scholar in University of Karachi, Pakistan.

Seongwoo Woo

[1] Manufacturing Technology, Mechanical Technology Faculty, Ethiopian Technical University, Addis Ababa PO box, Ethiopia

Improving the reliability design of mechanical systems such as refrigerator

To enhance the lifetime of mechanical system such as automobile, new reliability methodology – parametric Accelerated Life Testing (ALT) – suggests to produce the reliability quantitative (RQ) specifications—mission cycle—for identifying the design defects and modifying them. It incorporates: (1) a parametric ALT plan formed on system BX lifetime that will be X percent of the cumulated failure, (2) a load examination for ALT, (3) a customized parametric ALTs with the design alternatives, and (4) an assessment if the system design(s) fulfil the objective BX lifetime. So we suggest a BX life concept, life-stress (LS) model with a new effort idea, accelerated factor, and sample size equation. This new parametric ALT should help an engineer to discover the missing design parameters of the mechanical system influencing reliability in the design process. As the improper designs are experimentally identified, the mechanical system can recognize the reliability as computed by the growth in lifetime, LB, and the decrease in failure rate. Consequently, companies can escape recalls due to the product failures from the marketplace. As an experiment instance, two cases were investigated: 1) problematic reciprocating compressors in the French-door refrigerators returned from the marketplace and 2) the redesign of hinge kit system (HKS) in a domestic refrigerator. After a customized parametric ALT, the mechanical systems such as compressor and HKS with design alternatives were anticipated to fulfill the lifetime – B1 life 10 year

Audience Take Away:

- Parametric Accelerated Life Testing (ALT) for design alterations
- Quantum/transport based generalized life-stress (LS) model
- Sample size formulation for generating reliability quantitative (RQ) specifications

Biography:

Dr Woo has a BS and MS in Mechanical Engineering, and he has obtained PhD in Mechanical Engineering from Texas A&M. He majors in energy system such as HVAC and its heat transfer, optimal design and control of refrigerator, reliability design of thermal components, and failure Analysis of thermal components in marketplace using the Non-destructive such as SEM & XRAY. In 1992.03–1997 he worked in Agency for Defense Development, Chinhae, South Korea, where he has researcher in charge of Development of Naval weapon System. He was working as a Senior Reliability Engineer in Refrigerator Division, Digital Appliance, SAMSUNG Electronics. Now he is working as associate professor in mechanical department, Ethiopian Technical University.

Ahmed F Hasan
College of Engineering, University of Diyala, Diyala, Iraq

Using CFD code in materials engineering

In the present scenario many important features during the materials processing or application such welding process or phase change materials used in energy storage unit could not be captured and it is difficult to understand the physics of the process and many phenomena by experimental study alone. Generally, there are three types of process modelling techniques that have been used to investigate and analysis the materials behaviour in many processing process, which are solid mechanics models, Computational Fluid Dynamics (CFD) models and analytical models. In this presentation some important results obtained by the author will discussed which in include melting of the phase change materials utilized in energy storage unit. Flow behaviour during friction stir welding will be addressed.

Audience Take Away:

- Process modelling techniques that have been used to analysis the materials behaviour in some process
- How to deal with the industrial problem in order to simulate the process
- The outcome of this shows the ability to predict and interpret the behaviour of the materials using specific parameters and component geometry without the need for experimental trials; which will provide new information to assist in a design problem

Biography:

Associated professor. Ahmed Falh Hasan has B.Sc and M.Sc in metallurgy engineering from the university of technology Baghdad, Iraq; in 1999 and 2002 correspondingly. In 2016 Ahmed has a PhD in material design and material engineering from the University of Nottingham UK-England. My research covers two main themes: Friction Stir Welding 'FSW', experimental and simulation Tool wear modelling I am also work with high viscous flow behaviour modelling using Computational fluid dynamics 'CFD'. Process modelling using CFD code is the main interest. he has published more than 20 research articles in many journals.

Saman Momeni
Sharif University of Technology, Tehran, Iran

An investigation of material effects on the dynamic behavior of composite materials incorporated with MR-fluid using an N-layer model

Laminated composite beams incorporated with magneto-rheological fluids (MR- laminated-beam) are being widely used in many engineering applications. The effect of base materials on dynamic response of MR-laminated-beams were investigated using an *N*-layer- model based on layerwise-theory-(*NLWT*). Different composite materials including E-glass, fiber-carbon and Kevlar have been considered to determine the vibration response of the structures. Accuracy of *NLWT* has been verified by comparing the results with first-order- shear-deformation-theory-(FSDT) and experimental-tests. By applying magnetic fields, natural-frequencies of MR-laminated-beams have been increased. It is concluded that, applying1400-Gauss magnetic fields to low-cost materials like E-glass provides the same natural- frequency as fiber-carbon without magnetic fields.

Biography:

Dr. Momeni received his Ph.D., M.Sc., and B.Sc. in Mechanical Engineering fromSharif University of Technology, Iran. He has published several research articles in peer- reviewed journal conferences and he has taught several courses at Universities at Post-graduateand undergraduate levels. As a professional engineer, Dr. Momeni has extensive experience inmechanical engineering including oil and gas.

Oana Gingu[1]*, Gabriela Sima[1], Cristina Teisanu[1], Daniela Coman[1], Leonard Ciurezu[1], Vasile Iulian Antoniac[2], Felix Brehar[3], Horia Manolea[4], Vlad Georgeanu[3,5]

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Biocomposites for the bone reconstruction – current approaches and future trends in research, applications and education

The need for permanent improvement of everyday life derives its essence from education and research, with applications in various fields. The hard tissue engineering represents one of the envisaged fields and the medical doctors always claim advanced solutions to adapt to the patients' needs and demands. This paper is focusing on the biocomposite materials as potential alloplastic grafts. The state of the art in this domain is intertwined with the experimental results obtained by our research group and the partners from the consortia with whom we have worked for over 10 years. Our research product is a biocomposite material made of nanostructured ceramic matrix reinforced by micrometric Ti-based component. The main application is the bone reconstruction/addition at skull, maxillo-facial and orthopaedics level. The main goal of our research is to design and lab-scale produce such biocomposite materials fulfilling important demands, such as: to have similar structural architecture as the adjacent natural bone, respectively close mechanical properties; to be able to fit any bone geometry defect without damaging the surrounding natural bone; to have an improved biocompatibility vs. the existing similar materials/products. The powder metallurgy technology allows us, among other advantages, to perform the innovative combination of the hydroxyapatite (HA), as nanoparticles playing the matrix role, with TiH_2 as micrometric reinforcing powder particles. Especially the sintering thermal treatments, respectively the spark plasma sintering (SPS) and two steps sintering (TSS), offer the proper conditions to keep the "nano"- feature of the biocomposites. A new concept named "foaming window" [1] was developed for the TSS treatment which is able to monitor the pores' and the crystallin grains' size, both parameters being tightly related with the biocompatibility one. From the characterisation point of view, advanced methods are used to highlight the thermophysical, chemical, morphological, structural and mechanical properties of the obtained biocomposites. The biocompatibility of these biocomposites was tested by in-vitro and in-vivo specific analysis and the obtained results are more than satisfactory. One important aspect is marked by the biocomposites' capacity to transfer various drugs, targeting disease curing or human body organs recovery. Future expectations, from our point of view, is to make these biocomposites "smarter" and highly versatile for different medical applications. Also, for further research in this area we expect to develop dedicated policies and instruments to raise the interest of the public/private companies for the medical devices used for bone reconstruction, considering the advantageous economical aspects that these HA/Ti-based biocomposites present. Assuredly, all these outcomes are also possible involving more students and young researchers representing our future for whose formation we are responsible to design new education and research tools adapted to present days.

Audience Take Away:

- The well-known biocomposite system HA/Ti-based is still new because it is continuing offering large capabilities to improve the quality of the medical devices dedicated for the bone reconstruction/addition applications, depending on the use of the most advanced processing technologies
- The manufacturing companies and their specialists may learn that the processing logistics is affordable, using conventional equipment specific to the powder metallurgy technology, with cost and energy savings
- The medical doctors and/or researchers in the medical field will have the possibility to find details on the improved performances of these biocomposites such as: resorbability, geometrical stability, geometrical adjustments even during the grafting procedure, increased lifetime, large potential to evaluate the osseointegration process due to their translucence to the radiations, minimized risk to affect the body fluids with the biocomposite debris
- Also, the above-mentioned audience will see that these biocomposites may have complex shape and dimensional design. Thus, the potential alloplastic grafts made of these biocomposites may be produced as different product: bulk (for medium-sized applications, around 10 cm^2 as cross section); granules (i.e., for bone addition); thin films (from few microns up to few nanometers to coat current similar medical devices and subsequently to improve their properties)
- The education and research attendance could discover opportunities to create new jobs tightly connected to the Materials Science and Engineering applied in the Tissue Engineering field
- The Artificial Intelligence' (AI) representatives will discover that they could redirect their capabilities to a new frontier, such as the development of new non-invasive methods for evaluating the osseointegration process. This great advantage is due to the translucency of the HA/Ti-based biocomposites
- The specialists in augmented/virtual reality (AR/VR) also may find new opportunity to train the Tissue Engineering and Medicine students and researchers to work together in designing and testing new medical devices made of advanced materials regarding their new functionalities as well as capabilities

Biography:

Prof. Oana Gingu studied the Mechanical Engineering at the University of Craiova (UCV), Romania and graduated as licensed engineer in 1991. In 2000 she defended her Ph.D. thesis at the Technical University of Cluj-Napoca, under the supervision of Prof. Radu Orban, in the field of Materials Science and Engineering. She got specialization in "Nanosciences and Nanotechnologies" (2005, CNRS, France) and "Nanocomposite ceramic materials" (2009, CSIC, Spain). Since 2016 she is coordinating the scientific research department at UCV, connected with Romanian Office for Science and Technology (Brussels). She published more than 100 scientific papers in well-known journals.

Fermin Ak and Bayram Gündüz*
Department of Opticians, Malatya Turgut Özal University, Malatya, Turkey

Importance and future of optoelectronic materials science and engineering in interdisciplinary science fields

Engineering is an indispensable technology that forms the basis of every industry and social life today. The engineering of materials, that is, device performance, is as important as the performance of the materials. Basic science and creation of new nanotechnology related to electronic and optoelectronic materials such as insulators, semiconductors, dielectric materials, conductors, magnetic materials and superconductors, production of high efficiency optoelectronic devices is constantly being studied for current and future technologies. In terms of science and technology, engineering continues to develop broadly and interdisciplinary. In this talk, we will first talk about Optoelectronic Materials and especially efficient optoelectronic materials. Afterwards, we will discuss the importance of materials science and the point it has reached in the literature in detail. In the following, we will consider the relationship of efficient materials with engineering. In the next step, we will talk about the place, necessity and importance of synthesis, characterization and properties of materials in interdisciplinary science fields. Finally, we will explain and discuss the future of optoelectronic materials with examples from our own work at the scale of engineering and for interdisciplinary sciences.

Audience Take Away:

- It will raise awareness about the classification of optoelectronic materials
- By emphasizing the role of materials science and engineering in material and device performance, participants will be guided towards interdisciplinary collaboration
- The contributions of materials science and engineering to high efficiency device performances will be clearly presented

Biography:

Dr. Bayram Gunduz received his bachelor's degree in Physics from Firat University, Elazig, Turkey, 2001–2005, master degree from Solid State Physics, Firat University, 2005–2007, PhD degree from Solid State Physics, Firat University, 2007–2011. He was the First of the Physics Department for 8 consecutive terms (4 years) and completed the Physics Department as the FIRST of the DEPARTMENT. He was research assistant in Solid State Physics, Mus Alparslan University, Turkey, 2009–2011 and was Assist. Prof. Dr. in Department of Science Education, Mus Alparslan University, 2011–2017. He was an Assoc. Prof. Dr. in the same department and university, 2017-2019. He is currently an Assoc. Prof. Dr. in Malatya Turgut Özal University, since November 2019. By October 2022, he will also have received the Full Professor Title. His main achievements include organic semiconductors and optoelectronic materials: (i) electrical, optical, photonic and optoelectronic properties; (ii) fabrication of electronic and optoelectronic devices and and investigation their photophysical properties and applications such as Schottky diode, P–N heterojunction diode, metal–insulator–semiconductor junctions, solar cells, thin-film transistor, photodiode. (B) He has many articles (more than 75) published in SCI, SCI-Exp journals, which have high impact factors and has about 1000 citations to his studies.

Hasan Koten
Istanbul Medeniyet University, Mechanical Engineering Department, Istanbul, Turkey

Time-dependent corrosion resistance investigation of hydrophobic magnesium alloys

In this study, the corrosion resistance of AZ31B magnesium alloy was 2 evaluated against time. Because of its sensitivity to corrosion, AZ31B magne3 sium alloy was chosen to be coated with elephoretic coating method. With the 4 electrophoretic coating method, it is possible to coat the alloy surfaces practically 5 with biocompatible materials in one step. The characterization of the alloy surfaces 6 has been changed in order to eliminate the susceptibility of magnesium to corro7 sion. Surface characterization has been made superhydrophobic and hydrophobic by 8 coating the alloys. Stearic acid and magnesium nitart-containing coating materials 9 are aimed to reduce the surface energy of alloys. It has been shown that the corrosion 10 resistance of the surface coated alloys is higher than the uncoated alloy samples. To 11 discuss the authenticity of the thesis, it was observed for the first time that AZ31B 12 alloys were kept in corrosive liquids for a long time and preserved their hydrophobic 13 properties thanks to the coating. Since AZ31B alloy is used as a bio-implant raw 14 material, corrosion has been evaluated for the first time in an environment simulating 15 body conditions. Coated AZ31B samples have been shown to retain their stabiliza16 tion in DMEM for approximately one month. It has been shown that K.10AZ31B and 17 K.12AZ31B alloys taken as coating samples have superhydrophobic surface charac18 terization, and K.8AZ31B and K.D.10AZ31B samples are hydrophobic coated. For 19 the first time, AZ31B samples were coated at these concentrations. It has been shown 20 that the coating samples were made successfully and the coatings continued for a 21 long time both in 3.5% NaCl environment and in DMEM containing antibiotics.

Biography:

Assoc. Prof. Hasan KOTEN graduated from Mechanical Engineering Department with honor of degree in 2007. At the same time, he received a BSc degree in Electrical and Electronics Engineering Department as a double major. Hasan KOTEN worked in the first full geometry engine design project for The Scientific and Technological Research Council of Turkey (TUBITAK). During his Ph.D., he worked as a visiting scholar at the Ohio State University Center for Automotive Research (CAR). Hasan KÖTEN also worked as a consultant for TUBITAK Domestic Electric Vehicle Design project in 2017. He attended to CEDP group at Brunel University as a post-doctorate researcher in 2018. He leaded number of projects, MSc and PhD thesis in this combustion field. He attended and presented more than 100 conference proceedings and published about 50 articles indexed in SCI and SCI-e. He is awarded by TUBITAK 2238 programme with first degree over all national PhD thesis applications. Assoc. Dr. Hasan KÖTEN is still working at the mechanical engineering department of Istanbul Medeniyet University. Currently, He is working at Turkey's largest TÜBİTAK budgeted 2400HP 16 and 8-cylinder engine production project.

Hasan Koten
Istanbul Medeniyet University, Mechanical Engineering Department, Istanbul, Turkey

Hydraulic performance of a centrifugal pump and hydrophobic surface effects

Increasing amounts of consumption led people make technological improvements about energy efficiency. One of these improvements which is called biomimicry, which imitates structures and systems at nature, can be applied in various areas where decrease of energy losses are desired. It is mostly believed that decreasing sand grain roughness on surfaces decreases friction losses that can be obtained from low surface energy. This case can be seen at leaves of Lotus (N. nucifera) which shows hydrophobic properties on its surfaces. In this study, efficiency of pump and its characteristics are examined with CFD methods and performance tests. Inner surfaces of volute and impeller itself are coated to gain features of hydrophobic surfaces. Characterization of hydrophobic surfaces in flow simulations are validated with comparison of test results. To investigate the influence of low energy surfaces on hydrophobic coating, closed-loop tests are conducted using relevant measurement techniques as per international standards. made with necessary equipment. Results show that performance curves of the pump has been improved and efficiency of the pump is increased by 8.3% at its best efficiency point.

Biography:

Assoc. Prof. Hasan KOTEN graduated from Mechanical Engineering Department with honor of degree in 2007. At the same time, he received a BSc degree in Electrical and Electronics Engineering Department as a double major. Hasan KOTEN worked in the first full geometry engine design project for The Scientific and Technological Research Council of Turkey (TUBITAK). During his Ph.D., he worked as a visiting scholar at the Ohio State University Center for Automotive Research (CAR). Hasan KÖTEN also worked as a consultant for TUBITAK Domestic Electric Vehicle Design project in 2017. He attended to CEDP group at Brunel University as a post-doctorate researcher in 2018. He leaded number of projects, MSc and PhD thesis in this combustion field. He attended and presented more than 100 conference proceedings and published about 50 articles indexed in SCI and SCI-e. He is awarded by TUBITAK 2238 programme with first degree over all national PhD thesis applications. Assoc. Dr. Hasan KÖTEN is still working at the mechanical engineering department of Istanbul Medeniyet University. Currently, He is working at Turkey's largest TÜBİTAK budgeted 2400HP 16 and 8-cylinder engine production project.

Mohammd Hossein Mahdieh*, Ehsan Ahmadinejad
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Production of colloidal Ag-Au alloy nanoparticles by nanosecond laser ablation and influence of DC electric field

The study of nanoparticles (NPs) have been interested within the past decades because of their applications such as nonlinear optics, nano-photonics, electrochemical, biological and fiber sensors. NPs are remarkable due to their controllable electric, magnetic, optical and chemical properties. High surface to volume ratio and quantum size effects of nanostructures cause these properties. In general NPs are produced by chemical and physical methods. Chemical methods are more common and have the advantage of large scale synthesis of NPs, however toxicity, green incompatibility, and undesired radicals and products make these methods unsuitable in compare with physical methods.

Pulse laser ablation in liquids (PLAL) as a physical method has several advantages in compare with chemical methods. In PLAL a target is irradiated by laser pulse in a liquid environment. In this method, a portion of laser pulse energy is absorbed at the target surface and the target material heats up. In such condition the material may get melted, evaporated. Furthermore, when the beam intensity is high enough a plasma plume is formed on the target surface. The material is ablated by these mechanisms and NPs (and micro size particles) are formed in the environment liquid.

In this paper, synthesis of Ag-Au alloy nanoparticles (NPs) by laser post-irradiation is reported. Experimentally, in the first step colloidal of individual Ag and Au NPs were separately produced by nanosecond pulsed laser ablation in distilled water. In the second step an appropriate volume of these colloidal NPs samples was mixed and post-irradiated with the same pulsed laser beam. Finally, the post irradiation was performed in the presence of an eExternal Electric Field (EEF).

The investigation was focused mainly on the size characteristics, optical properties and plasmonic properties of produced colloidal Ag-Au alloy NPs. The synthesized colloidal alloy NPs were characterized using the Scanning Electron Microscopy (SEM) and UV-vis absorption spectroscopy. The results indicated that the EEF can reduce significantly the Ag-Au alloy formation time. The results also show that the wavelength of localize surface plasmon resonance of alloy NPs decreased by applied electric field.

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[2]Gazi University, Faculty of Arts and Sciences, Physics Department, Ankara, Turkey

[3]Université Côte d'Azur, CNRS, CRHEA, Valbonne, France

n-ZnO/p-GaN LED Heterostructure near UV-Blue LED with AlN electron blocking layer

High quality single crystalline n-type ZnO films (~200 nm) were grown on top of AlN/GaN heterostructures using r.f. magnetron sputtering under 25 W, 50 W and 100 W sputtering powers. The AlN and p-type GaN layers were deposited by metalorganic chemical vapor deposition (MOCVD). From X-ray diffraction measurements, the samples exhibited the (0 0 0 *l*) peaks corresponding to both ZnO, GaN and AlN monocrystalline layers. As the sputtering power increased, the grain size increased and the dislocation density decreased. This result is supported by the rms values obtained on the ZnO layers from AFM results. In addition, photoluminescence peaks of ZnO at 372 nm, 375 nm and 380 nm were seen as dependent on the sputtering power. We have used an AlN electron blocking layer between ZnO and GaN films to improve the electroluminescence from the n-ZnO side. Room temperature electroluminescence (EL) of the LEDs demonstrated near UV-blue emission consisting of predominating peaks centred at 405 nm, 390 nm and 380 nm for the device with ZnO deposited at 25 W, 50 W and 100 W sputtering powers, respectively. Moreover, the I-V curves of the LEDs showed a rectifying behavior with 6.8 V, 6.4 V, 5.2 V threshold voltages for 25 W, 50 W and 100W values.

Keywords: zno; nitrides; magnetron sputtering; light emitting diode; etching; mocvd; e-beam evaporation.

Thorsten Becker
Centre for Materials Engineering, University of Cape Town, Cape Town, South Africa

The influence of high-energy process parameters on the prior beta grain structure of additively manufactured titanium alloys

Titanium alpha-beta alloys fabricated by laser-based powder-bed fusion, an additive manufacturing process, present with an undesired martensitic microstructure, high residual stresses, and columnar prior-beta grains. Post-process heat treatments are recommended as an essential step to improve properties such as ductility and fracture toughness; however, they generally do not alter the columnar prior-beta grain structure, as they are below the beta-transis temperature to prevent excessive grain growth. Columnar prior-beta grains have been suggested to cause mechanical anisotropy; it is understood to cause significant anisotropy in ductility, fracture toughness, and fatigue strength. However, the influence of a columnar prior-beta structure, the underlying alpha-beta microstructure, and its influence on anisotropy are not yet well understood. This study investigates the differences in Ti-6Al-4V microstructure produced by laser-based powder bed fusion using a variation in process parameters, the application of above-beta transis temperature heat treatment, and the way the microstructural features control the behaviour of deformation and failure. Microscopy techniques of scanning electron microscopy imaging and backscatter diffraction are used for microstructure characterisation and deformation mode identification. The results identify key crystallographic and morphological features that control slip, microcrack initiation, and final fracture. These are related to anisotropy in mechanical properties.

Audience Take Away:

- Key laser-based powder-bed fusion process parameters that control the prior-beta grain structure in titanium alpha-beta alloys
- The influence of the prior-beta grain structure and underlying alpha-beta structure on anisotropy in mechanical properties of titanium alpha-beta alloys produced using additive manufacturing
- Improvement capabilities and limitations in reducing anisotropy in additively manufactured titanium alpha-beta alloys

Biography:

Thorsten Becker is appointed is the director for the Centre of Materials Engineering at the University of Cape Town. His research interest is in structural integrity: fatigue, fracture, and creep. His work aims to use advanced techniques such as digital image and volume correlation, high-resolution microscopy, and finite element modelling to measure and extract engineering parameters for structural integrity assessments. One of his keen interests lies in the additive manufacturing of metals and high temperature applications.

Promod Kumar*
Department of Physics, University of the Free State, Bloemfontein, Republic of South Africa

Fabrication of plasmonic nanostructures for SERS applications

Plasmonic nanostructures such as Ag, Cu, and Au nanostructures embedded in a dielectric host are promising materials for the various fields of Modern Science and Nanotechnology including optics, photonics, and SERS applications. The Plasmonic Cu nanostructures were embedded in a dielectric glass host by ion-exchange method followed by thermal treatment in an oxidizing atmosphere. The results verified the confirmation of plasmonic nanostructures after thermal heat treatment using UV-Vis absorption spectroscopy, X-ray diffraction (XRD), Transmission Electron Microscopy (TEM), X-Ray photoelectron spectroscopy (XPS), Raman spectroscopy, Time of Flight secondary mass spectroscopy (TOF-SIMS), Z-scan technique, and these nanostructures were further studied for SERS applications. QUASES-Tougaard simulation results confirmed that the plasmonic metals such as Cu atoms formed islands near the surface of the glass matrix. The observed growth mechanism of plasmonic nanostructures was studied using Ostwald's ripening process during the thermal heat treatment. The Wagner plot with modified Auger parameters (MAP) was thoroughly studied for the surface properties of embedded plasmonic nanostructures. Surface-enhanced Raman spectroscopy (SERS) technique was widely used to characterize the plasmonic nanostructures under the influence of thermal treatments and the highest Raman enhancement was observed for substrates with larger particle sizes.

Keywords: surface plasmon resonance, ion exchange, xps, tof- sims, sers.

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Halogen bond cocrystals: Tailoring multiple radiative decay pathways for amplified spontaneous emission

Halogen-bonded cocrystallization of anthracene derivative discussed towards Amplified spontaneous emission (ASE) which is intrinsically associated with lasing applications. Based on our results, we have defined some important guidelines for cocrystallization of organic ASE materials, cocrystals DPYA-BrFB and DPYA-IFB with varied optical features by subtly tailoring halogen bonds from C–Br···N to C–I···N. Noticeably, stronger halogen bond and other short intermolecular contacts in the segregated-stack DPYA-IFB cocrystal account for a lower number of vibration modes with smaller Huang–Rhys factors, thus enhancing remarkably the radiative decay rate up to 4.3×10-2 ns−1 at the ASE band, which is 11.0 times as high as DPYA-BrFB. Due to the higher radiative decay rate, larger radiative decay selectivity together with the lower optical loss coefficient, the DPYA-IFB cocrystal even with PLQY as low as 3.0% features an improved ASE threshold of 22 μJ/c 2, which is 4.7 and 10.1 times as low as those of DPYA and DPYA-BrFB respectively without shifting the wavelength of ASE band significantly. Therefore, the tailor made packing structures and intermolecular interactions of organic chromophores by cocrystallization pave a promsing way to the development of organic ASE or lasing materials by delicately regulating the multiple radiative decay pathways.

Audience Take Away:

- Current results showed how crystal engineering is important in organic materials
- As we know modern electronics, mobiles are basic need for all on daily basis day to day life. The existing materials has lot of issues in efficiency, cost and not eco-friendly. Hence there is a need and huge demand of organic crystals as display materials as well as to construct optoelectronic devices. Indeed, the expert of this current work would be able to find job in modern electronics and materials companies

Biography:

Geetha Bolla is currently a postdoc fellow at Ben-Gurion University, Israel. She was awarded a Ph.D. degree from University of Hyderabad in 2015. She has worked as research fellow ICCAS Beijing (2016–2017), an INDO-US Fellow at Massachusetts Institute of Technology (2017–2018), and at the National University of Singapore (2018-2020). Her research interests are on the design, crystallization, and bioavailability of pharmaceutical cocrystals, organic semiconductors and optoelectronics, heterogeneous nucleation, and smart photo- and thermo-salient materials. The main driving motivation in her research is solid-state chemistry and crystallization mechanisms, and their function in smart bioinspired materials and healthcare products.

Participants List

UPCOMING CONFERENCES

4th Edition of International Conference on
Materials Science and Engineering
March 13-15, 2023 - Singapore | Hybrid Event
https://magnusconferences.com/materials-science/

5th Edition of International Conference on
Materials Science and Engineering
September 25-27, 2023 Valencia, Spain | Hybrid Event
https://materials.magnusconferences.com/

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