25-27

APRIL 2022

VIRTUAL EVENT

4TH EDITION OF

WORLD NANOTECHNOLOGY CONFERENCE

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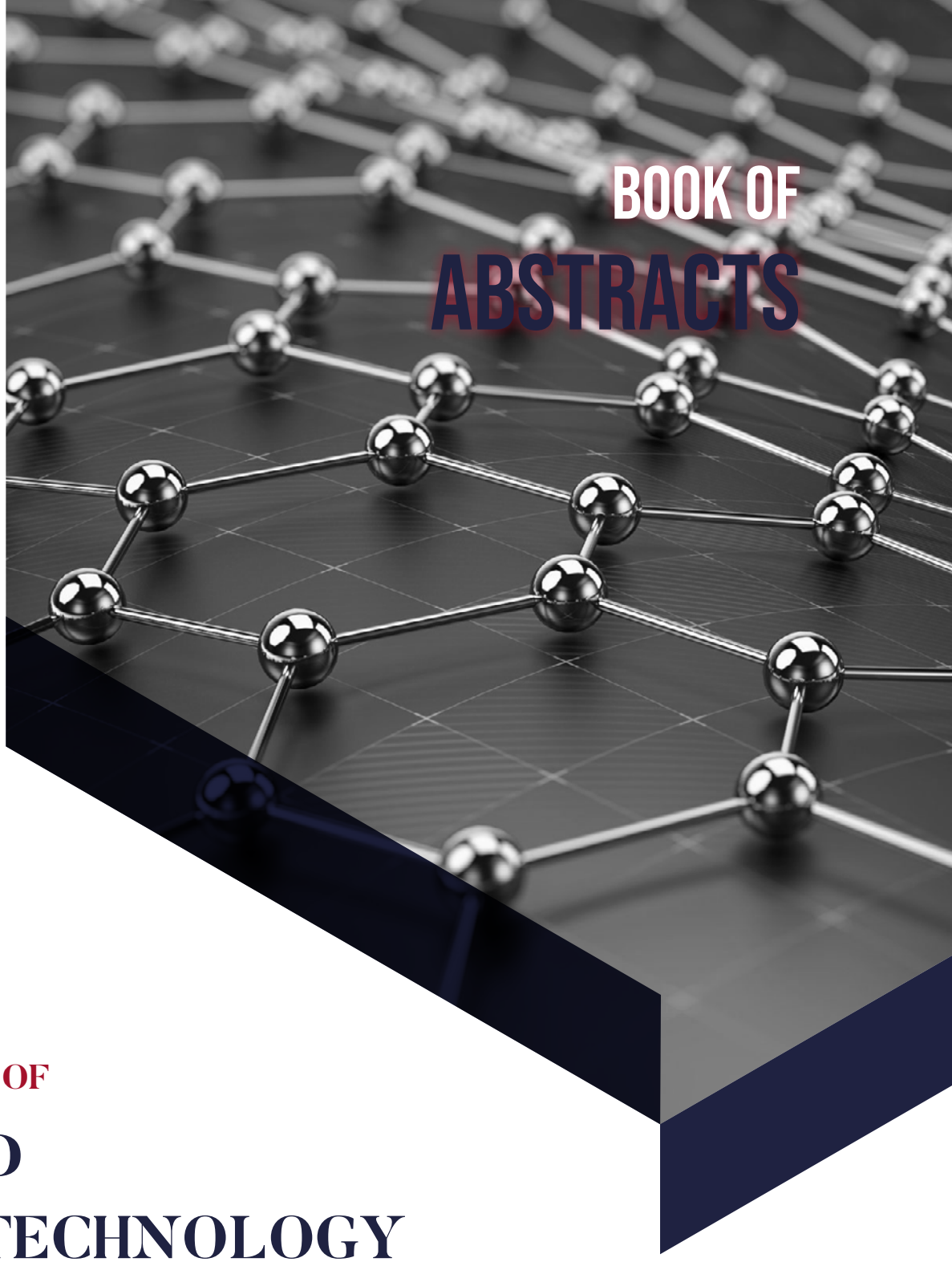

BOOK OF ABSTRACTS

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WORLD NANOTECHNOLOGY CONFERENCE

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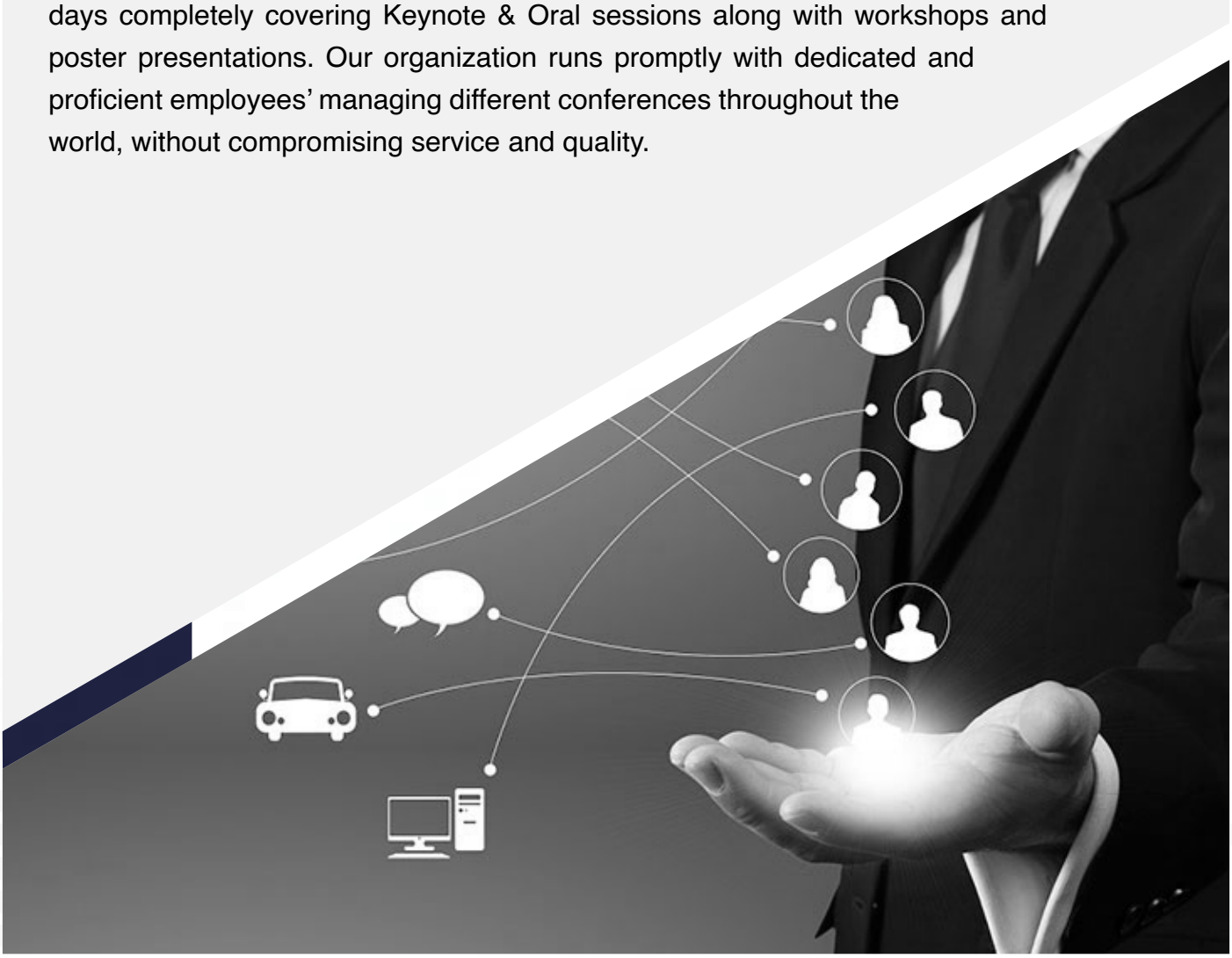
ABOUT MAGNUS GROUP

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 WORLD NANO 2022

World Nano 2022 welcomes members from different parts of the world to join our Online Event - "4th Edition of World Nanotechnology Conference" scheduled during April 25-27, 2022. It includes prompt Keynote presentations, Oral presentations, and Poster presentations, interactive and informal exchanges. This is going to be one of the most remarkable events of the year. Through the theme "*From Micro to Nanotechnology: Advances and Applications in Real World*" conference will explore the advances in the field. World Nano 2022 goal is to bring together bright minds to give talks that are ideas-focused, and on a wide range of scientific sessions, to faster learning inspiration. It will provide an international platform to share expertise, foster collaborations, discover new information, and stay current with trends and networking.

KEYNOTE FORUM

DAY 01

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Petra Perner

FutureLab Artificial Intelligence IBaI-2, Germany

Using signal- and image-interpreting methods to control the production and the quality of nanomaterials

The production and use of nanomaterials require appropriate testing methods for the quality and effectiveness of nanomaterials for use. Signal and image processing methods play an important role in this regard. In molecular imaging, the effectiveness of contrast agents, such as graphene, can be determined by image processing. Microscope image analysis can be used to determine whether the active ingredients dock to the correct cell parts and perform their expected function there or not. Protein crystallization can be monitored with RAMAN spectroscopy and the purity and type of protein can be determined automatically by suitable signal analysis methods. The talk presents the use of automatic image-interpreting systems and methods for molecular imaging and cell image analysis. An automatic RAMAN spectroscopy system and the novel signal interpretation methods are presented. All processes are to be considered generalistic and can be applied to various fields of application for the production of nanomaterials. This allows you to give an overview of the performance and application possibilities of signal- and image-interpreting systems and can stimulate the audience to think about new applications.

What will audience learn from your presentation?

- Learn how signal- and image-interpreting methods can be used to control the production and quality of nanomaterials.
- Tree examples will be given for molecular imaging, cell image analysis and protein crystallization with RAMAN spectroscopy.
- It will stimulate the audience to think about usage for their application.

Biography

Prof. Petra Perner (IAPR Fellow) is the director of the FutureLab Artificial Intelligence IBaI-2. She has been the principal investigator of various national and international research projects. She received several research awards for her research work and has been awarded with 3 business awards for her work on bringing intelligent image interpretation methods and data mining methods into business. Her research interest is image analysis and interpretation, machine learning, data mining, big data, machine learning, image mining and case-based reasoning.

Mindaugas Macernis

Vilnius University, Lithuania

Modeling excited states and raman spectra for carotenoid and their complexes using high performance parallel codes

Natural carotenoids display a large structural diversity and more than 1100 of such molecules have been identified while there are several chlorophyll type molecules only. The simplest model for carotenoids is polyene structure. This model predicts three low-energy excited states according to C_{2h} symmetry. Only the one can be calculated using time-dependent density functional theory which is labelled as second excited state transition. The higher-level ab-initio methods are required such as SAC-CI, EOM-CCSD, CASSCF or others in order to model the other two states. The other challenging factors are computations itself as the higher-level *ab-initio* methods have various limitations for scaling in high performance parallel codes. The main problem is the double excitation type electron correlations which play major part in these states. On the other hand, the allene and alkyne type carotenoids have clear internal charge transfer states in different solvents which modelling is challenging also. The other charge transfer states appear when the carotenoid and chlorophylls molecules are in complexes. The latter states can be predicted by typical time-dependent density functional theories. However, there should be additional states according to experimental data. According polyene chain models the second excited state and Raman v1 spectra should have linear correlations. It is not true for all type carotenoids; even effective conjugation length description cannot be applied in all cases. Density functional theory provide quite detailed Raman and second excites state spectra description about allene and alkyne carotenoids. Also, according our study the carotenoids with cyclodextrin provide information importance of central double bond carbon-carbon vibrations and Raman v1 value. Large scale computations provide more detailed information which allow better understand carotenoid properties which can be expected in real life biological systems.

What will audience learn from your presentation?

- Learn Time-Dependent Density functional theory, Density functional theory and other ab-initio limitations for modelling Carotenoids and conjugated structures.
- Several examples will be given for modeling beta-carotene, fucoxanthin and peridinin carotenoids.
- It will stimulate the audience to discuss about carotenoids properties.
- It will stimulate the audience to think about computational methodology and limitations.

Biography

Dr. Mindaugas Macernis is the head of Supercomputing “VU HPC” Saulėtekis and Supercomputing competence “EuroHPC NCC Lithuania” centers which are located in Institute of Chemical Physics of Vilnius University, Lithuania. He obtained PhD in Vilnius University by studding environmental effects on photoinduced processes in organic molecules. His primary research is related in quantum chemical modelling. Using developed and optimized quantum chemistry codes he is modeling electronic molecular systems relevant to light-harvesting in photosynthetic systems and having applicative potential for molecular electronics. Dr. M. Macernis study carotenoids and other conjugated systems. He is interested in supercomputing, quantum computing also.

Alexander G. Ramm

Kansas State University, United States

Wave scattering by many small particles and applications

The theory of wave scattering by many small impedance particles of arbitrary shapes is developed. The basic assumptions are: $a\ d\ \lambda$, where a is the characteristic size of particles, d is the smallest distance between the neighboring particles, λ is the wavelength. This theory allows one to give *a recipe for creating materials with a desired refraction coefficient*. One can create material with negative refraction: the group veloc- ity in this material is directed opposite to the phase velocity. One can create a material with a desired wave focusing property. Quantum-mechanical scattering by many potentials with small supports is considered. The problem of creating material with a desired refraction coefficient is discussed in the case when the material is located inside a bounded closed connected surface on which the Dirichlet boundary condition is imposed.

Biography

Alexander G. Ramm was born in Russia, emigrated to USA in 1979 and is a US citizen. He is the Professor of Mathematics with broad interests in analysis, scattering theory, inverse problems, theoretical physics, engineering, signal estimation, tomography, theoretical numerical analysis and applied mathematics. He is an author of 712 research papers, 20 research monographs and an editor of 3 books. He was Fulbright Research Professor in Israel and in Ukraine; distinguished visiting professor in Mexico and Egypt; Mercator professor in Germany; invited plenary speaker at the 7-th PACOM; he won Khwarizmi international award in 2004 and received many other honors.

Raymond C. Jagessar

University of Guyana, Guyana

Nanotechnology and its pursuit, in the treatment of COVID-19

COVID-19 is caused by the SARS-COV-2 virus and became a pandemic on the 3rd of March, 2020. Since then it has cause havoc on humanity lives, affecting all aspects. Initial treatments include chloroquinine and Remdesivir, amongst other drugs. The latter was discontinued by FDA. Since then, humanity has seen the emergence of several vaccines: Oxford AstraZeneca, Moderna, Sputnik-V, Sinopharm and Pfizer, amongst others. Virologists, biologists, pharmacists, materials scientists, and clinicians are collaborating to develop further efficient treatment strategies. The best vaccine is yet to emerge. In addition to these, nanotechnology in nanomedicine offers promises in the treatment of COVID-19. Nanomedicine has already proven its value through its application in drug delivery and nanosensors in other diseases. Nanomedicine and its components can play an important role in various stages of prevention, diagnosis, treatment, vaccination, and research related to COVID-19. Nano-based antimicrobial technology can be integrated into personal equipment for the greater safety of healthcare workers and people. Nanomaterials such as quantum dots can be used as biosensors to diagnose COVID-19. Nanotechnology offers benefits from the use of nanosystems, such as liposomes, polymeric and lipid nanoparticles, metallic nanoparticles, and micelles, for drug encapsulation, and facilitates the improvement of pharmacological drug properties. Nanomaterials can aid in the drug/vaccine delivery process. Antiviral functions for nanoparticles can target the binding, entry, replication, and budding of SARS-COV-2 i.e various stages of the virus life cycle. The toxicity-related inorganic nanoparticles are one of the limiting factors of its use that should be further investigated and modified. Nanomaterials have already shown its uses in the treatment of pneumonia. This presentation will discuss the emerging role of nanotechnology in the development of therapeutic agents to totally eradicate the SARS-COV-2 virus. Of course, FDA and WHO approval will be necessary to see its use on humanity.

What will audience learn from your presentation?

- Most of the audience are nanotechnologists and thus can incorporate part of my research in their work or apply them to their work.
- The audience will be more knowledgeable at work in nanotechnology, with specific focus on COVID-19. Thus research faculty can use part of my research to expand their research. However, they must reference my work. It will improve the accuracy of a design, or provide new information to assist in a design problem.

Biography

Prof. Raymond C. Jagessar obtained his BSc (distinction) in Chemistry/Biology from the University of Guyana (1991) and was assistant lecturer in the Department of Chemistry from (1991-1992). He obtained his PhD from the UK in 1995. He held three Post Doctoral Research Fellowships (PDF) at the University of South Carolina (USA), Wichita State University (USA) and the University of the West Indies during the period, 1996-1999. He has several international awards, amongst them are Chartered Chemist, CChem and Fellow of the Royal Society of Chemistry, FRSC, UK, Research Grants and recently, one of the awardees of the Guyana Innovation Prize, 2021. His research interests are broad, covering the spectrum of Pure and Applied Chemistry, Chemical Biology and Pharmaceutical Chemistry. He has published over 100 research articles, five book chapters, one book and presented at many conferences, locally and internationally. He is currently Professor in Chemistry (Organic and Inorganic) at the University of Guyana (South America), Fellow and President of the Caribbean Academy of Sciences.

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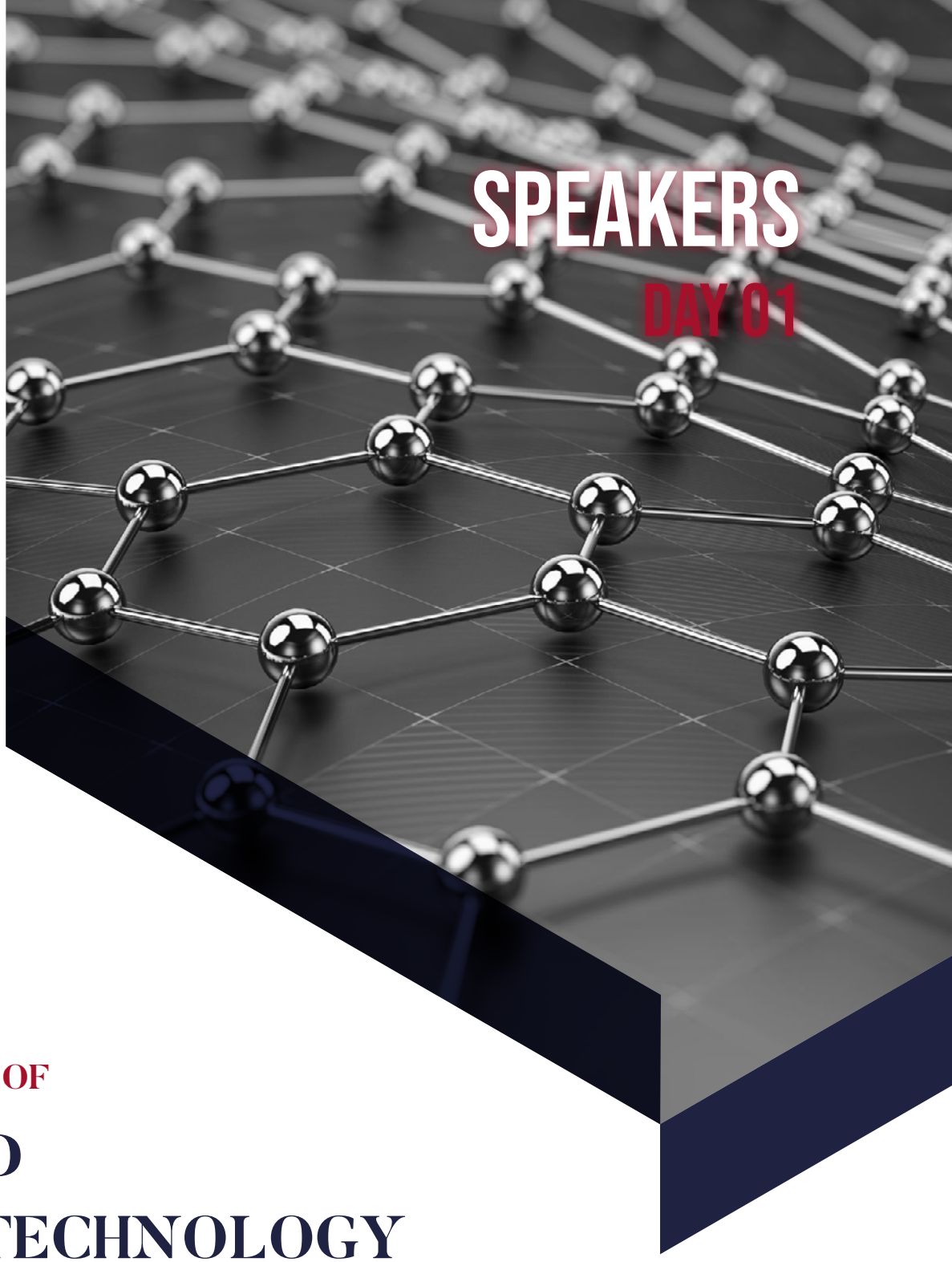

SPEAKERS

DAY 01

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Xing Wu* and Zongli Xie
CSIRO Manufacturing, Australia

High-performance forward osmosis membranes achieved by incorporating two-dimensional nanomaterials

Forward osmosis technology has been widely applied in industrial areas including desalination and wastewater treatment. However, the forward osmosis membrane is still facing challenges such as the trade-off between selectivity and permeability, membrane fouling and internal concentration polarization. Enhanced forward osmosis membrane performance could be achieved by embedding nanomaterials and intelligent design of advanced nanocomposite membranes. In our recent studies, we have explored different two-dimensional nanomaterials such as graphene oxide and MXene for improving the performance and properties of forward osmosis membranes. In addition, we have designed different membrane modification strategies for forward osmosis membrane modification. We report here how the incorporation of two-dimensional nanomaterials improves the filtration efficiency of forward osmosis membranes and show proof-of-concept studies about applying these advanced FO membranes in desalination, sewage concentration, wastewater treatment, and some emerging application areas such as organic solvent recovery and cooling water production in the CO_2 capture system.

What will audience learn from your presentation?

- This presentation will offer new insight into the application of nanomaterials for membrane modification.
- This presentation may inspire researchers for selecting or fabricating suitable nanomaterials for membrane modification.
- Some emerging application areas about nanomaterials modified forward osmosis membranes presented in this presentation may trigger new orientations for nanomaterials designing.

Biography

Dr. Xing Wu joined the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Manufacturing as a postdoctoral research fellow in 2019. He obtained his Ph.D. degree from Chinese Academy of Sciences (CAS) in 2018. At CSIRO, his research interests are focused on membrane fabrication and modification for desalination, purification and wastewater treatment. His expertise includes the development of nanomaterials modified membrane for ultrafiltration, forward osmosis and membrane distillation. He is a member of the Reviewer Board of Membranes (SCI Journal), the guest editor of Special Issue of Sustainability (SCI Journal), and a member of the Membrane Society of Australasia.

Getachew Feyissa Gemeda*[a], Habtamu Fekadu Etefa[b], Chin-Chih Hsieh[c], Mekuriaw Assefa Kebede[b], Toyoko Imae[a,b,c], Yee-Wen Yen[a]

[a]National Taiwan University of Science and Technology, Taiwan
[b]National Taiwan University of Science and Technology, Taiwan
[c]National Taiwan University of Science and Technology, Taiwan

Heterojunction of zinc oxides of nanowires, and nanoparticles for dye synthesis solar cell

ZnO-nanowire and nanoparticles are used for the photonics, solar cells, and photovoltaic devices, and the composites were characterized. ZnO-nanowire, ZnO-nanoparticles, and Cdots were synthesized by hydrothermal, polyol solvent, and hydrothermal methods, respectively. ZnO nanowires and nanoparticles have been evaluated the effects of added carbon dots (C-dots) on the performance of photovoltaic devices. The photovoltaic conversion of dye-sensitized solar cells (DSSCs) was effective for ZnO NW/ZnO NP (75 wt%) and the incorporation of 10 wt% Cdots in the hybrid nanostructures. Additionally, when the mole ratio (ethylene diamine: citric acid) between raw materials of C-dots was 1:2, the conversion efficiency was highest, and this value was 6 times higher than that of DSSCs ZnO NW/ZnO NP (75 wt%) without C-dots. Electrochemical impedance spectroscopy also indicated that the charge transfer resistance property was lowest for Cdots (1:2)-hybridized ZnO NW/ZnO NP (75 wt%) DSSCs.

Biography

Getachew Feyissa Gemeda was born on June.12, 1985 GC in Oromia, Ethiopia from Feyissa Gemeda Balcha and Abebech Jimma Bedane. He graduated with BE.d (physics) from Haramaya University in 2008, and MSc in Condensed Matter (physics) in 2016 from Addis Ababa University. He has been teaching physics from Asella College since 2017 and lecturer, Bule Hora University, Bule Hora, Ethiopia, and joined the National Taiwan University of Science and Technology in 2019 to study his Ph.D. program in Material Science and Engineering focused on Nanotechnology application (Solar cell energy) and Two manuscripts are under review.

Safayet Ahmed*[1a,b], Junpeng Qiao[1a,b], Ping Kwong Cheng[1a,b], Ahmed Mortuza Saleque[1a,b], Md. Nahian Al Subri Ivan[1a,b], Tawsif Ibne Alam[1a,b], Yuen Hong Tsang[1a,b]

[1a]The Hong Kong Polytechnic University, Hong Kong
[1b]The Hong Kong Polytechnic University, China

Two-dimensional gallium sulfide as a novel saturable absorber for broadband ultrafast photonics application

Two-dimensional (2D) Gallium Sulfide (GaS) offers a plethora of exceptional electrical and optical properties, allowing it to be used in a wide range of applications, including photodetectors, hydrogen generation, and nonlinear optical devices. In this presentation, the synthesis process of ultrathin 2D GaS nanosheets, using the liquid-phase exfoliation method will be discussed. Moreover, the structure, morphology, and chemical composition of as prepared nanosheets will be extensively explained. Followed by the fabrication method of 2D GaS nanosheets-based saturable absorber (SA) on a side polished fiber, will be presented for the first time. The realized modulation depths are 10% and 5.3% at 1 μm and 1.5 μm, respectively, indicating the wideband saturable absorption performance of the prepared SA. By integrating the GaS-SA into three different wavelength-based fiber laser cavities, stable mode-locked pulses are achieved, having a pulse duration of 46.22 ps (1 μm), 614 fs (1.5 μm) and 1.02 ps (2 μm), respectively. Additionally, different orders of harmonic mode-locking pulses with the highest repetition rate of 0.55 GHz (45th order) and Q-switching pulses with the shortest pulse duration of 2.2 μs are obtained in the telecommunication waveband. These findings suggest that 2D GaS has a lot of potential for broadband ultrafast photonics in nonlinear photonic devices.

What will audience learn from your presentation?

- This presentation will help the audience to learn about the saturable absorption property of 2D Gallium Sulfide (GaS).
- Readers will get vital information regarding the characterization technique of 2D materials for photonics research.
- As this presentation is based on generating ultrafast pulsed laser using a novel saturable absorber, therefore, this presentation will encourage the readers to work on this topic as well. As we know ultrafast lasers are being utilized in several areas like optical communication, industrial sectors, scientific research, medical, and eye surgery, hence, this kind of research work will have a beneficial impact on society.

Biography

Safayet Ahmed is a Ph.D. candidate in the Department of Applied Physics at The Hong Kong Polytechnic University. Before starting his Ph.D., he completed his B.Sc. and M.Sc. degrees and worked as a Senior Lecturer in the Electrical and Electronics Department at American International University-Bangladesh. His research interest lies in ultrafast photonics, nonlinear optics, laser applications, perovskite solar cells, and 2D Materials characterization. His Ph.D. research goal is to characterize and optimize the properties of different kinds of novel 2D materials that can be utilized in nonlinear optics and ultrafast photonics devices.

Mohammad Al Mamun*[1,2], Yasmin Abdul Wahab[1], M. A. Motalib Hossain[1], Abu Hashem[1], Mohd Rafie Johan[1]

[1]University of Malaya, Malaysia
[2]Jagannath University, Bangladesh

Synthesis, characterization and applications of NEVHCS LSC of GO from waste pencil leads (WPL)

As a reliable precursor and derivate of graphene, graphene oxide (GO) (with a few layers) has received wide attention in recent years. However, the synthesis of GO (>10 nm) in an economical and efficient way from a low-cost renewable source remains a great challenge. More specifically, a high quality, low cost, nearly defect free, highly dispersible, naked eye viewed honeycomb structured (NEVHCS) liquid single crystals (LSC) of GO (graphene oxide) is still now rare and a big challenge to synthesize, which has been successfully done using waste pencil leads as raw material following improved modified Hummer's method. A gradual increase of RPM during centrifugation was used to purify and optimize the final pH range of the graphene oxide (GO) solution before crystallization and drying. This modification is not only successful to get defect free NEVHCS mega-sized crystalline product but also to achieve GO with a few layers (up to 3 nm) increasing the reaction yield regarding the volume and surface area in comparison with conventional Hummer's method. It was thereafter converted to rGO (reduced GO) using an aqueous leaf extract of *bryophyllum pinnatum* as reducing agent. The morphology and structure of both GO and rGO were characterized by different physico-chemical, microscopic, spectroscopic, and electrochemical methods. Moreover, the rGO was applied as nanocomposite with copper oxide (Cu2O) for the electrochemical conversion of CO2 into useful products. These findings would introduce and encourage researchers of this field to synthesize nearly defect free NEVHCS graphene NMs to achieve more efficient graphene-based products eliminating its inherent defect problem. However, the NEVHCS highly crystalline GO would be a very simple but great practical evidence to confirm the formation of quasi perfect crystals of GO instead of confirming with highly expensive electronic microscope. Furthermore, this green, ultralow-cost, improved approach of synthesis shows good prospects for large- scale commercial production and applications of high-quality GO and its derivatives.

What will audience learn from your presentation?

- Since its complete isolation and characterization in 2004 until now it is not possible to figure out the honey-comb structure of graphene without the help of high-resolution microscope. From my presentation, the audiences could be able to introduce first time with the Naked Eye Viewed (NEV) honey-comb structure (HCS) of graphene in GO.
- Here, I will describe the detailed method of synthesis of naked-eye visible highly pure large size liquid crystals of GO from waste pencil lead and its characterization by different physicochemical, spectroscopic, microscopic, and electrochemical techniques. I will also present the green conversion of GO to rGO and then apply prepared rGO for the electrochemical reduction of CO2. The scientific community working with graphene or GO would be able to learn how to prepare, characterize and apply the defect free, highly quality NEVHCS GO.
- This knowledge would encourage them to avoid the commercial graphene NMs. Because they often use those graphene NMs remaining mostly in dark regarding their quality, surface area or surface to volume ratio which is very important to evaluate any nanomaterials. Especially, in case of graphene, the thickness of the layer is the most vital issue. Unfortunately, world renowned commercial manufacturers are supplying the NMs claiming as graphene with few nm but practically those are not like that as they claimed. Even those NMs are either defect free or how much defect present in them is not possible to know without going through a tedious, time consuming and highly expensive microscopic characterization. As a result, the optimization regarding the performance of their graphene-based products or devices remain practically undone that is a great obstacle for the commercialization of graphene-based technologies.
- I hope the method for the synthesis of NEVHCS liquid single crystal (LSC) of GO would solve those inherent limitations in the field of graphene-based Nanoscience and Nanotechnology. The interdisciplinary researchers such as Chemist, Physicist, Biochemist, Microbiologist, Engineer, Material scientists who are working with graphene would be benefited as well from my research findings. The students, colleagues of the participants could also be updated their knowledge by sharing with them.

Biography

Mohammad Al Mamun did his B.Sc. (Hons.) in Chemistry in 1999, M.Sc. in Physical-Inorganic Chemistry in 2001, and M.Phil. in Physical Chemistry in 2008 from the University of Dhaka, Bangladesh. He also did MS in Nanoscience and Nanotechnology from University of Rovira I. Virgili (URV), Spain in 2011. Now, he is working as an Associate Professor of Chemistry at Jagannath University, Dhaka. Currently, he is doing his PhD at NANOCAT (Nanotechnology and Catalysis Research Centre), IAS (Institute for Advanced Studies) of University of Malaya, Malaysia under the research group of Professor Mohd Rafie Bin Johan. He has published more than 35 research articles in different National and International journals.

Flora M. Yrad
Silliman University, Philippines

Modified synthesis of dextrin-capped gold nanoparticles and its chemistry

Dextrin methodology is an aqueous alkaline chemical process for gold nanoparticle (AuNP) synthesis. Although dextrin-capped AuNPs reportedly demonstrate versatility in some biosensing applications, their synthesis takes 8 long hours of reaction. A modified method is hereby described that simplified the procedure, equipment, and reduced the reaction time to only one hour. The key features of the modified method are the reversal of the addition of reagents in the original dextrin protocol and the increase of reaction temperature. Optimum synthesis was achieved by sequential neutralization of 50 mL of 2 mM HAuCl4 with 0.5 mL of 10% Na_2CO_3 and alkaline reduction using selected volumes of 25 g/L dextrin. The AuNPs produced were monodispersed based on dynamic light scattering (DLS) measurements. The surface plasmon resonance band ranged from 517 to 520 nm indicating spherically shaped AuNPs. High resolution transmission electron microscopy (HRTEM) further confirmed the spherical shape with average sizes from 7.3 ± 1.1 to 18.9 ± 1.5 nm, depending on the volume of dextrin. Chemical reactions are hereby proposed to explain the chemistry of AuNP formation based on the alkaline reduction of HAuCl4 with dextrin as the reducing agent.

What will audience learn from your presentation?

- The audience will learn an alternative method of producing dextrin-capped gold nanoparticles.
- The modified method that will be described provides a simpler protocol, shorter reaction time, and less expensive equipment.
- Chemical reactions are proposed to explain the chemistry of the formation of dextrin-capped AuNPs.

Biography

Dr. Flora Yrad studied at the University of San Carlos, Cebu City, Philippines and received her diploma for PhD degree in Chemistry in 2019. She conducted her dissertation research at the Nano-Biosensor Lab of Michigan State University, Michigan, USA under the USAID-STRIDE scholarship and published her works in Diagnostics, 2019, 9, 74 and Silliman Journal, 2020, 61, vol. 2. She is currently teaching at Silliman University, Dumaguete City, Philippines.

Subas Chandra Dinda
Teerthanker Mahaveer University, India

Nanotheranostics in drug targeting

Nanotheranostics is the integration of diagnostic and therapeutic function in one system at nono-size level, which attracts attention in personalized medicine. Because treating cancer is not a one-size-fits-all scenario, it requires therapy to be adapted to the patient's specific biomolecules. It identifies biomarkers to gain an understanding of the diagnosis and in turn treating the specific disorder based on the precise diagnosis. By predominantly utilizing the unique properties of nanoparticles to achieve biomarker identification and drug delivery, nanotheranostics can be applied to noninvasively discover and target image biomarkers and further deliver treatment based on the biomarker distribution. Different drug delivery systems such as liposomes, microspheres, nanoparticles, nonogels and nonobiocapsules have been used to improve the bioavailability of the drug in the brain, but microchips and biodegradable polymeric nanoparticulate careers are found to be more effective therapeutically in treating brain tumor. The physiological approaches also utilized to improve the transcytosis capacity of specific receptors expressed across the BBB. It is found that the low-density lipoproteins related protein (LPR) with engineered peptide compound (EpiC) formed the platform incorporating the Angiopep peptide as new effective therapeutics. The lipid-based formulations comprise nanoemulsions, solid-lipid nanoparticles (SLNs), nano-structured lipid carriers (NLCs), liposomes, and niosomal systems, etc. have found more promising antitubercular activity as its intended for targeted drug delivery especially to the infected part. Further mannosylation of liposomes offers tremendous results in TB chemotherapy as it directly binds to mannose receptors available on the surface of alveolar macrophages resulting mycobacterium destruction. SLNs and manosylated SLNs are the advanced form of the lipid formulations, which found to enhance the drug uptake at the infected organ and show significant in vivo anti-tubercular activity with reduced toxicity.

Recently it has been found that the use of nanotechnology in the field of pharmaceutical biotechnology helps in improving the drug delivery strategy including the kinetics and therapeutic index to solve the delivery problems of some biotech drugs including the recombinant proteins and oligonucleotides. Use of nanotechnological based formulations and nanomaterials are increasing day-by-day in wide range covering a broad typology of applications, from design and development of targeted drug delivery systems, manufacturing of pesticides, domestic appliances, textiles, to bioremediation engineering. There are therefore concerns about the environmental risks or bioaccumulation related issues that may arise particularly resulting from the application of drug loaded nano-carriers or effect of pesticides that reach the natural ecosystems.

Biography

Dr. Subas Chandra Dinda who is serving at present as Professor & Head, Department of pharmaceutics, Teerthanker Mahaveer University, India is found to be having a wide research experience in the frontier of Drug Delivery and Drug Targeting Research covering the area of design and development of Matrix systems, Floating Drug delivery systems, Muco-adhesive microcapsules, and Nano-particle based formulations. He explored several poorly bio-available drugs through muco-adhesive as well as nano-particle based dosage forms and found to be very effective through oral route. He also actively involved in guiding the scholars in the field of Drug Delivery System as well as interdisciplinary research covering the area of Drug Synthesis and Herbal Drug Research under the joint collaboration with the teachers from other University as well. To date some of his research finding claimed patents and published in more than hundreds of peer reviewed journals for the benefit of scientific community. He serves as reviewer of many journals including ELSEVIER, SPRINGER, and SCIENCE DIRECT publications. To his credit he supervised/awarded more than 18 Ph.D candidates in the field of pharmaceutical sciences for the professional development and having a vast administrative experience in establishing the new pharmacy institutions as well as designed new pharmacy course curricula as the chairperson of Board of Studies/Council for the development of pharmaceutical sciences at Berhampur University in India as well as Mekelle University in Ethiopia.

Gunadhor S. Okram

UGC-DAE Consortium for Scientific Research, India

Harvesting electricity using nanostructures

Enabling efficient thermoelectric materials with high thermoelectric figure of merit ZT = (S2σ/κ)T is the key to thermoelectrics research today, where S is the thermo-electric voltage, σ is the electrical conductivity, κ the thermal conductivity and T the temperature. Thermoelectricity is among the cleanest form of energy making it among the most preferred one. It can be obtained in general from waste heat or temperature gradient. Recent several reports prove that it is possible using nanostructured thermoelectric materials. These aspects shall be discussed in the context of our recent findings.

What will audience learn from your presentation?

- In this talk, the audience will learn how much progress has been made in the last about three decades.
- The audience will learn how this progress in this research has been proliferating due to the use of the theoretical concept of low dimensions or nanostructures, in general.
- This research may help other faculty to expand their research or teaching and wellbeing of the society against the global warming.
- This provides a way out for a practical solution to a problem that could simplify or make a designer's job more efficient.
- It may improve the accuracy of a design, or provide new information to assist in a design problem of a better futuristic thermoelectric material.

Biography

Dr. G. S. Okram did his PhD from Indian Institute of Technology, Bombay (1995), India. 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 as Engineer/ Scientist D in 2001. He is now Engineer/ Scientist G, and has guided four PhD, 6 MPhil, 4 M Tech, 54 MSc and 5 BSc project students, delivered over 86 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 2001 times citations.

M. P. Ajith*, Paulraj Rajamani
Jawaharlal Nehru University, India

An excellent adsorbent for the removal of aqueous Ni2+

The current study focuses on the green synthesis of aqueous-stable and highly fluorescent carbon dots (CD) via a hydrothermal treatment of Ficus *benghalensis* tender leaf extract. UV-visible spectroscopy, fluorescence spectroscopy, HRTEM, DLS, Zeta Potential, FTIR, and other techniques were used to characterise the synthesised CD. CD with a blue-green fluorescence emission at 317 nm had an average size of 2.28 nm. Heavy metal-binding efficiency and adsorption affinity of the CD was evaluated by spectroscopy methods, which showed high selectivity and specificity nickel amongst the different tested heavy metals with a LOD 0.000014 µmol/mL. Further, we functionalized mesoporous silica (MS) with the prepared CD to generate an adsorbent (CD@MS) for purification of contaminated water. To determine the suitable adsorption isotherm, a series of batch tests were conducted. The experiment results examined the Langmuir, Freundlich, and Tempkin equilibrium isotherms, and associated parameters were calculated. The Langmuir isotherm gives a great match with experimental data, according to the findings. The kinetic experiments revealed that the adsorption obeys pseudo-second-order kinetics. Moreover, a column-based purification strategy was developed by conjugation of MS@CD. Through the column Small Bed Adsorption (SBA) studies breakthrough curves were plotted by changing MS-CQDs bed height. Finally, the ideal breakthrough curves were plotted, and characteristics needed to construct fixed-bed adsorption columns on an industrial scale such as bed capacity, length of the new bed, the time required for complete bed saturation at infinite rapid adsorption TS and the breakthrough times Tb were analyzed for all scenario.

What will audience learn from your presentation?

- Audience can learn the feasible biogenic synthesis of Carbon Dots from Ficus benghalensis.
- Evaluation of heavy metal-binding efficiency and adsorption affinity of the CD by spectroscopy methods.
- Adsorption kinetics and thermodynamics.

Biography

M P Ajith completed his undergraduate studies in zoology at CMS College Campus, Kottayam of Mahatma Gandhi University, Kerala in 2015. In 2017, he received his post-graduation degree in zoology from Gandhi gram Rural University, Tamil Nadu, India. His postgraduation research topic was on iron oxide nanoparticles and their environmental applications. Then he joined at University of Madras, Chennai, India for M.Phil. research. Currently, he is a PhD scholar at the School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, India under the supervision of Prof. Paulraj Rajamani. His area of interest is nanobiotechnology, organic quantum dots, water purification, pollutant sensing and decontamination.

Chandra Mohan*, Neeraj Kumari

K. R. Mangalam University, India

A green approach of catalysis: Silicomolybdic acid modified montmorillonite clay for organic synthesis

The present work is based on to replace the hazardous chemicals/ catalyst in the existing processes which is one of the innovative trends in the present time. As green catalysts, heteropolyacid (HPA) has been introduced as a promising candidates for the application as solid acid catalysts. Heteropoly acids can be used to modify clay by several methods such as pillaring to possess qualities such as good thermal stability, high acidity and high oxidising ability. Here, we have used Silicomolybdic Acid (SMA) to modify montmorillonite Clay to use them in reactions such as Deoximation of oximes of aldehydes and ketones, synthesis of acetal derivatives of aldehydes and ketones, synthesis of coumarin derivatives etc. Silicomolybdic Acid (SMA) modified montmorillonite (SMA-Mmt) clay have been synthesized and characterized by various analytical techniques such as XRD, FT-IR, TGA, DTA, DSC and Surface area etc. It was observed that the efficiency of this catalyst was excellent for the synthesis of coumarin derivatives in short time.

What will audience learn from your presentation?

- One will be able to know the methods to synthesize modified clays.
- Using modified clays as catalysts in organic synthesis.
- Use of green solid acid catalysts and how to reuse it.
- The clay can be modified by various methods by using different modifiers.
- This clay has wide applications as catalysts, adsorbent and for water treatment process for the removal of metal ions in problem.
- Future research can be done on these modified clays for their efficient use in microwave synthesis and for other organic reactions.

Biography

Dr. Chandra Mohan obtained his Ph.D. degree in the field of Inorganic Chemistry from Guru Gobind Singh Indraprastha University, Delhi, India. He has done M.Phil. in Inorganic Chemistry from Delhi University in 2009. He has keen interest in research and development activities. He has more than 9 years of teaching experience and about 8 years of research experience. He has published around 25 research papers in reputed journals and has presented 15 research papers in various conferences and workshops held in India and abroad. He is an awardee of a national fellowship from University Grant Commission Delhi for his Ph.D. degree.

Monika Gupta[1], Raghvendra Kumar Mishra*[2]

[1]Amity Institute of Biotechnology, India

[2]Amity University of Biotechnology, India

Callus mediated green synthesis of nanoparticles under controlled conditions and their antimicrobial activities

The present study was an attempt to develop a common laboratory procedure for synthesis of nanoparticles from callus of C. roseus under controlled conditions. The nanoparticles synthesized by the callus extract had proven to be an effective tool for synthesizing nanoparticles of small size (<100 nm) and uniformly distributed as confirmed by TEM, DLS and AFM analysis. In conclusion the study offers the potential method to synthesize new economically viable potential green particles having high efficacy, less cytotoxic, feasibility, and eco friendly in nature. The synthesized NPs demonstrated moderate antimicrobial activity against both Gram +ve and Gram -ve bacteria individually and in combination with antibiotics. The antibacterial activity of nanoparticles individually and in combination with existing antibiotics and natural products will encourage to check more new compounds and also providing a new route against multi drug resistant bacteria. The synergistic effect also increase the efficiency of natural compounds at very low concentration that will help to treat more and more patients effectively. The green particles may decrease the dependency on synthetic drugs and also protect patient from the painful traditional methods of treatment.

What will audience learn from your presentation?

- Present work was focused on synthesis of green nanoparticles from callus under controlled conditions.
- This work will help to researchers to generate the callus by using different physiological conditions and photoperiod. Changes in physiological and photoperiod conditions are very important factors to increase the production of secondary metabolites which were act as reducing agents in synthesis of green nanoparticles. This work will also help to regulate the size and shape of synthesize nanoparticles.

Biography

Dr. Raghvendra Kumar Mishra, is a Professor in Amity Institute of Biotechnology, Gwalior, India. He did Ph.D. under supervision of Prof. Sushil Kumar (INSA Senior Scientist) NIPGR, New Delhi. After completion of post doc he joined Konkuk University South Korea as an Assistant Professor. He has Co-supervised two Ph.D. scholar for the award of Ph.D. in Biotechnology and currently supervising 01 Ph.D. scholar. He has completed one project as Co-PI (MPCOST, Bhopal) and presently one project is running (DST-SERB TARE Scheme). He has published 55 research papers, 03 US patents, 04 Indian patents, 05 books and book chapters have been published.

Lamya Al Farsi*, Tewfik Souier
Sultan Qaboos University, Oman

Aluminum-doped zinc oxide nanorods: Challenges and solutions

Vertically aligned doped zinc oxide (ZnO) nanorods is a very promising material. It has the potential for use in a wide variety of applications such as photo catalysis, nano sensors, solar cells, and spintronic devices. While scientists and engineers have made great strides towards improving the properties of ZnO nanorods for the use in different applications, doping causes deterioration of the nanorods. This makes it difficult to characterize the actual properties of vertically aligned nanorods and makes is challenging to determine the best application for their use. Aluminum doping of ZnO nanorods enhances the electrical and optical properties of the nanorod and is one of the easiest and most cost-effective techniques that, if perfected, can improve the properties of the nanorod. This, in turn, is expected to increase the production of affordable high quality nanorods which will allow its wider use in practice. This talk will summarize studies that use different methods to overcome the problems faced in doping and present the techniques and methods our group used to get vertically aligned aluminum (Al) doped ZnO. In addition, we describe the use of atomistic simulation, and ab initio study to examine the detailed structural, electronic, and optical properties of Al doped ZnO.

Biography

Lamya Al Farsi is currently a physics Ph.D. student at Sultan Qaboos University. She graduated from college of Education in 2000 with the Bachelor of Science. She worked as a physics high school teacher from 2000 to 2013. Then, she obtained her master's degree in physics from Sultan Qaboos university in 2017.

Mauliady Satria*, Mulya M Nur and Tawfik A. Saleh

King Fahd University of Petroleum & Minerals Dhahran, Saudi Arabia

Facile preparation of the superhydrophobic/superoleophilic polydopamine coated- polyurethane sponge by incorporating functionalized graphene oxide for efficient oil/water separation

The development of technology led to the development of a superhydrophobic/superoleophilic absorbent using polyurethane sponge modified with functionalized carbon nanostructures for the oil industry which can remove oily contaminants from oil/water mixtures and emulsion. As a result of the advance in technology and its impact in many fields, it is extremely crucial to eliminate the oil contaminant to purify the water content. A polyurethane (PU) sponge was dipped in the in-situ coating method by introducing an ultrathin polydopamine (PDA) layer and followed by functionalized graphene oxide with palmitic acid (GO-PA) insertion via ultrasonication and refluxing at 60 °C for 12 h. In addition, FTIR, SEM, EDX, XRD, and TGA results of the prepared nanocomposites indicated that chelating bonds between amine on PU-PDA surface, carboxylate, hydroxide on active modified GO surface area investigated the uniform distribution on the material surface. Fascinatingly, the water contact angle (WCA) measurement exhibited that PU-PDA- GO-PA nanocomposite showed a significant increase of the contact angles which was around 164°, while pure PU was 73° and material with the absence of PDA layer (PU-GO-PA) was 152°. After 20 cycles of material testing, the WCA steadily remained at 155°-152° indicating powerful superhydrophobic properties. For oil contact angle measurements, this modified material can immediately absorb the commercial oils and various organic solvents showing the excellent superoleophilicity with oil contact angle (OAC) was 0o. Moreover, the performance of the modified material toward oil-water separation has been tested to observe the oil absorption capability, material reusability, efficiency, and permeate flux. The results have shown that by adjusting the surface roughness of the PU sponge, it could increase its capacity to absorb oil content such as heptane, toluene, cooking oil, and car lubricants. The modified material showed up to 53 times in oil absorption capability from its initial mass of PU, as well as up to 99.7 % in separation efficiency with permeate flux as high as 8000-9000 L.m-1h-2. More importantly, the sponge demonstrated excellent water- in-heptane emulsion separation and oil-water mixture separation for dyed oil removal within a few seconds. Hence, due to the PDA coating on the PU surface producing long-term performance, high mechanical, and thermal stability, the newly modified absorbents were proven to be capable of absorbing in a wide range of industrial applications with cost-effective and environmentally friendly characteristics. As a result, the PU- PDA-GO-PA nanocomposite has the huge potential to be a promising absorbent in a variety of industrial applications on account of its outstanding performance in various environmental issue.

What will the audience learn from your presentation?

- The audience can learn how urgent is water remediation topic.
- The audience can learn how the materials were chosen and prepared.
- The audience can notice that nanomaterial is an essential nowadays for many hot topics.
- The audience can know the excellent performance from the modified material for the oil/water separation process.
- The audience can investigate many promising/prospective materials to be found for solving the future problem.

Biography

Mauliady Satria received his B.Sc degree in chemistry from Institut Teknologi Bandung, Indonesia, in July 2016. He achieved his master's degree in the same major at King Fahd University of Petroleum and Minerals (KFUPM), Saudi Arabia. He was working as a researcher and student at Chemistry Department, KFUPM. His current research interests including synthesis, design, and preparation of materials, nanomaterials, polymers, nanocomposites, hybrid materials were proposed to generate their applications in oil/water separation, water treatment, and purification.

Mert Saraçoğlu*[1-2], Utku Bakırdöven[1], Hande Arpalı[3] and Servet Timur[1]

[1]İstanbul Technical University, Turkey
[2]Nanosilver Inc. Teknopark İstanbul, Turkey
[3]Montana State University, USA

Nano-structured Fe_3O_4 (Magnetite) powder synthesis using co-precipitation method for bio-separation applications

Magnetic separation is one of the most efficient and rapid isolation technique for many biomedical applications such as gene therapy and clinical diagnosis where alternatives could harm the target molecule. Herein this work, superparamagnetic Fe3O4 powders were synthesized by co-precipitation method and characterized for its potential applications in DNA extraction & purification. Proposed method was optimized by adjusting the pH and the stabilizer concentration. As a result, Fe3O4 nanoparticles that show superparamagnetic characteristic and aggregated morphology was obtained in high purity. Formed phases were investigated using X-ray diffraction (XRD). Morphological analysis and particle size distribution of the synthesized powders were done by both Scanning Electron Microscope (SEM) and Scherrer Formula. Results have suggested that the synthesized particles were in the size of micrometer which made up from nanoparticles between 50 - 110 nm in size. Magnetic property of Fe_3O_4 were measured using Vibrating Sample Magnetometer (VSM). According to results, Fe3O4 particles have shown superparamagnetic behaviour, in the value of 40 emu/g. where superparamagnetic ability arises from the nanosized crystallites and nanoparticles present in the structure. Comprehensively, Co-precipitation of Fe3O4 particles with proposed pH and stabilizer concentration, offers easy and non-toxic powder synthesis with a short reaction time which is believed to enable industrial scale Fe_3O_4 powder production. Usage of Fe3O4 particles produced with this method could widen the use of magnetic separation processes in DNA extraction and purification.

What will audience learn from your presentation?

- This work contains general characterization approaches for a powder material where it comprises of XRD, SEM and their empirical calculations where the phase purity and crystallite size of the specimen can be found theoretically.
- Additionally, effect of phase purity and crystallite size of the specimens on magnetic property of the powders will be explained.
- Chemical precipitation basics and parameters, used to produce nano-structured powders will be explained where the same approach could be used in alternative nano-powder synthesis.
- The relation between particle size and crystallite (nucleis in the particle) size and their effect on magnetic property will also be explained in the presentation.

Biography

Mert Saraçoğlu studied Material and Metallurgy Engineering at the İstanbul Technical University, Turkey and graduated in 2021. Currently applied for MSc degree in the same university, the research group of Prof. Servet Timur. Where he worked for two and half year in the topic of nano & micro particle synthesis.

Elena Lagreca*[1,2], Raffaele Vecchione[1], Chiara Di Cicco[1,2], Federica D'Aria[3], Alessia La Rocca[1,2], Ezia De Gregorio[2], Luana Izzo[2], Emiliano Bedini[2], Giorgia Imparato[1,2], Alberto Ritieni[2], Concetta Giancola[2] and Paolo Antonio Netti[1,2]

[1]Istituto Italiano di Tecnologia, Italy
[2]University of Naples Federico II, Italy

Development and thermodynamically characterization of Food Grade secondary oil in water nanoemulsions and in vitro validation through digestion simulation and muco-adhesion evaluation by intestine on chip and infogest protocol

Among oral delivery systems, oil in water nano-emulsions (O/W NEs) are of particular interest to improve pharmacokinetics of lipophilic compounds. Recently, we have implemented a successful strategy to improve O/W NEs stability, based on a polymeric coating on an oil core, through the use of pharma grade formulations. However, in the field of food supplements, food grade materials are the top choice since they combine safety and cost effectiveness. Here, we have replaced pharma grade (PG) with food grade (FG) materials in the preparation of the secondary O/W NEs and performed a comparative study between the two formulations to assess the FG one. Additionally, in order to provide formulations with improved muco-adhesion to the intestinal barrier, secondary O/W NEs were prepared by adding thiol groups to chitosan (Ct) via a simple non-covalent procedure based on N-acetyl-cysteine (NAC) salification, which is compliant with food supplement formulations. PG and FG formulations, in different materials combinations, were prepared and physio-chemically characterized (DLS, 1H-NMR, ITC). The obtained findings demonstrate that FG and PG formulations are similar and have comparable stability. FG formulations (NEs, Ct-NEs and Ct-NAC-NEs) loaded with curcumin were prepared and compared with the free drug in terms of drug bioaccessibility through the INFOGEST modified protocol confirming improved bioaccessibility as compared to free curcumin. Very interestingly, by comparing muco-adhesion properties of the two polymeric coatings (Ct and Ct-NAC) within an intestine on chip device able to mimic the complex intestinal functions, a significant improvement in the muco-adhesive properties of Ct-NAC was observed with respect to Ct due to the presence of thiol groups. Nonetheless, in-vivo assays are required as a final assessment of the proposed system.

What will audience learn from your presentation?

- Optimized layering of nanomaterials trough different method.
- Improve bioavability and muco-adhesive properties of nano formulation.
- The non-covalent thiol functionalization of chitosan open the door to an immediate use of such formulation with no need for safety clinical tests.

Biography

Elena Lagreca was graduated at University of Naples Federico II in Medicinal Chemistry and Pharmaceutical Technology and She is a PhD candidate in "Industrial Product and Process Engineering" at Department of Chemical, Materials and Production Engineering (DICMaPI) of University of Naples Federico II and Istituto Italiano di Tecnologia in Naples. She is expert in preparation and characterization of polymeric micro-particles, primary and secondary nano-emulsion oil in water as drug delivery system for enzyme, proteins, small molecules and nutraceuticals. In the last 3 years She become an expert in biomaterial synthesis, peptide synthesis, functionalization and characterization by novel techniques such as IR, QCM, SEM, CRYO-TEM, AFM, ITC confocal microscopies; moreover she works in cell culture and cell membrane extraction.

Concetta Di Natale*[1,2], Martina Profeta[1], Elena Lagreca[1,2], Valentina Mollo[1], Paolo Antonio Netti[1,2] and Raffaele Vecchione[1]

[1]Istituto Italiano di Tecnologia, Italy
[2]University of Naples Federico II, Italy

Cell membrane-coated oil in water nano-emulsions as biomimetic nanocarriers for lipophilic compounds conveyance

Recently, we developed ultra-stable oil in water nano-emulsions (O/W NEs), able to carry both internal and external cargos (Somes), such as lipophilic compounds and hydrophilic coatings, respectively, that we call here NEsoSomes. O/W NEs are an excellent bioengineering tool for drug and molecules delivery, due to their ability to dissolve many hydrophobic compounds and protect them from hydrolysis and degradation under biological conditions. At present, no report is available on the combination of cell membrane coatings with such nanocarriers, probably due to their typical instability feature. Since then, we have reported, for the first time, a new cell membrane (CM)-coated nanomaterial composed of membranes extracted from glioblastoma cancer cells (U87-MG) deposited on NEsoSomes, through a liquid–liquid interface method, to produce highly controllable membrane caked nano-capsules, namely CM-NEsoSomes. CM-NEsoSomes were physically characterized by dynamic light scattering (DLS) over time and their correct morphology was analyzed by confocal and transmission electron microscopy (TEM) microscopy. Moreover, CM-NEsoSomes biocompatibility was tested on the healthy model cell line, performing cell cytotoxicity and uptake assay, showing nanocarriers uptake by cells with no induced cytotoxicity.

What will audience learn from your presentation?

- Audience could learn to fabricate nanocarriers as innovative cell-derived biocompatible systems.
- Adopting a simple but efficient purification and deposition strategy.
- The use of oil core-based nanocarriers, which opens to the conveyance of several lipophilic compounds, ranging from drugs and biomolecules to contrast agent compounds.
- The use of biocompatible systems for the treatment and diagnosis of several human diseases, including cancer, as well as for vaccination and prevention from viral infection.
- The production of mature cell membrane delivery systems could improve the potential of nanocarriers increasing chemotherapeutic drug biocompatibility and decreasing the incidence of associated side effects.

Biography

Concetta Di Natale is expert in the field of protein-protein interaction and in the identification of compounds able to modulate these interactions. She has 10-years track record in the field of the chemical synthesis and biochemical characterization of biomolecules. She has a background in peptide and protein chemistry and a specific expertise in the identification of new bioactive molecules of peptidic and peptidomimetic nature, in the preparation and screening o peptide/peptoid libraries and in the structural and functional characterization of biomolecules by biochemical methods as LC-MS, CD, ELISA, SPR, ITC and fluorescence assays. In the last 5 years she has become an expert in biomaterial synthesis, funcationalization and characterization by novel techniques such as IR, QCM, SEM, TEM, AFM, confocal microscopies and microfluidics devices. Contribution to research (data from Scopus) H-index: 16, Documents by author 48, Total citations 720 by 440 documents.

Raymond C. Jagessar
University of Guyana, Guyana

Nanotechnology and nanomaterials

Nanotechnology has been a rapidly growing field of advanced science at the inception of this century. Nanotechnology & Advanced Materials Research of Advanced materials, polymers, principally revolves around endeavours to plan materials at a sub-atomic level to accomplish alluring properties and applications at a naturally visible level. Nanomaterials science and nanotechnology can be used for the advancement of technologies, ranging from communication and information, health and medicine, future energy, environment and climate change to transport and cultural heritage. Nanomaterials will lead to a new approach to manufacturing materials and devices. Faster computers, advanced pharmaceuticals, controlled drug delivery, biocompatible materials, nerve and tissue repair, crackproof surface coatings, better skin care and protection, more efficient catalysts, better and smaller sensors, even more efficient telecommunication. For example, a low risk solution using antibody modified bismuth nanoparticle, in combination with an X-ray dose equivalent to a chest X-ray specifically, has been shown to kill the common bacterium Pseudomonas aeruginosa in a set up designed to resemble a deep wound in human tissue. Nanosized gold particle could catalyse the oxidation of carbon monoxide better than anything previously known. Heparin functionalized nanoparticles have been use for targeted delivery of anti-malarial drugs. Heparin is abundant and cheap, compared to treatments that involve antibodies, an important consideration, since malaria is most common in developing countries. A bone repairing nano-particle paste has been developed that promises faster repair of fractures and breakages. DNA containing two growth genes is encapsulated inside synthetic calcium phosphate nanoparticles. In a remarkable demonstration of the extreme limits of nanoscale engineering, researchers have used the tip of a scanning tunnelling microscope to cleave and form selected chemical bonds in a complex molecule. Many medicinal and industrial endeavours have seen the use of Nanotechnology. Nanoparticles can attach to SARS COV-2 viruses, disrupting their structure and so kill the virus. These and other more recent advances in nanotechnology will be presented at this conference.

What will audience learn from your presentation?

- Most of the audience are nanotechnologists and thus can incorporate part of my research in their work or apply them to their work.
- The audience will be more knowledgeable at work in nanotechnology. This research faculty can use part of my research to expand their research. However, they must reference my work. It will improve the accuracy of a design, or provide new information to assist in a design problem.

Biography

Prof. Raymond C. Jagessar obtained his BSc (distinction) in Chemistry/Biology from the University of Guyana (1991) and was assistant lecturer in the Department of Chemistry from (1991-1992). He obtained his PhD from the UK in 1995. He held three Post-Doctoral Research Fellowships (PDF) at the University of South Carolina (USA), Wichita State University (USA) and the University of the West Indies during the period, 1996-1999. He has several international awards, amongst them are Chartered Chemist, CChem and Fellow of the Royal Society of Chemistry, FRSC, UK, Research Grants and recently, one of the awardees of the Guyana Innovation Prize, 2021. His research interests are broad, covering the spectrum of Pure and Applied Chemistry, Chemical Biology and Pharmaceutical Chemistry. He has published over 100 research articles, five book chapters, one book and presented at many conferences, locally and internationally. He is currently Professor in Chemistry (Organic and Inorganic) at the University of Guyana (South America), Fellow and President of the Caribbean Academy of Sciences.

Regina M. Chiechio*[1,3], Pascale Even-Hernandez[1], Celia Marets[1], Christelle Meriadec[2], Franck Artzner[2], Paolo Musumeci [3], Maria Jose Lo Faro[3] and Valerie Marchi[1]

[1]CNRS Universitè de Rennes 1, France
[2]Université de Rennes 1, France
[3]Università di Catania, Italy

Luminescent gold nanoclusters interacting with synthetic and biological vesicles

Thanks to their high electron density and ultrasmall size, gold nanoclusters (Au NCs) have unique luminescence and photo-electrochemical properties that make them very attractive for diagnosis, bio-imaging and theranostics. These applications require control of their delivery and interaction with cells and more particularly with the cell membrane. the Au NCs surface chemistry permits to control their interaction with lipid membranes. Here we demonstrate their ability of the AuNCs as markers of lipidic structures. Thanks to electrostatic interaction, the AuNCs adhere strongly to lipid vesicle membranes without altering their structure. SAXS technique make possible to localize the Au atoms at the vicinity of the phosphatidyl ammonium lipidic headgroups thanks to their high electronic density. In addition, we present a simple method for the encapsulation of the luminescent AuNC into liposomes without disturbing their integrity. These gold nanostructures can therefore serve as biomarkers of lipidic structures such as extracellular vesicular structures but can also be incorporated into liposomal cargos for targeting and drug delivery.

What will audience learn from your presentation?

- Process of synthesis of fluorescent nanoparticles (Gold Nanoclusters, Au NCs).
- Functionalization of NCs for labeling and bioimaging of targeted biological objects.
- Mechanism of interaction between NCs and biological or synthetic vesicles.
- Method of encapsulation of nanostructures in synthetic vesicles (Giant Unilamellar Vesicles, GUVs).

Biography

Regina Maria Chiechio was born in 1993 in Catania, Italy. She obtained her Master Degree in Condensed Matter Physics and Nanomaterial, pathway Nanosciences, Nanomaterials and Nanotechnologies with marks 110/110 cum laude from the University of Rennes 1, France, in June 2019. In November 2019 she started the Ph.D. course in Materials Science and Nanotechnology at the University of Catania in co-tutelage with the University of Rennes 1. She is currently working at the Department of Physics and Astronomy, University of Catania, and at CNR-IMM.

Bongiwe Dhlamini*, Hugues Kamdem Paumo and Lebogang Katata-Seru

North-West University, South Africa

Nano-engineered metal-based nutrients using chitosan for efficient plant nutrition and growth

In 2020, the number of people affected by hunger had dramatically increased globally under the shadow of the COVID-19-related economic shocks. The ongoing pandemic has put a strain on food productivity and induced a significant increase in food demands. Even before this scenario, acute hunger has risen in developing countries due to rapid population growth, socio-economic conditions, and climate change. Although bulky chemically processed fertilisers have been encouraged in recent decades to improve agricultural productivity, these inputs have also promoted environmental pollution. The nanoformulation of nutrients represents a cutting-edge strategy that can revolutionise the agricultural sector and solve current concerns surrounding sustainable agriculture and climate-sensitive crops. Recently, natural-sourced polymers' nanoparticles have been of scientific interest in agriculture due to their growth-stimulating potential, water-retention capacity, and bactericidal activity against phytopathogens . Alternatively, these nanomaterials can also serve as carrier devices for the controllable release of entrapped nutrients. This presentation focuses on the development of chitosan-based agronanochemicals, magnesium- and zinc oxide-loaded chitosan nanoparticles. The systems are prepared through ionic gelation of chitosan and tripolyphosphate in the presence of various concentrations of Mg salt and ZnO nanoparticles, respectively. The phytoassisted reduction process using the *Helichrysum odoratissimum* extract is employed to prefabricate the latter. These matal oxide nanoparticles and their chitosan-encapsulated derivatives will be systematically characterised through a combination of microscopic and spectroscopic techniques. The antifungal activity of the as-prepared nanoparticles against *Fusarium* species will be presented, and their effect on plant growth parameters will be discussed. The nutrient release profiles from these nanoformulated fertilisers will also be reported.

The presentation can be anticipated to provide avenues for discovering novel nano-engineered fertilisers for sustainable agriculture.

Biography

Bongiwe Dhlamini obtained a Master's Degree in Chemistry at the North-West University in 2020. Currently, she is a PhD candidate under the supervision of Prof. L. Katata-Seru and Dr. H. Kamdem Paumo. She is interested in the development of nanomaterials with potential application in agriculture.

Hugues Kamdem Paumo*[1], Rebaone Makaudi[1], Boniface Pone Kamdem[2] and Lebogang Maureen Katata-Seru[1]

[1]North-West University, South Africa
[2]University of Sao Paulo, Brazil

In situ development of silver nanocatalysts at chitosan-functionalised graphene oxide for conversion of 2,4-dinitrophenol in water

The discharge of untreated industrial effluents into the environment represents one of the leading causes of pollution on our freshwater ecosystems. Appropriate treatment of the contaminants in these effluents is a feasible approach that can value wastewater and reduce the negative impact on the environment. Among the organic contaminants that have been identified in industrial wastewater, nitrophenols have shown acute toxicity to human health and aquatic life [1]. Several technologies have been reported to treat nitroaromatics in water and these include the noble metal nanoparticle-assisted hydrogenation in the presence of hydrogen-donors. Stabilisation of these nanocatalysts onto supports is a popular strategy that improves their efficiency. Although the performance of noble metal nanocatalysts is laudable in terms of their synergistic action with the support matrix [2], high cost and limited availability are their major downsides [3]. The focus of this presentation is on the development of relatively low-cost materials that could support the *in situ* nucleation, growth, and stabilisation of Ag nanoparticles in adsorption procedures, without the assistance of a reductant and stabiliser. The simple fabrication of a four-component, graphene oxide/fumaryl chloride/chitosan/Ag NPs (GO-FL-CS-Ag NPs) composite will be described. The pre-synthesized graphene oxide sheets are cross-linked with bio-derived chitosan polymer through ester linkage using fumaryl chloride. Next, the reduction between silver ions and the amino-rich GO-FL-CS is carried out at room temperature under organic solvent-free conditions. The kinetic study for the conversion of the harmful nitrophenols to amino derivatives in water, using the in situ developed Ag NPs at solid supports will be discussed. The presented materials will be systematically characterised using a combination of microscopic and spectrometric techniques. The catalytic reduction route and reusability test will also be presented based upon voltammetric measurements.

What will audience learn from your presentation?

- This presentation will show that the presence of amino groups within the support structure provides a “green” and simple alternative for the nucleation and anchoring of metal NPs, in the presence of the corresponding cations.

Biography

Dr. Hugues Kamdem Paumo obtained his MSc (2014) and PhD (2017) in Chemistry at the University of South Africa under the supervision of Prof. MJ Mphahlele. He then joined the water research group of Prof. Arjun Maity at CSIR, South Africa from 2017 to 2019. Currently, he is a postdoctoral research fellow at North-West University under the supervision of Prof. LM Katata-Seru. He is interested in the development of nanomaterials with potential application in pharmaceutical, agriculture, and water reclamation. He has published more than 20 research articles in SCI(E) journals.

KEYNOTE FORUM

DAY 02

4TH EDITION OF

WORLD NANOTECHNOLOGY CONFERENCE

25-27 APR

Maros Halama*[1,2], Peter Slovenský[1], František Mihok[1], Malgorzata Makowska Janusik[3]

[1]Technical University of Kosice, Slovakia

[2]Slovak Academy of Science, Slovakia

[3]Jan Dlugosz University of Czestochowa, Poland

Thermodynamic and corrosion properties of metallic nanobjects and application of quantum chemical calculations in management of experiments in lab scale

Corrosion properties of Ag and Au nanoparticles in water-based environment were compared using electrochemical techniques hyphenated with quartz-crystal microbalance. In addition, quantum chemical calculations of Ag nanoparticles and Ag nanoparticles/ascorbic acid hybrid system were performed to find out how theoretical approach can contribute as support for laboratory experiments. An assessment of dissolution rate from measured corrosion parameters for both bare and inhibited nanoparticles was determined in Hank solution as simulated human body fluid. The dramatic change of redox behaviour for Ag nanoparticles was observed in the presence of antioxidant molecules of ascorbic acid (AsA). Inhibition effect in dissolution of Ag NPs initiated by AsA was theoretically proofed by performing quantum chemical calculations of redox properties of studied hybrid system. The quantum-chemical calculation has showed that the electrons are mainly transferred from AsA molecule to nanoparticle and the free radicals are suppressed. Combination of these techniques help to study unknown thermodynamics, corrosion of nanoobjects and finally assessment of the life-time of NPs applied in environment of interest.

What will audience learn from your presentation?

- The aim is to highlight problem related with opening “Pandora´s box” regarding reactivity of NPs and their interaction with environment due to the changes of redox properties by surface modification.
- Prediction of life-time of metallic nanobjects in application environment by monitoring of corrosion phenomena.

Biography

Dr. Halama is vice-dean for Research, Innovations and International Affairs, obtained M.Sc. in Chemistry at UPJS Kosice (partly Aristotle Uni. of Thessaloniki) and PhD at TUKE in Materials Science. Since 2006 he took part on several European Science Foundation’s trainings on advanced materials, nanomedicine and nanosafety. He has conducted more than 40 industrial inquires and failure analysis within energy sector. He was awarded with prestigious International Association for Advanced Materials Scientist Medal 2016 in Miami. Since 2017 he acted as member of Steel Advisory Group at RFCS, EC and since 2019 as CnGE representative, Captech Group, European Defence Agency, since 2019 member of Presidency of Slovak Battery Alliance. His actual research focusing on safety of advanced materials for Li-ion batteries, safety of nanotechnologies in different environment, safety of advanced materials in hydrogen technologies, application of artificial neural networks in material science.

Purushottam Chakraborty*, Biswajit Saha

Saha Institute of Nuclear Physics, India

Alkali-based molecular-ion sims: An innovative chemical approach for the exact composition analysis of quantum structures

If alkali metals such as Li, Rb, K, Na, Cs, ...etc. (referred to as A in general) are present in the neighborhood of the probing element (M) on a sample surface, quasi-molecular ions can be formed by the attachment of these alkali ions [$(MA)^+$ formation] in the Secondary Ion Mass Spectrometry (SIMS) process. The formation of these $(MA)^+$ molecular ions has strong correlation with the atomic polarizability of the element M. The emission process for the re-sputtered species M^0 is decoupled from the MA^+ ion formation process, in analogy with the ion formation in secondary neutral mass spectrometry (SNMS), resulting in a drastic decrease in the conventional 'matrix effect' in secondary ion mass spectrometry (SIMS). Although the detection of MA^+ molecular ions in SIMS has found its applicability in direct materials quantification, it generally suffers from a low useful yield. In such cases, detection of $(MA)_n^+$ [n=2, 3.....] molecular-ions offers a better sensitivity (even by several orders of magnitude), as the yields of such molecular-ion complexes have often been found to be much higher than that of MA^+ ions. The recombination coefficient of MA^+ or $(MA_2)^+$ molecular-ion species depends on the electro-positivity or electro-negativity of the element M, respectively. Apart from the surface binding energy of the respective uppermost monolayer, the changes in 'local surface work-function' have been found to play a significant role in the emission of these molecular ions. Although these MA_n^+ molecular-ion based SIMS has great relevance in the analysis of materials, a complete understanding on the formation mechanisms of these ion-complexes is still lacking.

A procedure, based on MA_n^+- SIMS approach, has been employed for the accurate germanium quantification in Molecular Beam Epitaxy (MBE)-grown $Si_{1-x}Ge_x$ alloys. The 'matrix effect' has been shown to be completely suppressed for all Ge-concentrations irrespective of impact Cs^+ ion energies. The methodology has successfully been applied for direct quantitative composition analysis of various thin films, multilayer structures and quantum structures without the need of calibration standards. Recent SIMS study on various ZnO-based nanostructures has successfully been correlated to their photo-catalysis and photoemission responses. The talk will address the basics of SIMS, complex formation mechanisms of $(MA_n)^+$ molecular ions and potential applications of the MA_n^+-SIMS approach in chemical analysis of low-dimensional materials.

What will audience learn from your presentation?

- My talk will address on the fundamentals of quantum structures, theoretical understandings of their "density of states" and their structural/compositional characterizations using state-of-the-art ion-beam methods.
- The audience will be acquainted with the basics of low-dimensional structures (nanomaterials) and an innovative methodology for direct quantitative analysis of smart materials.
- The talk will be pedagogical and motivational which will help the audience know the intricacies and wonders of smart materials and their applications in diverse fields of materials science.
- The researchers will be highly benefited to gain knowledge so that they can initiate experimental research in this challenging area. They can expand the scope of their expertise in teaching and guiding the students and researchers.
- The experimental physicists/chemists with their basic background, knowledge and training will be greatly enriched with the comprehensiveness in novelties and complexities of analytical methods to characterize low-dimensional materials.

Biography

Prof. Purushottam Chakraborty is considered one of the leading experts on ion-beam analysis of materials. His research areas include atomic collisions, low-dimensional materials, X-UV optics, nonlinear Optics, photonics/plasmonics, etc. He has delivered talks at more than 130 national/international conferences and published more than 120 scientific papers, including reviews, monographs and book-chapters. He edited a book on 'Ion-beam analysis of surfaces and interfaces of condensed matter systems' (Nova Science, New York) and Journal of Physics – Conference Series (Inst. of Physics, UK). He is one of the editors for the "Encyclopaedia of Materials: Electronics", to be published by Elsevier Science. He visited and worked at many renowned universities like FOM-Institute Netherlands, Padova University - Italy, Universite Laval - Canada, Friedrich Schiller University – Germany, Osaka Electrocommunication University - Japan, University of Pretoria – South africa, etc. He was awarded the "Most Eminent Mass Spectrometrist of India" and conferred the Gold Medal by the Indian Society of Mass Spectrometry. He has received the prestigious 'Premchand Roychand Scholarship (PRS)' and 'Rashbehari Ghose Fellowship' of Calcutta University. He is a Fellow of the Indian Chemical society and West Bengal Academy of Science and Technology.

Ramesh K. Agarwal

Washington University in St. Louis, USA

Environmentally responsible sustainable 'Green' nanocomposites

Most advanced composites currently available are made using non-degradable polymeric resins such as epoxies, esters, polyurethane, etc., and high strength and/or high stiffness fibers such as graphite, aramids, and glass, designed for long term durability. While they have desirable mechanical, thermal and chemical properties, they have two major disadvantages. First, the materials used are not sustainable; the high performance fibers (except glass) and resins are almost entirely derived from petroleum, and secondly these composites are non-degradable under normal environmental conditions. In recent years, the growing environmental concerns have pushed research in the area of bio-degradable green composites since they do not require petroleum (source of greenhouse gas emissions) and land-fills at the end of their lives. In green polymer composites, one of the two chemicals from which they are synthesized can be produced sustainably reducing their carbon footprint. For example, polyurethanes (PU) can now be produced using polyols from soybean oil, polyethylene terephthalate (PET) from ethylene glycol, and polybutylene succinate (PBS) from succinic acid. Use of renewable plant-based lignocellulosic fibers has been a natural choice for reinforcing (or filling) polymers to make them greener. Plenty of examples can be found where plant-based fibers are used for reinforcing non-degradable thermoplastic polymers such as PP, high, medium, and low density polyethylene (HDPE, MDPE, LDPE), nylons, polyvinylchloride (PVC), and polyesters as well as thermoset resins such as epoxies and esters to produce greener composites.

Due to their good mechanical properties, longer plant-based fibers, extracted from the stems or leaves of plants such as abaca, bamboo, flax, henequen, hemp, jute, kenaf, pineapple, ramie, sisal, etc., are being evaluated as low cost alternative reinforcements to commonly used glass fibers to make composites. These fibers are annually renewable, as compared to wood which takes 20–25 years to grow before it can be cut and used. Significant research efforts are currently being spent in developing a new class of fully biodegradable or compostable green nanocomposites by combining natural fibers with biodegradable resins. Most of the current technology is still in the research and development stage. This presentation will review some of these developments and their current and potential applications, especially in transportation sector.

Biography

Prior to joining the faculty at Washington University in 2001, Professor Agarwal was the Chair of the Aerospace Engineering Department at Wichita State University from 1994 to 1996 and the Executive Director of National Institute for Aviation Research from 1996 to 2001. From 1994 to 2001, he was also the Bloomfield Distinguished Professor at Wichita State University. He has received many honors and awards for his research contributions including the ASME Fluids Engineering Award (2001), ASME Charles Russ Richards Memorial Award (2006), Royal Aeronautical Society Gold Award (2007), AIAA Aerodynamics Award (2008), AIAA/SAE 2009 William Littlewood Lecture Award (2009), AIAA Lindbergh Award (2010), SAE Aerospace Engineering Leadership Award (2013), SAE Excellence in Engineering Education Award, SAE International Medal of Honor (2015) and AIAA Reed Aeronautics Award (2015) among many others.

Kyoungtae Kim*, Nhi Le and Jonathan Routh

Missouri State University, USA

Cadmium selenide zinc sulfide quantum dots on Saccharomyces cerevisiae: Their traffic routes and impact on endocytosis and exocytosis as well as on actin dynamics

Quantum dots (QDs) are nano-sized semiconductor crystals that are highly utilized for research and medical purposes. Although recent studies have hinted at the toxicity of QDs, their impact on fungal cells remains unclear. Instead of relying on each biochemical assay to assess the harmful effects mediated by QDs, we have used RNAseq to create altered transcriptome profiles in response to QD treatment. We found that cadmium-based QDs leads to an alteration in the quantity of mRNA transcripts implicated in endocytosis, membrane fusion, sorting at the endosome, and endosome maturation. We then examined the trafficking route of red Cadmium Selenide Zinc Sulfide Quantum Dots (CdSe/ZnS QDs) as well as the phenotypic changes it induces in budding yeast cells. We tracked CdSe/ZnS QDs' subcellular location by using yeast strains expressing different reference markers, including: plasma membrane reference marker GFP-2PH; early endocytosis vesicle reference marker Abp1- GFP; late Golgi/trans Golgi network reference marker FAPPI(PH)-GFP; and late endosome reference marker Vps10-GFP. We found that immediately after treating, CdSe/ZnS QDs interacted with yeast cells. However, CdSe/ZnS QD only co-localized with the plasma membrane reference marker after 3 hours of treatment, suggesting that CdSe/ZnS requires at least 3hrs to arrive at the plasma membrane. Around 6 hours after treatment, CdSe/ZnS was found at the plasma membrane, the early endocytosis vesicle, and the late Golgi/ trans Golgi network. QDs was never found co-localizing with the late endosome, suggesting that this is not a destination for CdSe/ZnS QDs intracellular trafficking. The rest of QDs' intracellular trafficking route is in need of further investigation. We also treated yeast with different concentrations of CdSe/ZnS QDs (4µg/mL, 12µg/mL, 50µg/mL) and studied the integrity of actin cable upon QDs exposure. After 6 hours, a higher percentage of cells showed actin cable fragmentation in 12µg/mL and 50µg/mL of QDs treatment. Furthermore, we performed a recovery assay by removing QDs from the culture media. After 3 hours of incubation in QDs- free media, partial actin cable recovery was observed, hinting that the effect of QDs toxicity is reversible. Additionally, our viability assay data reveals that 6hrs of QDs exposure led to a significant decrease in the yeast sample's optical density for all treatment concentrations. Interestingly, there was no significant difference in optical density between the treated samples and the control samples after 24 hours of treatment, indicating that QDs exposure only causes an inhibitory effect on yeast growth. We are currently assessing if QDs affect the membrane cargo Snc1 trafficking. Altogether, our research will provide new insights into the understanding of QD-mediated impacts on endocytosis and exocytosis.

What will audience learn from your presentation?

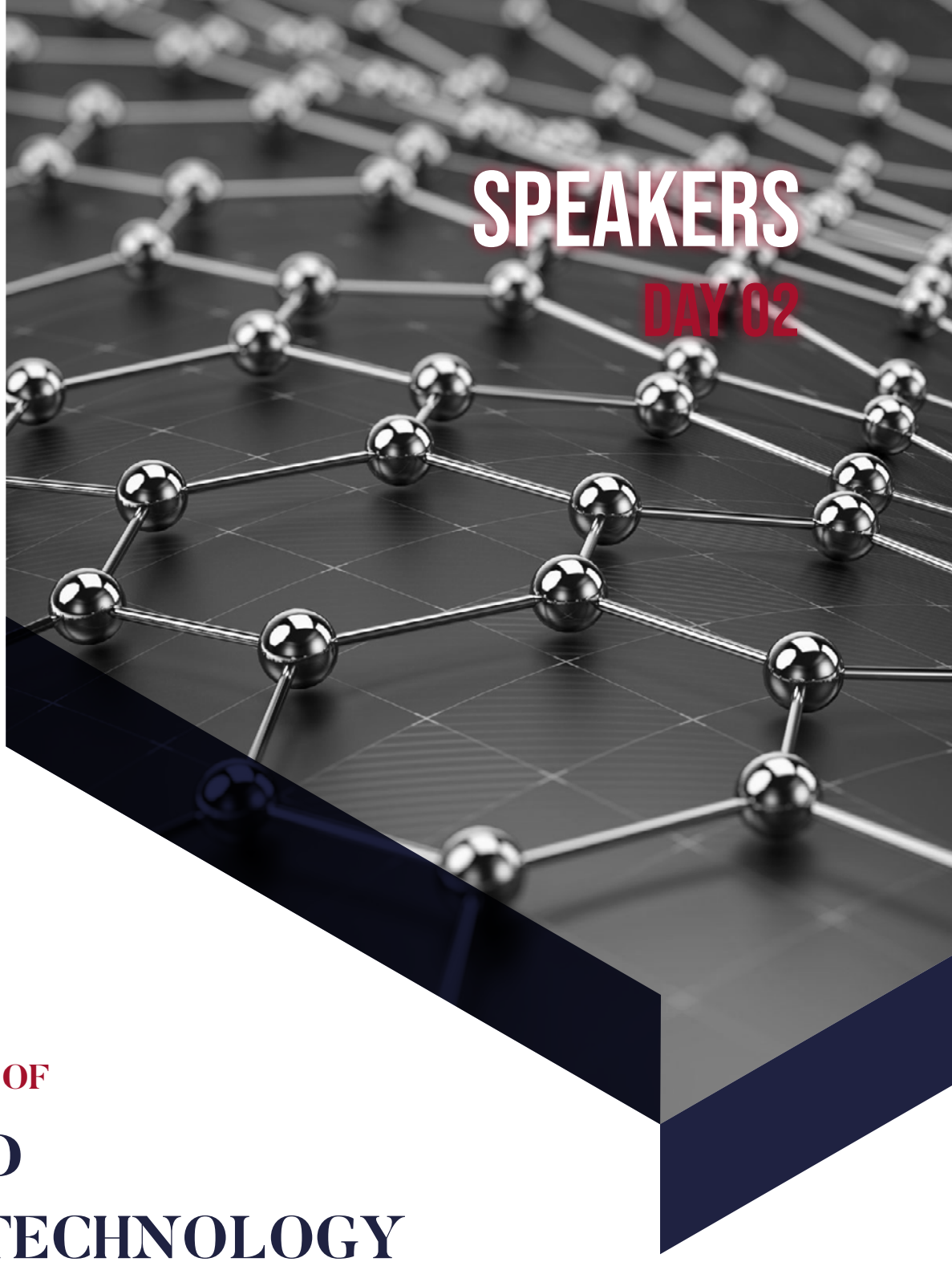
- Quantum dot chemical and physical properties.
- Quantum-dot impacts on the alteration of transcriptome.
- Transcriptome data-based hypothesis would be tested for more investigation on physiological impacts mediated by QDs.
- Over the last five years, we have characterized the toxicity of several Engineered Nanomaterials (ENMs) that are not strictly regulated by the FDA or EPA in the United States. ENMs, being nano- sized particles (1-100 nm in diameter), have a significant number of applications and are currently used in healthcare as fluorescent probes and drug delivery vehicles. They are also used in consumer products including textiles, cosmetics, and food.
- According to the EPA's Information Gathering Rule, companies must report on the chemical identity, manufacturing methods, and exposure of any nanoscale materials they incorporate into their products. We provided gene

expression data in yeast and mammalian cells exposed to nanoparticles, including carbon nanotubes, silver nanoparticles, metal oxide nanoparticles (ZnO and CuO), and quantum dots (CdSe/ZnS and InP/ZnS). With our results, we have identified thousands of genes and many cellular functions that were negatively impacted by ENM exposure.

- Notably, our contributions provided novel insights into the field of ENM-toxicity by implementing state-of-the-art transcriptomic techniques (RNA- seq). Although these agencies have attempted to manage the risks of ENM exposure, there are legal frameworks preventing their regulation because of their poorly understood toxicity. Currently, we have a poor understanding of ENM-toxicity, however, we continue to use them. These reasons are precisely why new government regulations and oversight are needed to responsibly use them. A big step in updating the current ENM government regulations is conducting a thorough investigation of their toxicity.
- Our findings on ENMs have ultimately helped us to understand how they are toxic through identifying changes in gene expression and what functions those genes are implicated in. Eventually, when we better understand how these extremely small materials behave, we can improve upon current regulation policies that will more efficiently protect public health and the environment.

Biography

Dr. Kyoungtae Kim is a professor at Missouri State University in Springfield, MO. He received his B.A. and M.A. in Biological Science at Kyungpook National University in Taegu, Korea. He went on to obtain his Ph.D. in Biology at Florida State University in Tallahassee, Florida, and completed his post-doc at Washington University in St. Louis, MO, where he studied cell biology and physiology. He is now located at Missouri State University where his research focuses on cellular trafficking and nanomaterial-based nanotoxicology. His work has been published in the following international peer-reviewed journals: European Polymer Journal FEMS Yeast Research, Cell Biology International, Nanomaterials and Biomolecules and many more. His research also has been covered by internal publications (2017, Mind's Eye, MSU Alumni Magazine), local media (KSMU Ozark Public Radio STEM spots, 2017), and many news articles in the College of Natural and Applied Sciences News Watch articles.



SPEAKERS

DAY 02

4TH EDITION OF

WORLD NANOTECHNOLOGY CONFERENCE

25-27 APR

Fei Teng*, Jian Wu
Harbin Institute of Technology, China

The potential application of EUG/NR composite with enhanced mechanical and tribological properties in aircraft

The Eucommia ulmoides gum (EUG) is an isomer of natural rubber (NR). The overall properties are enhanced by the unique trans-configuration. According to reported articles, the EUG has excellent miscibility with other polymers, which means the potential application in aircraft in order to satisfy severe working conditions. The whole tire test of aircraft tire is extremely expensive and the results may be affected by unproper production. With the development of computer science, the properties of rubber blends are able to be predicted by molecular dynamics (MD) simulation. Lots of experimental researches proved that the mechanical and tribological properties of EUG/NR composite were enhanced by EUG addition. However, the enhancement mechanism is still remained to be revealed. We propose a more suitable molecular modelling method for the EUG/NR composite, which considering the effects of cross-linking density, bond composition of vulcanization and so on. Suitable size of model is determined for describing the blending system and saving computing power. The results indicate the hardness of the composite increases with the EUG content in the blending system. The young's and shear modulus show a nonlinear trend with EUG addition. The largest shear modulus and young's modulo both occur in the 20/80 composite, which are 11.8% and 11% higher than that of NR. The numerical differences between the modulus of the cross- and uncross-linked models reflect the important influence of the cross-linking structure on the overall properties. The results of fractional free volume (FFV) and mean square displacement (MSD) explain the enhancement mechanism of the mechanical properties. Less abrasion is observed in the friction process of EUG/NR composite with high EUG content. The EUG content of the EUG/NR composite is suggested to be no more than 30 phr for the expected overall properties. The results of MD simulation are well trendily matched with the experimental results. Although the huge time and space scale gap between the experiment and simulation makes it impossible to compare results numerically, the results of the MD simulation can provide us a view from nanoscale for the prescription design of rubber composite in aircraft tire application.

What will audience learn from your presentation?

- The modelling method is suitable for other polymers with cross-linked structure. The results are more accurate than the simple blending system.
- The analysis idea of our work can be adopted and combined with experimental studies for multi-scale research of material design.
- The great overall properties and wide potential application of EUG may inspire others for the R&D of green tire and rubber products.

Biography

Mr. Teng is a postgraduate student of Harbin Institute of Technology, majoring in mechanical engineering. His research is focus on the tribological behaviors of rubber composites for aircraft tire application. The multi-scale solution for soft material is his current learning field. He joined the research group of Dr. Wu at Center for Rubber Composite Materials and Structures in 2020. He has published 5 research articles in SCI journals.

Boggarapu Nageswara Rao
Koneru Lakshmaiah Education Foundation, India

Design of experiments to specify the optimal process parameters in nano-powder-mixed EDM of IN800 with coated electrodes

The low thermal diffusivity and high thermal strength of INCONEL materials are useful in the construction of equipments of electrical power plant, chemical vessels, gas turbines and nuclear reactors. For machining of such hard materials, there is a need for heavy-duty machining equipment and tooling to minimize chatter. Optimal electrical discharge machining (EDM) parameters are to be specified for producing quality products. Karunakaran and Chandrsekharan have performed experiments employing the die sinking CNC EDM machine (Xpert1 model of Electronica India Limited). Aluminum powder is mixed with the low viscosity kerosene and stirred for 9 hours in the magnetic stirrer, which minimizes the particle size to 5 Nm. Aluminum nano powder concentration is 3g/l. The nano powder mixed EDM (n-PMEDM) minimizes arcing problems. This presentation focuses on machining of INCONEL 800 in PMEDM with electrolyte copper electrode as well as silver coated electrolyte copper electrode. Three independent process variables considered in the design of experiments are gap current, pulse-on-time and pulse-off-time, whereas the material removal rate (MRR), the surface roughness (SR) and tool wear rate (TWR) are the dependent performance indicators. Modified Taguchi approach is followed to perform few experiments and generate output responses for the full factorial design of experiments with expected range. Different sets of optimal process parameters are obtained for the output responses. The process designer needs a set of optimal process parameters. A simple and reliable multi-objective optimization technique is followed to identify a set of optimal process parameters. Empirical relations for MRR, SR and TWR are developed in terms of the EDM parameters and validated with test results. Test results are found to be within the expected range. Statistical factor is worked out on the output responses due to machining of INCONEL 800 in PMEDM with electrolyte copper electrode and silver coated electrolyte copper electrode.

What will audience learn from your presentation?

- Majority of industrial engineering problems are complex in nature and very difficult to formulate theoretically. Hence, there is a need for experimental investigation. As the number of parameters and assigned levels to each parameter are increasing, it is practically impossible to perform that many tests. In such situations, Taguchi method explained in the presentation will help them to perform few experiments and obtain the information for full factorial design of experiments.
- Modified Taguchi method explained in the presentation will help the audience to estimate the range of output responses for the specified process parameters. This type of analysis will be helpful to know well in advance the scatter in the output responses due to repetition of tests.
- The simple and reliable multi-optimization technique will definitely help the process engineers to identify a set of optimal process parameters for achieving the desired output responses.
- Development of empirical relations for the output responses help the process engineer to understand the behavior in case of slight variations in the assigned levels of the process parameters.
- Statistical factor will help the designer in understanding the influence of change in the process.

Biography

Dr. Boggarapu Nageswara Rao has completed his M.Sc. (1975) & Ph.D. (1982) in Mathematics from IIT Bombay, India. Currently he is working as Professor at Koneru Lakshmaiah Education Foundation, India. He also worked as Scientist/Engineer at ISRO/ VSSC Trivandrum for 33 years. He is the author/co-author of 315 articles in journals. He has successfully supervised 20 PhD projects. He is serving as reviewer in number of journals. He is a member of the Aeronautical Society of India (AeSI); Indian Society of Theoretical and Applied Mechanics (ISTAM); and Indian Society for Non-Destructive Testing (ISNT).

Thomas Jüstel*, Jan Kappelhoff
FH Münster-University of Applied Sciences, Germany

Rare earth doped $LuPO_4$ nanoparticles for multimodal medical applications

A novel approach for the improved treatment of cancer in the framework of radiation therapy will by presented, including a comparison to traditional cancer treatment schemes. This approach is about UV emitting $LuPO_4$:Pr^{3+} nanoparticles in contact to cancer cell lines. Those nanoparticles absorb X-rays and convert it into UV-C radiation, whereby cancer cells will be efficiently inactivated. In consequence, the harm of the radiation treatment for the patient can be reduced tremendously. Selected materials have to meet specific physical and chemical properties to be applicable, like nanoscale Pr^{3+} doped $LuPO_4$. Recent research results are shown to proof the concept, as well as further possible applications of rare-earth doped $LuPO_4$.

What will audience learn from your presentation?

- The audience gets an inside view of a completely new form of cancer therapy.
- It is a novel pathway in cancer therapy, while the radiation dose at the patient can be reduced due to higher treatment efficiency. This could reduce the negative “side effects”. The proof of concept at the cellular level has been made, however, much more research with capable partners is required.

Biography

Thomas Jüstel was born in Witten, Germany in 1968. He studied chemistry at the University of Bochum from 1987 to 1992. He received his Ph.D. in coordination chemistry in 1995 in the group of Prof. Dr. K. Wieghardt (Faculty of Chemistry). He was hired by the Philips Research Laboratories Aachen in summer 1995 as a research scientist, where he started to work on luminescent materials. Some years later he became a Senior Scientist; then he was promoted to a Principal Scientist in 2003. In spring 2004 he became a professor of Inorganic Chemistry and Material Sciences at the Münster University of Applied Sciences in Germany. His current research at the University deals with nanoscale materials and novel luminescent compositions for LEDs, UV radiation sources, and X-ray detectors. He also consults several companies in the field of chemistry and light sources. His work has been published in about 250 papers and has led to 100 granted US patents on inorganic luminescent materials and their application in detectors, fluorescent lamps, plasma displays, and solid state light sources (LEDs and OLEDs).

Shivani Dhall
D.A.V. College, India

Role of electron beam-induced deposition (EBID) technique in joining of broken carbon materials

In this presentation, joining of broken multiwalled carbon nanotubes (MWCNTs) via an electron beam- induced deposition technique is discussed. Current-induced breakdown caused by Joule heating was achieved by applying an appropriate sweep voltage. Scanning electron microscopy images indicated physical joining of broken tubes. To confirm electrical joining of the tubes, current–voltage measurements of the same tube were carried out before and after joining. The current–voltage characteristics remained ohmic after joining of the broken tube. This approach provides a significant tool for repairing CNTs in interconnect technologies and assembly of three-dimensional (3D) nanostructures.

What will audience learn from your presentation?

- Knowledge of separation of nanotubes from network.
- They will learn how we use EBID technique at nano-level for the joining or welding of nanomaterials.

Biography

Dr. Shivani Dhall has been working as an Assistant Professor in the Department of Physics, D.A.V. College, Jalandhar, since July 2018. Previously, she worked as a NPDF in Department of Physics, IITD. During her PhD, she worked in CEN, Electrical Department, IIT Bombay. She got best INUP project award from IIT Bombay in 2015. In 2018, she awarded with CSIR Nehru and DS Kothari Fellowships. In 2019, She received TARE project under DST for continue her research work. She is working on carbon materials, nanoparticles and their device fabrication using lithography technique for gas sensing, photo-sensor and interconnected applications. She is reviewer of many SCI journals. She has 21 SCI Journals publications.

D. Nagasamy Venkatesh

JSS College of Pharmacy, India

Atazanavir loaded nano structured lipid carriers: Preparation and characterisation

The aim of the present work was to prepare and characterization of atazanavir loaded nanostructured lipid carriers, Atazanavir (ATV), chosen is a BCS class II drug with poor water solubility and high permeability (log p of 4.11). In adults, ATV-recommended therapeutic dose is 400 mg once a day. Besides these, it undergoes rapid first-pass metabolism in liver, leading eventually to marked reduction in the drug oral bioavailable fraction (i.e., 60%) in humans and animals such as rats, and so on. To circumvent the aforementioned limitations, various formulation approaches of ATV have been reported such as, nanocrystals, nanoparticles, tablets and capsules but all with limited fruition. Atazanvair loaded nano structured NLC formulation was prepared by solvent emulsification-evaporation technique. The formulated solid lipid nanoparticles have the mean particle size 130 nm, zeta potential was found to be -13.2 mV and Polydispersity index values were found to be 0.27. DSC and FTIR studies revealed change in the crystallinity index of drug when incorporated into NLC. Cell lines studies and In-vitro cytotoxicity studies was carried out to evaluate the efficacy and safety of the formulation.

What will audience learn from your presentation?

- They audience can learn about the method of preparation of atazanavir loaded nanostructured lipid carriers.
- Characterization technique's involved in the study.
- Use of this drug loaded NLC in exhibiting the in vitro cytotoxicity studies using an appropriate cell lines.

Biography

Dr. D. Nagasamy Venkatesh is working as Associate Professor at Department of Pharmaceutics, JSS College of Pharmacy, Udhagamandalam. India. Dr. D.Nagasamy Venkatesh is interested in developing certain nanobased drug delivery systems for antiviral and anticancer drugs. His research is also extended in developing oral sustained/controlled drug delivery systems for certain drugs of therapeutic interest and analytical and bio-analytical method development for such drugs. He serves as a reviewer of more than 25 peer reviewed journals including AAPS, Carbohydrate polymer, Indian Journal of Pharmaceutical Sciences. He has authored more than 50 peer-reviewed publications. He has received three best awards for his presentations/publications in national and international level conferences.

Arun Kumar Singh
Guru Ghasidas Vishwavidyalaya, India

Field effect transistors based on two-dimensional materials

Two-dimensional (2D) atomic crystals have attracted intense recent interest in science and engineering due to their rich and tunable electronic, optical, mechanical, chemical, thermal and magnetic properties. These atomically thin materials, with a nearly perfect crystalline structure and dangling-bond free surface, have emerged as a new material platform for fundamental materials science and diverse technology opportunities. Recently, 2D materials beyond graphene mainly transition metal dichalcogenides (TMDCs) (e.g. MoS_2, $MoSe_2$, WS_2, and WSe_2) are finding niche applications for next-generation electronics. Among various electronic devices, the field- effect transistors (FETs) is the very important and a basic element of any electronic circuit/device. MoS_2 is a typical example from the layered TMDCs family, is n-type semiconductor with an indirect bandgap of 1.2 eV and can be easily exfoliated by micromechanical exfoliation technique. Here we have presented high-performance field-effect transistors of different layer (single, bi- and multi layer) of MoS2 nanosheets. We have also discussed fabrication of all components of FETs using 2D materials and their performance. Finally, the challenges for this promising material are featured on the basis of its current development.

What will audience learn from your presentation?

- All those who interested in 2D materials and related work will enjoy. It will also be of great interest to both specialists and general scientists from diverse backgrounds.
- Device fabrication.
- Electronic properties of 2D materials.
- Applications of 2D materials.
- Our study may also useful for other area of science and engineering.

Biography

Dr. Arun Kumar Singh is working as Associate Professor at Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, India. He received his M.Sc. degree in Physics from Banaras Hindu University, Varanasi, India and received his Ph.D. degree from School of Materials Science and Technology, IIT(BHU), India.After Ph.D., he joined postdoctoral research work at Graphene Research Institute, Sejong University, South Korea. He got India most prestigious research award, “INSPIRE Faculty awards” from DST, India. He has published many papers as a main author and co-author in international journals/conferences in the area of materials science/ physics. His research work basically includes the charge transport in organic semiconductors/two dimensional nanomaterials and their electronics device applications. He is life member of many scientific societies and reviewer of International scientific journals.

I.V. Melnyk*, S.B. Tuhai and I.S. Shved

National Technical University of Ukraine, Ukraine

Estimation of discharge arc current density in the technology of obtaining ceramic nanocoatings with activation of metal vapor during electron-beam evaporation

The High Voltage Glow Discharge Electron Guns (HVGDEG) are widely used in industry for obtaining the coating from chemically-complex ceramics, including advanced nanocoatings [1, 2]. The main advantages of applying such type of electron guns for providing Physical Vapor Deposition (PVD) of thin films from complex compound is the simplicity of gun construction and evacuation equipment, as well as operation of HVGDEGs in the soft vacuum with the possibility of using different gases, including noble and active ones [1 – 4]. The operation pressure of HVGDEGs is usually in range of 1 – 10 Pa, but it also strongly depended on the using operation gas [3, 4]. If maintaining of the chemical reaction between the evaporated metal and residual gas in the soft vacuum without additional activation is impossible, the non- simultaneous arc discharge with the cooled ring electrode, located under the crucible, can be used for providing the activation of such reaction [3]. Corresponded electrodes' scheme of the equipment for arc discharge lighting is presented at Fig. 1 [3].

For providing the estimation of the level of activation of evaporated material and probability of its chemical reaction with the residual gas in such conditions, the pervious estimations of the electric parameters of arc lighting is necessary. Therefore, obtaining of analytical relations for such estimations is the subject of this report.

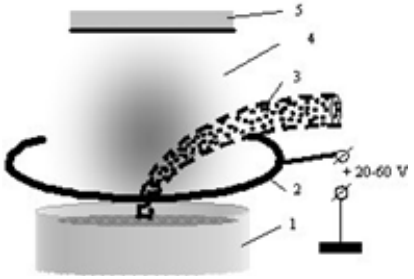


Fig. 1. Shematic view of arc ionization equipment. 1 – crucible, 2 – ring-like electrode, 3 – electron beam, 4 – vapor of evaporated materials, 5 – substrate

The distribution of electric field potential at the plane of ring electrode is defined by solving of the simple differential equation:

d2φ(r) = C + C2, (1)

dr2 1 √φ(r)

where C_1 and C_2 – the equation coefficients, depended on the power of electron beam, pressure of residual gas and on concentration of meal vapor. Considering

of these coefficients is the separate problem and it isn't connected with the subject of this report.

By using the corresponded analytical transforming, with taking into account the initial value of potential at the surface of ring φR = φd, the differential equation (1) is reduced to the cubic one:

$2C_2t^3 — t^2 + C_1r^2 = 0,$ (2)

where

$t(r) = \varphi(r) + \varphi_0.$ (3)

Set of equations (2, 3) is solved analytically with using well-known Cordano formula [5]. Corresponded solution can be written as follows:

1 C2r4 C1r2 1 D(r) = 6 1 2 — 3 + 6. (4)

36C2 16C2 532C2C2 4665 2 3 1 C1r2 3

t(r) = — + √D(r) + \1 — C1r2 + √D(r). √216C3 4C2 √216C3 $4C_2$

Numerical solution of the set of equation (4), with taking into account the initial condition φR = φd, is presented at Fig 2. With knowing the potential distribution φ(r), the current density of non-simultaneous arc discharge is defined as follows:

$j(r) = (2e)1.5\sqrt{\varphi(r)}\,(N_{im}\sqrt{1}_{im} + N_{ig}\sqrt{1}_{ig} + (N_{im} + N_{ig})\sqrt{1}),$ (5)

where e – charge of electron, Nim – the concentration of ions of evaporated metal, Nig – concentration of ions of residual gas, mim and mig – corresponded masses of metal ions and gas ions correspondently, me – mass of electron.

Dependences j(r), obtained with using the set of equations (4, 5), are presented at Fig. 3. All calculations have been provided for evaporation of titanium in the nitrogen media with beam power Pb = 10 kW.

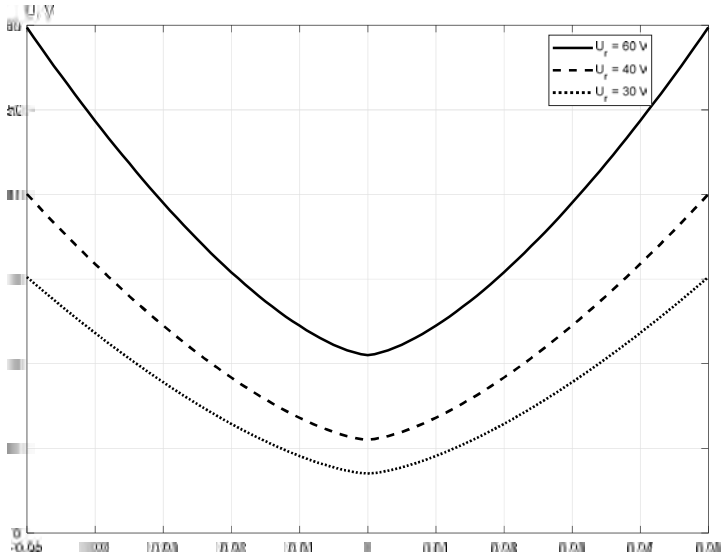


Fig. 2. Dependences of the potential distribution in the plane of ring for different voltage on the ring Ur, obtained with using the set of equations (4).

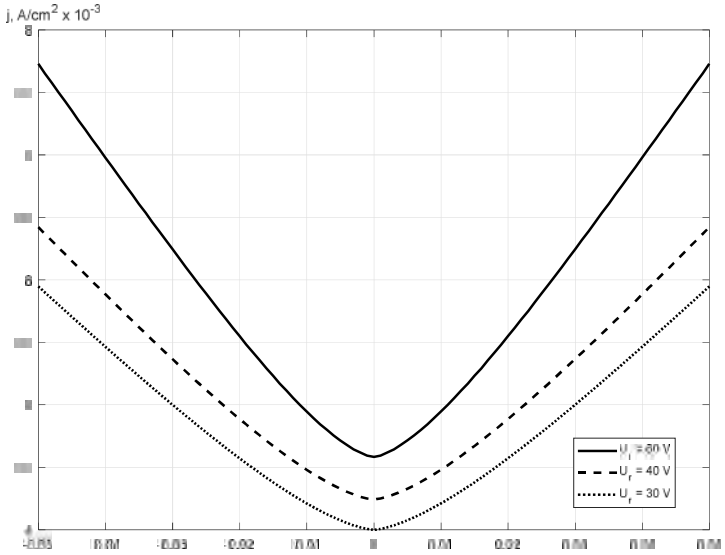


Fig. 3. Dependences of the current density of arc discharge in the plane of ring electrode, obtained with using the relations (4, 5)

Biography

Igor V. Melnyk was born in 1966. He received the Dipl. Eng. degree in electron devices and the Ph.D. degree from the Polytechnic Institute of Kiev, National Technical University of Ukraine, Kiev, in 1989 and 1994, respectively.,Since 1989, he has been with the Electron Devices Center, Kiev Polytechnic Institute, first as an Engineer, then, since 1994, as an Associate Professor. His research interests include computer techniques, mathematical simulation of electron beam and plasma devices, network technologies, and the Internet, including parallel computing.

Rosalind Volpe
Silver Nanotechnology Working Group (SNWG), USA

Road to registration – Nanosilver -10 years later

The Silver Nanotechnology Working Group (SNWG) (2009-2019) was a small group of companies with interests in using nanosilver in products. The team consisted of an interesting cross-section of toxicologists, advanced material scientists, chemists, and other silver and nanosilver specialists. In 2008, Servicios Administrativos Peñoles, S.A. de C.V., approached the EPA Office of Pesticide Programs (OPP) to register a new nanosilver product. They were told at the time that there was a moratorium on registrations for nanosilver products. Some nanosilver products had already been registered, but because of new environmental concerns, registrations were on hold. Both the Silver Institute and Peñoles decided that it would be best to form a group to try to work with EPA OPP to overcome this registration moratorium. Dr. Rosalind Volpe, D.PH whose background is in environmental health and metal toxicology was hired to head the Silver Nanotechnology Working Group which at the time was a project of the Silver Research Consortium, LLC. Over a four month period at the end of 2008, Dr. Volpe began to recruit companies interested in working to clear a path for registration of nanosilver products.The Silver Nanotechnology Working Group (SNWG) was formed in January 2009 with six members. Twelve years after the founding of SNWG and its push to overcome many regulatory hurdles, and with the help of the EPA and other nanosilver companies, there now appears to be a relatively clear registration path for nanosilver products in the US that will be finally completed at the end of the registration review in mid- 2022.

What will audience learn from your presentation?

- The audience will understand the difficulties that can occur in bringing a nanotechnology product to full registration with the EPA.
- The audience can learn how to avoid some of the difficulties that faced the nanosilver industry in getting their products registered with the EPA.

Biography

Dr. Volpe rceived her D.PH (Doctor of Public Health) from the Environmental Sciences Department of Columbia University in 1988. She spent 33 years in environmental toxicology and policy, specializing in Heavy Metals, lead, zinc, cadmium, and silver/nanosilver. She served as Director of the Silver Nanotoxicology Working Group (SNWG) for the last 10 years of her career and is now retired, but still consults and remains the Director of the Silver Nanotechnology Working Group.

Mohamed Elmahi Mohamed Ahmed

University of Messina, Italy

Structural and optical properties of ZnO nano-Powder synthesized by combustion and sol-gel method

ZnO is considered as the most important chemical compounds due to their distinctive properties owing to its wide band gab and large exciton binding energy. It is well known that the structural and the optical properties of ZnO differ by different methods of preparation. X-ray diffraction (XRD) and Transmission electron microscopy (TEM) were used to determine the structure properties of un-doped ZnO powders. Ultraviolet visible spectroscopy (UV-Vis) and Photoluminescence spectroscopy (PL) were used to determine the optical properties of un-doped ZnO powders prepared by both sol-gel and combustion method. The obtained results from ZnO synthesized by the sol- gel method showed that the crystallite size of ZnO was increases by increasing of the annealing temperature. Also, little change in the lattice parameter was observed when the annealing temperature increased, this change may be attributed to the change of particle size and quantum size effects. It is observed also that similar structure of ZnO prepared by sol-gel and combustion can be obtained at particular conditions. TEM studies showed that the ZnO nanocrystals are irregularly spherical with average diameter of 32 nm which is similar to the calculated crystallite size from the XRD data. The calculated energy band gab of ZnO prepared by sol-gel method is found to be increased with increasing the annealing temperature. There was a clear difference between the two PL spectra obtained from ZnO synthesized by a different method which is assigned to be due to complicated defect chemistry relevant to the experimental process. Also, the concentration and the type of defect are basically associated with preparation method.

What will audience learn from your presentation?

- The audience will be able to know the effect of the preparation methods (Combustion and Sol-gel) on the structure and optical properties of un-doped ZnO.
- Using of X-ray diffraction (XRD) and Transmission electron microscopy (TEM) techniques to determine the structure properties of un-doped ZnO nano-powders.
- Using of UV-Vis spectrometer and photoluminescence (PL) techniques to determine the optical properties of un-doped ZnO nano-powders.
- The audience will know the difference in the structural and optical properties of the sample with different methods of synthesized.

Biography

Mr. Mohamed is studying Condensed Matter of Physics at University of Messina, Italy. He graduated from Sudan university of Science and Technology department of physics in 2015, then he received his Master's degree in Physics in 2018 at the same institution. He has been working as Teaching assistant at SUST. Also, has been working at University of Khartoum in laboratory of Physics, collage of Engineering.

L. Catucci*[1], V. De Leo[1], A. M. Maurelli[1], F. Ciriaco[1], S. Di Gioia[2] and M. Conese[2]

[1]University of Bari, Italy
[2]University of Foggia, Italy

Polymer-modified liposomes as nanocarrier for oral delivery of natural active molecules

Liposomes, with their ability to incorporate molecules of different polarity, are particularly suitable for the delivery of drugs, proteins and other bioactive molecules. Nevertheless, first-generation vesicles suffer from some limitations including physical instability, short in vivo circulation lifetime, reduced payload, uncontrolled release properties, and low targeting abilities. Liposome performance can be improved using both natural and synthetic polymers.

In this study, we exploited polymer-liposomes hybrid system for the oral delivery of natural active molecules. Specifically, we used curcumin, a natural hydrophobic compound with antioxidant, anti-inflammatory and antimicrobial properties but that shows low aqueous solubility and therefore very poor bioavailability, in vivo instability, and rapid metabolism. Therefore, encapsulation of curcumin in liposomes adapted for oral delivery could be a valid approach to protect it from degradation in the gastrointestinal tract (GIT) and promote its absorption. This work illustrates how it is possible to adapt liposomes to oral delivery of curcumin by modulating their composition and coupling them to a suitable polymeric cover. In particular liposomes prepared by micelle-to-vesicle transition method were coated with the pH-sensitive polymer Eudragit S100 using a pH-driven and organic solvent-free method

The maximum EE% obtained was around 98%. Liposomes were very stable, showing a low tendency to aggregate both at 4 ° C and 25 ° C. The antioxidant and release properties have proved excellent, with a TEAC comparable with that of free curcumin and a cumulative release complete after 200 min. TEM investigations revealed that the Eudragit S100 coating includes several liposomes into clusters of variable shape and size. Prepared vesicles are able to enter in Caco-2 cells through a mechanism of endocytosis where they exert a protective action against oxidative stress as proved by in vitro tests [2]. Liposomes with a double polymer shell were also prepared to gain mucus penetrating and bile salts resistant features in GIT. Vesicles were covered with a first polymer shell of PEG-2000 and then with a second shell of Eudragit-S100. In silico investigations have been conducted to optimize the encapsulation efficiency (EE%) and the loading capacity (LC%) of the curcumin in these conditions. In vitro simulated saliva-gastrointestinal digestion of such systems was performed.

What will audience learn from your presentation?

- The strategy adopted in this work is suitable for the development of polymer- lipid systems for colonic delivery of hydrophobic bioactive molecules.
- The work illustrates that a green, fast and easily scalable pH-driven method allow to cover liposomes with a polymeric layer that keeps vesicles and their cargo intact in the gastrointestinal tract.
- Coverage of liposomes with a double polymer shell can further improve liposome performance in oral delivery of hydrophobic molecules

Biography

Prof. Catucci studied Chemistry at the Bari University, Italy and graduated with summa cum laude as MS in 1991. She then obtained a CNR post degree grant (1991-1993) at the actual Institute for Chemical Physic Processes. She received her PhD degree in Chemistry in 1997 at University of Bari, where in 1996 she got the Researcher position and in 2005 that of Associate Professor. She had international experiences at Imperial College-London, BCR of Szeged-Hungary, Universität Munic-Germany and Albert-Ludwigs-Univeritat of Friburg-Germany. She has published more than 70 scientific publications in international journals (IF).

Laura Mais*, Michele Mascia, Simonetta Palmas and Annalisa Vacca

University of Cagliari, Italy

Catalysis of ORR in nano-structured Mn oxides based-electrodes for microbial fuel cells

The microbial fuel cell (MFC) is a biotechnology that utilises bacteria to create clean and renewable electrical energy by oxidising organic substances in wastewater and represents a promising alternative for generating power. The performance of MFCs is currently limited by the cathode, and this problem is projected to remain for some time. Thus, cathode materials and their design are the most challenging aspects of an MFC. Previous research has determined that the oxygen reduction reaction (ORR) on the cathode is a limiting step for electricity production. The ORR rate is a major factor to be considered in the design of low-cost and high-efficiency MFCs. Platinum (Pt) is a highly active catalyst generally used to improve the ORR rate. However, catalyst poisoning of Pt-based cathodes are essential problems, which cause considerable kinetic losses in ORR, especially in the long-time operations. Despite higher power density of Pt in the polarization curve, poisoning of Pt cathode may occur by exposure to wastewater in long time operations of MFCs lead to the lower potential generation. For this reasons, low-cost non-Pt catalysts should be developed. Manganese dioxide has previously been studied as a highly chemical stable, eco-friendly and cost-effective alternative to Pt in fuel cells. In this work, a carbon cloth (CC) air cathode decorated by nano-structured MnO2 was prepared using a voltametric method, in which CC acted as a support for the MnO2 catalyst. After the electrodeposition, the prepared catalyst has been coupled with a mixture of activated carbon and carbon black (AC/CB) by a paint brush method. Linear sweep voltammetry (LSV), scanning electron microscopy (SEM) and X-ray diffraction (XRD) were used to characterise the prepared air-electrodes. The bio-activity of the MFCs equipped with the prepared MnO2 air cathodes was evaluated: the influence of MnO2 electrodeposition time on cathode performance was investigated.

What will audience learn from your presentation?

- The audience can use the techniques proposed in the present work to set an experimental procedure that can be used for the synthesis of nanostructured manganese oxide.
- The audience can apply a defined procedure for the synthesis of new materials for energy application.
- This research can be used by other researchers both for energy applications and wastewater treatment, because it is a low-cost solution for the set-up of microbial fuel cells.
- This research will provide a practical solution to simplify the synthesis of cathode surfaces, as the process studied for obtaining the new materials can be easily scaled from mm2 to cm2 of electrode surface.

Biography

Laura Mais is master graduate in Chemical Engineering in 2011 and PhD in Industrial Engineering in 2015; she got the assistant professor position in the field of “Chemical Plant design”. The research activities are focused on the field of electrochemical engineering applied to the study of processes for environmental remediation and energy conversion. Main topics have been electrochemical synthesis and characterization of semiconductor nanostructured materials (anodization for synthesis of TiO2 nanotubes), electrochemical characterization of the deposition process of refractory metals. In particular, the study covers key aspects such as catalytic activity of electrode materials, identification of reaction mechanisms, and surface/solid interactions.

Bekir Fatih Kahraman*, Ahmet Altin
Zonguldak Bülent Ecevit University, Turkey

A research on process parameters of heavy metal immobilization using nano zero-valent iron (nZVI) in contaminated soils

Heavy metal contamination brought about by industrialization severely affects soils and groundwater sources. Elevated heavy metal concentrations in soils can cause toxic effects on living organisms by direct exposure or by entering into the food chain. Immobilization is a soil remediation method that aims to decrease the mobility and bioavailability of heavy metal contaminants to reduce the environmental impact of these contaminants. However conventional immobilization methods have destructive effects on soil structure and functionality. One of the innovative immobilization methods is nano-sized zero-valent iron (nZVI) technology. nZVI is a unique material that is highly reactive, environmentally friendly, and easy to use. Its small size makes it applicable to soil and groundwater contamination problems. On the other hand, the effective use of nZVI in soil media requires a thorough understanding of process parameters. Besides the efficiency of the process in complex contamination scenarios needs to be investigated. In this lab-scale study, nZVI was applied to Pb, Ni, Cr, and Cd contaminated soils for immobilization, and the process parameters (nZVI concentration, temperature, nZVI suspension pH, and contaminant concentration) were investigated using a factorial design approach. The immobilization performance of the process was measured by analyzing the most mobile soil heavy metal fractions (exchangeable and carbonate-bound fractions). The results showed that Pb, Ni, Cr, and Cd were immobilized 52.4, 43.8, 43.4, and 28.1%, respectively. The investigated process parameters had significant effects on the process efficiency and these effects varied for every heavy metal. A modified version of the process incorporating activated sludge addition was also tested on soil contaminated with Pb and diesel fuel. Besides Pb immobilization, biological degradation of diesel was detected. These results indicated the potential of nZVI application together with other remediation approaches for co-contaminated site reclamation.

What will audience learn from your presentation?

- Nano zero-valent iron (nZVI) application is an effective immobilization tool for heavy metal-contaminated soils.
- There are different process parameters affecting the immobilization via nZVI application such as nZVI and contaminant concentrations, temperature, and pH.
- The effects of process parameters are not the same for every heavy metal.
- Combined use of the nZVI process and other remediation methods can be a solution for complex contamination scenarios.
- Findings of this research can be beneficial for remediation practitioners who deal with contaminated sites on industrial scale as well as academic researchers studying nanomaterials for contaminant clean-up.

Biography

Dr. Kahraman studied BSc in Environmental Engineering at Marmara University, Turkey, and MS in Zonguldak Bülent Ecevit University (ZBEU), Turkey. In 2020, he received his Ph.D. in Environmental Engineering at ZBEU. He is currently working as a Research Assistant at the Environmental Engineering Department of ZBEU. His research areas are soil contamination and remediation, bioremediation, and nanoremediation. He has published research articles in SCI(E) journals and has given presentations at international conferences.

Souhail Dhouib
University of Sfax, Tunisia

New optimization concept for combinatorial problems: The dhouib-matrix

Very recently, we have invented a new optimization concept namely Dhouib-Matrix (DM) in order to solve combinatorial problems. DM gathers several approximative methods subdivided into two categories heuristics and metaheuristics. We design and develop several heuristics in order to rapidly find an initial basic feasible solution for different combinatorial problems: for the Travelling Salesman Problems which are focused on finding the minimal cycle between several nodes, we create a deterministic heuristic Dhouib-Matrix-TSP1 followed by a stochastic method entitled Dhouib-Matrix-TSP2. Concerning the Assignment Problems which deal with affecting objects to resources (jobs to machines ... etc.), we announce our novel heuristic Dhouib-Matrix- AP1. Also, for the Transportation Problems we propose Dhouib-Matrix-TP1. Furthermore, these problems are optimized under certain and uncertain environments. Thus, we consider these problems with crisp, fuzzy, intuitionistic and neutrosophic parameters.

Moreover, we design several metaheuristics in order to nicely generate the optimal or the near optimal solutions in a reasonable computational time: we design at first the new local search metaheuristic entitled Far-to-Near; followed by a novel iterative metaheuristic namely Dhouib-Matrix-3 (DM3) and an original multi-start metaheuristic entitled Dhouib-Matrix-4 (DM4). Obviously, the performance of the proposed concept DM is proven based on the simulation results.

Biography

Prof. Souhail Dhouib is from University of Sfax, Tunisia, with 38 publications.He is full professor at Higher Institute of Industrial Management, Universite de Sfax.

Diogo M.F. Santos*[1], Dušan Mladenović[2], Elif Daş[3], Ayşe B. Yurtcan[4], Šćepan Miljanić[2] and Biljana Šljukić[1,2]

[1]Universidade de Lisboa, Portugal
[2]University of Belgrade, Serbia
[3]Atatürk University, Turkey
[4]Atatürk University, Turkey

Pt-M (M=Ni,Fe,Cu) alloys supported on graphene nanoplatelets as bifunctional electrocatalysts for ORR/OER

Alkaline water electrolysis is a well-established technology for hydrogen production. If the required electricity comes from renewable energy sources (e.g., solar, wind), green hydrogen will be generated. Improving hydrogen (HER) and oxygen evolution reaction (OER) efficiency is essential to make electrolysis more competitive with dominant fossil fuel-based technologies. That requires developing efficient electrocatalytic materials for fuel and oxygen electrodes. In this study, PtM (M=Ni,Fe,Cu) alloy nanoparticles were supported on graphene nanoplatelets (GNPs) and tested as bifunctional electrocatalysts for the oxygen evolution (OER) and oxygen reduction (ORR) reactions. Bifunctional electrocatalysts can be applied in unitized regenerative fuel cells (URFCs), as these devices work in two operation modes: electrolysis mode, converting water to hydrogen and oxygen when there is a surplus of electricity, and fuel cell mode, in which hydrogen and oxygen are consumed when there is a need for extra power. The PtM/GNPs were synthesized via simultaneous supercritical carbon dioxide ($scCO_2$) deposition technique, where the primary metal (Pt) and secondary metal (Ni, Fe, Cu) were deposited onto GNPs by $scCO_2$ in the same step. This resulted in ca. 20 wt.% Pt loading and M loading in the 1.4 - 3.4 wt.% range. Morphology analysis by TEM revealed the formation of metal nanoparticles of 2–3 nm size uniformly distributed over GNPs, while XPS was used to determine their oxidation states. The electrocatalytic activity of the produced materials towards ORR was investigated in 0.1 M KOH by performing a series of linear scan voltammetry experiments at different rotation rates. The data allowed calculating the number of exchanged electrons, n, and the Tafel slope, b, two critical parameters for electrocatalysts' evaluation. PtFe/GNPs exhibited favorable ORR kinetics in terms of the highest diffusion-limited current density, low Tafel slope, and high number of exchanged electrons (n = 3.66), which might be attributed to its high double-layer capacitance and, thus, high electrochemically active surface area. Furthermore, this material performance was comparable to that of commercial Pt/C electrocatalyst containing double the amount of Pt. PtFe/GNPs also showed the best performance toward OER as evidenced by the high current density, the lowest overpotential to reach a current density of 10 mA cm^{-2}, and the lowest Tafel slope. The results show a great potential of the synthesized PtFe/GNPs as bifunctional catalysts for OER/ORR in URFCs.

What will audience learn from your presentation?

- This presentation will present the fundamentals of green hydrogen production by alkaline water electrolysis.
- Then, a particular study on the development of bifunctional catalysts for OER/ORR will show the possibility of incorporating such catalysts in the oxygen electrode of URFCs for enhancing the efficiency of green hydrogen production (electrolysis mode) and simultaneously boosting the oxygen reduction reaction kinetics (fuel cell mode).

Biography

Diogo M.F. Santos is an Invited Assistant Professor at Instituto Superior Técnico (ULisboa, Portugal) and Researcher in the Center of Physics and Engineering of Advanced Materials, studying electrodes and membranes for application in direct liquid fuel cells. D.M.F. Santos has authored 120 journal papers and 90 conference proceedings, and his current h index is 30. He is in the "World's Top 2% Scientists list" of Stanford University for the impact in 2020. D.M.F. Santos has presented more than 60 oral communications and 80 posters at international conferences. His main research interests are related to electrochemical energy conversion and storage.

C. Ngnintedem Yonti*[1,2], Patrice Kenfack Tsobnang[3], Roussin Lontio Fomekong[2], A. Delcorte[1] and J. Lambi Ngolui[2]

[1]Catholic University of Louvain, Belgium

[2]University of Yaoundé, Cameroon

[3]University of Dschang, Cameroon

Green synthesis using palm kernel oil of Fe-doped Co_3O_4 nanoparticles and structural characterization

There is an increased interest in efficient green chemistry because it involves clean technology and is environmentally friendly/benign, economic and simple. In this study, a bio-derived precipitating agent/ligand, palm kernel oil, has been used as an alternative route for the green synthesis of nanoparticles of Iron-doped cobalt oxide (Fe- Co_3O_4) via the co-precipitation reaction. The palm oil was extracted from dried palm kernel seeds by crushing, squeezing and filtration. The reaction of the palm kernel oil with potassium hydroxide, under reflux, yielded a solution containing a mixture of potassium carboxylate and excess hydroxide ions, irrespective of the length of saponification. After neutralization of the as-obtained solution with nitric acid, an aqueous solution containing of iron and cobalt ions was added to yield the desired metallo-organic precursors, iron cobalt carboxylate. Characterization of the precursors by Fourrier Transform Infrared (FTIR) attests of the presence of the entire organic groups as expected while gas chromatography (GC) gives the profile of carboxylate group in the proportion predicted by the literature and Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) confirms that the metallic ratios are as expected. The thermal decomposition of the precursors was monitored by thermogravimetry (TG) between 400 °C and 600 °C. The Analysis of the decomposition products by XRD, EDX, TEM and ToF-SIMS, confirmed the formation of cobalt iron oxide nanoparticles $(Co_{(1-x)}Fe_x)_3O_4$ for x≤0,2 and a nanocomposite material $Co_{(1-x)}Fe_x)_3O_4/Fe_3O_4$ for x≥0,2, with size between 22 and 9 nm. XRD suggests that there is only one spinel phase while ToF-SIMS provides a direct evidence of the progressive substitution of cobalt by iron in the Co_3O_4 crystal structure for x≤0,2.

What will audience learn from your presentation?

- The audience will learn similitude between synthetic and natural O-donor ligands.
- They will learn how to use all vegetable oil as ligand for the synthesis of simple and mixed metal oxide nanoparticles.
- The audience will learn the importance of green synthesis in modern functional materials
- The audience can also learn on the valorisation of some Cameroonian natural sources.

Biography

Cedrik Ngnintedem Yonti studied Chemistry at the University of Yaoundé I, Cameroon and graduated as MS in 2010. He joined the team of Prof John Lambi Ngolui expert in the synthesis of nanoparticles, Cameroon and the team of Prof Arnaud Delcorte expert in Time of Flight Secondary Ions Spectroscopy (ToF-SIMS), Belgium, as Ph. D student in 2018. He is currently working on the synthesis of metal oxide nanoparticles using natural ligand coming from plants with the precipitation method.

M. Górska-Ponikowska[1]*, N.Knap[1], A. Kamm[1], E. Iżycka-Świeszewska[2], J. Gulczyński[2] and L. Lipińska[3]

[1]Medical University of Gdansk, Poland
[2]University of Gdansk, Poland
[3]The Łukasiewicz Research Network, Poland

Nanotechnology as a sophisticated tool for cosmetic industry and medicine

Nanotechnology is a novel tool used in targeted therapies, e.g. anticancer treatment or in cosmetology for modification of active substances with carrier molecules. Cosmetic law is naturally very cautious about "nano-products", taking care of consumer's safety. The available literature provides information on the anticancer potential of graphene oxides (GO) and reduced graphene oxides (rGO) against various types of cancer. However, there are no approved graphene solutions on the market for application of such drugs in oncology. Up to date, GO and rGO have most often been used as a component of the composite with a chemically modified surface binding (via adhesive forces or covalently) specific nanoparticles (including magnetics), polymers as well as immobilized anticancer substances, primarily doxorubicin or its electrophilic derivatives, and cisplatin. Scientific activity in the field of graphene biomedicine has been continually increasing both in Poland and worldwide, and as referred to by Graphene Flagship, the first graphene-based drugs will have been developed by 2030.

Acknowledgements: The part of studies were funded by the Inkubator Innowacyjności 21-0012/21/658 and ST-46. This research was supported in part by PLGrid Infrastructure.

What will audience learn from your presentation?

- Nanotechnology applied for modification of active substance in order to improve efficacy and bioavailability.
- Nanotechnology in cosmetic industry.
- Graphene nanoplates as drug carriers of the future.

Biography

Dr. Magdalena Gorska Ponikowska, Associate Proffessor (born on December 26, 1984) is the Head & Chair of the Department of Medical Chemistry, Medical University of Gdansk, Poland. She has been a visiting researcher at the University of Stuttgart, Germany since 2017 and also at the Institute 'Istituto Euro Mediterraneo di Scienza' (Palermo, Italy) since 2018. She is a creator and co-owner of the cosmetic brand Skin Science with her expert authorship. Prof. Magdalena Gorska Ponikowska graduated from the Faculty of Pharmacy, Medical University of Gdansk, Poland. Consequently, she obtained her habilitation degree in 2018. She participated in numerous international scientific research internships, including University of Palermo (Italy), University of Stuttgart (Germany) and University of Alberta (Edmonton, Canada). Prof. Magdalena Gorska-Ponikowska received a scholarship of the Minister of Science and Higher Education (2017), and was awarded the title of the 'Muse of the City of Sopot' (Poland) in the field of regional scientific activity (2017). Her research areas involve medical chemistry, biochemistry, molecular biology, oncology, cosmetology, nanotechnology and neurobiology. She is an author and co-author of 74 peer-reviewed articles in international journals.

Turkiya M. Al-Shahumi *, Imaddin A. Al-Omari, Salim H. Al-Harthi and Myo Tay Zar Myint

Sultan Qaboos University, Oman

Synthesis, structure, morphology, magnetic and magnetocaloric-effect studies of $(La_{1-x}Pr_x)_{0.7}Sr_{0.3}MnO_3$ nanoparticles perovskites

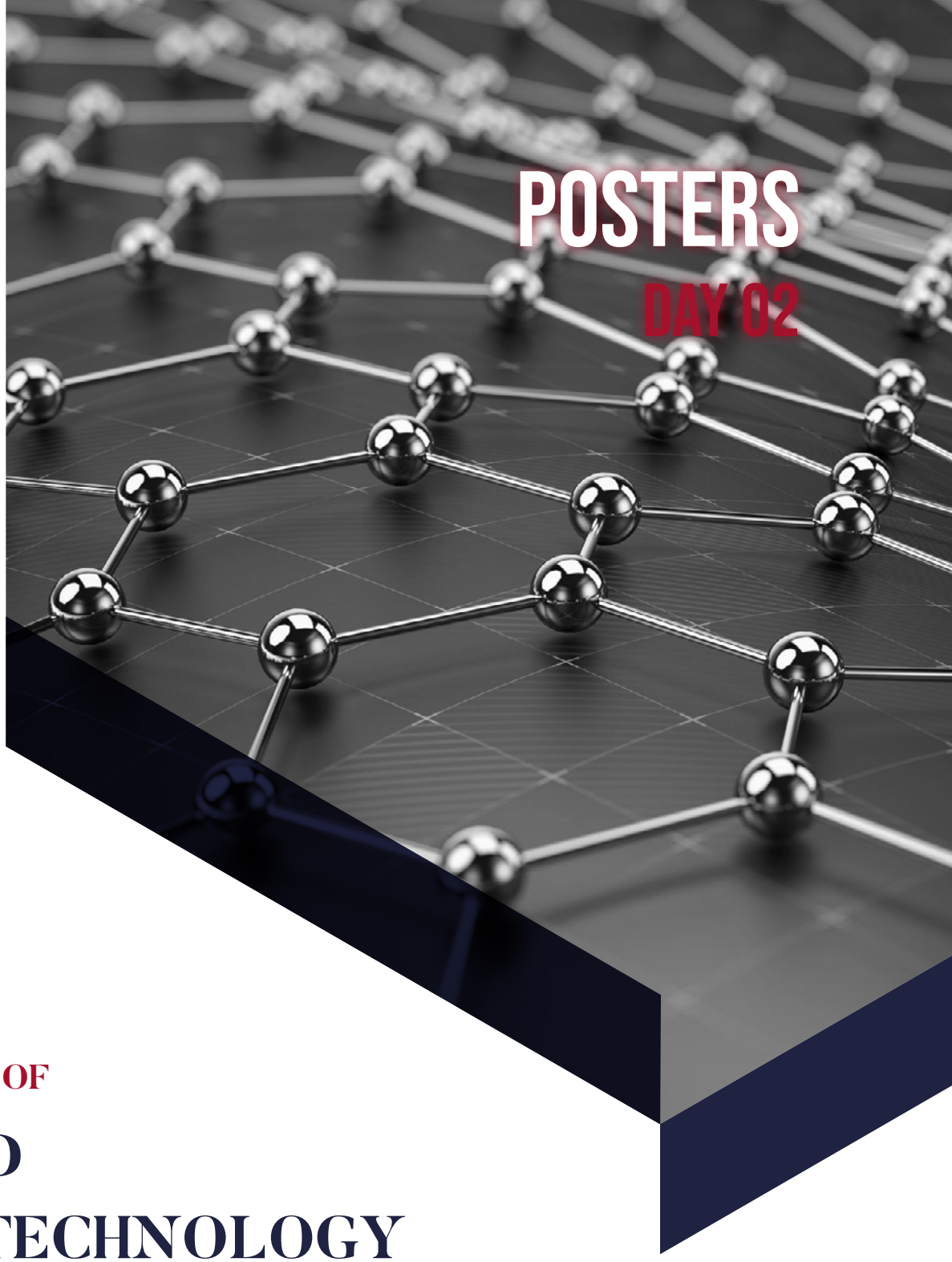
Single-Phase $(La_{1-x}Pr_x)_{0.7}Sr_{0.3}MnO_3$ (x= 0.0, 0.2, 0.4, 0.6, 0.8 and 1.0) nanoparticles perovskites were synthesized by the sol-gel method followed by sintering at 700 oC for 5 h. The X-Ray diffraction rietveld refinement revealed that samples with x=0.0, 0.2 and 0.4 formed a single-phase rhombohedral structure with R-3C space group while the ones with x=0.6, 0.8 and 1.0 crystallized into orthorhombic structure with Pbnm space group. The TEM and SEM images show that all the samples are nanoparticles with nearly spherical and irregular shapes with different sizes and they tend to aggregate. The average particle size of the series is in the range of 21 to 44 nm. The EDXS spectra confirm the purity of the samples prepared and the estimated ratios of the elements in the samples are very closed to their nominal values within the experimental limits. The XPS measurement confirmed the co-existence of mixed valence state of Mn^{4+} and Mn^{3+} in our compounds. Magnetization versus temperatures measurements shows that all samples undergo a second order magnetic phase transition near the Curie temperature (T_C).

It was observed that the nanoparticles exhibit a ferromagnetic (FM) to paramagnetic (PM) transition at TC which is in an agreement with our results obtained from the Arrott plots. We found that as the Pr concentration increases there is a linear decrease in the Curie temperature from TC = 356 K for x = 0 to 275 K for x = 1.0. For each sample below T_C the magnetic coercivity (Hc) is found to be small (~ -10 Oe) while the blocking temperature (T_B) decreases with increasing the Pr concentration. Using the isothermal magnetization curves, the magnetic entropy change was obtained using the thermodynamic Maxwell relation. It was found that the magnitude of the magnetic entropy change (-ΔSM) and the maximum relative cooling power (RCP) for the samples having orthorhombic structure (x = 0.6, 0.8 and 1.0) increases with Pr content reaching a maximum value of 4.67 J/kg.K and 560 J/kg at ΔμoH = 9 T for x = 1.0. On the other hand the ones with rhombohedral structure (x = 0.0, 0.2 and 0.4) have a maximum (-ΔSM) and RCP of 4.62 J/kg.K and 485 J/kg at ΔμoH = 9 T for x = 0.2. Using the Curie-Weiss law, the experimental effective paramagnetic moment (μ_{eff}) have been found to increase with increasing the Pr concentration from 3.99 μB for x = 0.0 to 5.05 μB for x = 1.0 which is in an agreement with the trend of the calculated effective paramagnetic moment (4.62 μ_B for x = 0.0 to 5.50 μ_B for x = 1.0) using the free ions moments for Pr^{3+}, Mn^{3+} and Mn^{4+}.

Biography

Miss Turkiya Al-Shahumi studied Physics in Sultan Qaboos University, Sultanate of Oman and graduated with BSc in 1998. She then joined the university as a technician in the physicsdepartment at the college of science in the same year. In 2009 she graduated withMSc from the same university. Now she is completing her PhD studies at the same department.

magnus Group



POSTERS

DAY 02

4TH EDITION OF

WORLD NANOTECHNOLOGY CONFERENCE

25-27 APR

S.G. Lebedev

Institute for Nuclear Research RAS, Russian Federation

Contemplation about superconducting correlations in nanographite films

Report discussed some unconventional electromagnetics properties of nanographite (NG) films which reminiscent room temperature superconductivity. NG film is the composite of 20-30Å graphite clusters embedded in amorphous matrix. At such a small dimension the superconductivity can be explained by the attraction of all electrons to all kernels of atoms constituting the graphite cluster. Possibilities of room temperature weak superconductivity in nanographite films are supported by the observation of reversed Josephson Effect (which is the transformation of microwave irradiation falling on the sample into the direct current through this sample) and its dependence on temperature, frequency and alternative current voltage. These dependencies are fully reminiscent the behavior of known superconductors, but in the case of NG films such a dependencies takes place at room temperature. Another effect is switching conductivity from high to very small value at some critical current (which can be used in electrical switchers), pinning of vortices on columnar topological structure of film surface observed in atomic force and magnetic force microscope, non-zero current at zero voltage in scanning tunneling microscope in local area of nanographite film surface. Terahertz coherent light emission has been observed under switching process in NG film (which can be used for new type of lasers). The report discussed the opportunity to transform the local room-temperature superconducting phase in nanographite film into the state with the overall phase coherency (which promises the production of new types of room temperature superconductors). The hope is related with production of new pinning centers by means heavy ions irradiation.

What will audience learn from your presentation?

- Possible room temperature superconductivity in nanographite films.
- New types of electrical switchers.
- New types of lasers.

Biography

Sergey G. Lebedev was born in 1956 in the sity of Kursk, Russia. Dr. Sergey G. Lebedev has graduated from the Moscow Physical Engineering Institute in 1980. In 1983 S. G. Lebedev has graduated from Dept. of Mathematics of the Lomonosov Moscow State University. Since 1980 up to now he has worked at the Institute for Nuclear Research of Russian Academy of Sciences. In 1990 S. G. Lebedev has obtained his PhD. Dr. Lebedev is the author of about 150 scientific articles. He is a member of International Nuclear Target Development Society. The whole point of his life is in science and his whole life devoted to science. The prime interests of S. G. Lebedev are in nuclear physics, solid state physics and superconductivity. Now he occupied the position of Senior Scientist, Head of research team.

Nina Ivanova*, Margarita Gevorkova

SE "Insitute of Dermatology and Venereology of Academy of National Medical Science of Ukraine, Ukraine

Negatively charged liposomes in the treatment of alzheimer's disease

The extensive research that we have undertaken has led to the development of a new drug specifically aimed at treating Alzheimer's disease using the liposomal drug Lipochrome.

It has been widely published that the treatment of Alzeimer's disease is unsuccessful using existing medicine as they cannot cross the blood brain barrier. It is known that only nanoparticles can cross the hemato-encephilic barrier allowing them to "drug" their contents inside at the cellular level. This concept has been published by Gang Liu, Ping Men, George Perry, Mark A. Smith and other researchers working in this area of medical science.

The basis of the research was to develop the liposomal drug to allow for the transmission of an effective treatment directly within the brain by crossing the blood brain barrier.

A new developed technique using negatively charged liposomes with an original lipid structure has been tested for efficacy on the treatment of Alzheimer's disease. The use of the negatively charged liposomes is more effective at overcoming the blood brain barrier than neural or positively charged liposomes.

In the treatment of experimental animals, a complex mixture of liposomes containing a drug used in cardiology to create Lipochrome. Studies of the biological activity of this complex Lipochrome were conducted to measure its effectiveness on the treatment of Alzheimer's disease. The animals were induced with Alzheimer's Chlamydia pneumoniae.

The experimental animals were observed for a period of three (3) months under the certification received from the Committee on Bioethics and Deontology. The results have been very positive showing that 98% of the animals induced with Alzheimer's disease were recorded as being healthy after two (2) injections of the drug Lipochrome.

It was demonstrated that Lipochrome prevented the aggregation of beta amyloid in amyloid plaques in vivo. It was shown that the animals after treatment with Lipochrome did not have beta-amyloid plaques.

The control group of animals induced with Alzheimer's disease who did not undergo any treatment had pronounced accumulations of beta-amyloid plaques with signs of death of border neurocytes in the wall and tissue of cerebral arteries.

It has been proven that Lipochrome is non-toxic allowing for it to be used effectively to prevent and treat Alzheimer's disease.

The research has been undertaken by me in Ukraine and all Intellectual Property has been protected by patents.The authors are waiting for any proposition of cooperation to finish work and obtain ready form of a medicine for treatment Alzheimer's disease.

What will audience learn from your presentation?

- Alzheimer's Disease is a progressive neurodegenerative disorder marked by loss of memory, cognition, and behavioural stability. Alzheimer's Disease afflicts 10% of the population over age 65 and up to 50% over age 85.
- Why did we decide to do this and what is the problem with other drugs for this treatment? In fact, because mostly medical drugs can't get directly to the brain. They can't cross the blood-brain barrier. Therefore we made a new technology of a liposomal drug which can bring our new original drug for the treatment of Alzheimer's disease directly to brain. Our loaded liposomal preparation is nontoxic, treatments of Alzheimer's Disease.
- As much as possible positive therapeutic effect has been reached: 98 % of the animals with induced Alzheimer's were healthy after two injections of the preparation.

Biography

Dr. Nina Ivanova, Ph.D. She completed Ph.D. from the State University Thin Chemical Technologies 1985. The speciality: bioorganic chemistry, chemistry of natural and physiologically active substances. After that worked for 22 years as the head of the lipid laboratory. Since 2007 she has been working as the leading researcher of the immunology and molecular genetics laboratory, SE„ Institute of dermatology and venerology of National Medical Science of Ukraine". She has 160 publications and 30 patents. Her work: developing of the liposomal preparations for the treatment of Alzheimer 's desease, hemolytic diseases, syphilis, anthelmintics in parasitology, antiinfluenzal vaccine, antimycotics.Institute in 1980. In 1983 S. G. Lebedev has graduated from Dept. of Mathematics of the Lomonosov Moscow State University. Since 1980 up to now he has worked at the Institute for Nuclear Research of Russian Academy of Sciences. In 1990 S. G. Lebedev has obtained his PhD. Dr. Lebedev is the author of about 150 scientific articles. He is a member of International Nuclear Target Development Society. The whole point of his life is in science and his whole life devoted to science. The prime interests of S. G. Lebedev are in nuclear physics, solid state physics and superconductivity. Now he occupied the position of Senior Scientist, Head of research team.

Mariya Aleksandrova
Technical University of Sofia, Bulgaria

Texturing of nanocoatings for surface acoustic wave based precise sensors

It is presented an approach for texturing of gas sensitive nanocoatings by using surface acoustic wave (SAW) phenomenon. This approach enhanced the performance of the precise SAW based gas sensors due to the increased specific area of the nanocoating, induced during its growth over piezoelectric substrate with propagating SAW at the moment of deposition. The technique can be used for tuneable alignment of nanoparticles or nanowires and it is scale-independent. To control the texture of the sensitive nanocoating, different topologies of the interdigital (IDT) electrodes were used in order to generate waves with different space distribution, therefore inducing electrical fields with different parameters, which in turn caused different degrees of assembling of the nanoparticles. The advantage of the proposed method are easy gas sensitive properties tailoring, large area processing, implementation of conventional patterning technologies (no needs of nanolithographic techniques for the texturing of the nanocoating), low cost, and applicability in variety of sensing structures such as optical, mechanical and biological. The study is funded from BNSF under ERA.NET RUS+ project grant KP-06-DO2/2.

What will audience learn from your presentation?

- The audience will learn how to texture nanocoatings for efficient sensor applications without using expensive nanolithographic techniques.
- The audience will be able to use this knowledge for fabrication of highly sensitive structures, for example gas detecting.
- The approach reported is useful in variety of sensor types in the field of optics, mechanics, biology, as it can be applied for improving the sensing behavior of coatings with no matter of the operational principle of the sensor.
- This method will improve the accuracy of measurement of the sensor characteristics, especially for precise sensors that are expected to detect small quantities of the stimuli. The paper will provide new information that will assist the sensor designers to enhance the sensors' performance at a low cost.

Biography

Dr. Aleksandrova studied Electronics at the Technical University of Sofia, Bulgaria and graduated as MS in 2007. She received her PhD degree in 2010 at the same institution, working in the field of interface optimization of organic optoelectronic devices. At 2011 she obtained the position of an Assistant Professor at the Department of Microelectronics and at 2015 – an Associate Professor at the same department. She has published more than 70 research articles in peer-reviewed journals. Currently she is a head of two research labs of "Thin-film electronics" and "Photolithographic and galvanic processes".

Rehana Badar*[1,2], Asma Ahmed[1], Iqra Aslam[1] and Nadeem Iqbal[3]

The University of Lahore, Pakistan
Superior University, Pakistan
Microtech Chemicals and Minerals/Tech Fab International, Pakistan

Green synthesis, characterization and wound healing potential of silver nanoparticles

Nanotechnology is the manipulation, fabrication and designing of individual atom, molecule or restructuring of matter at nano-scale range. The ultra-fined particles within 1 to 100nm diameter are termed as nanoparticles. The nano-equipments including nanoparticles, nanocapsules etc which brought innovations in almost all the fields of life. Fundamental to current research was the synthesis of AgNPs by using the leaf extracts of *Acacia nilotica*, due to the eco-friendly nature of plant parts, after successful synthesis these particles were characterized by UV vis spectrophotometry scanning electron microscopy and XRD. Formation of AgNPs was confirmed by observing the surface plasmon resonance peak at 424nm and determination of their wound healing potential to cure the excision wounds in male and female albino rats (300-350g), at four different doses (1000µg/ml,500µg/ml, 250µg/ml and 125µg/ml) at three intervals within 21 days (wound measurement after 7, 14 and 21 days), keeping water as negative control and pyodine as positive control, followed by the histopathology of the animal skin.

SEM images elucidated the formation of irregular shaped (spherical, triangular and platy shapes) silver nanoparticles, with the average diameter of 30-70nm. Statistical analyze results denoted that AgNPs showed effective speedy recovery of wound healing after 7days of dose application at 250µg/ml and 500µg/ml at which wound reduction in male and female rats was 79% and 64% respectively as compared to the negative control (43% and 40% in male and female rats respectively) while positive control showed 50% and 43% male and female rats respectively. After 14 days, about 70% of the wound area healed and at 21 days above 90% wound area was cured. Histopathology of cure skin revealed healed epidermal lining and granular layer appeared normal, without any degeneration, necrosis, inflammation and dermal edema at high dose of 1000µg/ml. The functional groups (Carbonyl group of amino acids or OH group of phenolics) present in the biomolecules of *A.nilotica* leave extracts might have attached to the silver particles as reducing and capping agent that may have played role to reduce the wound area. So, AgNPs proved to be potential wound healing material for normal wounds.

What will audience learn from your presentation?

- This study was designed to formulate wound healing drugs based of plant extracts in order to reduce the toxic effects of chemicals and nano based drugs are preferable now a days due to having numerous benefits such as low cost production, overcome environmental hazards, disease detection to prevent losses.
- Furthermore efforts are required to formulate effective nano-drugs using waste materials from plant materials. In order to keeping in view the hazards of chemicals and cost effectiveness of drugs.

Biography

Rehana Badar is a PhD scholar in Biochemistry at The University of Lahore, Lahore, Pakistan. She has completed her MPhil in Botany from The University of Lahore, Lahore Pakistan, in the year 2019. She is a member of British Pharmacological Society. She is working as a lecturer in Superior University Lahore, Pakistan. She received two merit based scholarships while doing BS Hons in Botany, from The University of Education Lahore, Pakistan. She was awarded with the laptop and also wins poster competition. Being a junior scientist she has published 3 articles and one abstract in meetings 2019 organized by British Pharmacological Society.

Ahmed Mortuza Saleque*[1,2], Yuen H. Tsang[1,2]

[1]The Hong Kong Polytechnic University, Hong Kong
[2]The Hong Kong Polytechnic University, China

Solar driven interfacial steam generation derived from biodegradable luffa sponge for efficient and cost-effect water purification

A chemically treated luffa sponge (LS) derived from the ripe fruit of the *Luffa cylindrica* (LC) plant was investigated as an efficient solar photothermal conversion material for water purification applications for the very first time. Hydrophilicity and solar absorbance of the LS were enhanced by dopamine treatment and candle soot surface coating. The fabricated surface modified LS (SM-LS) leads to achieving a superb solar evaporation rate of water as high as 1.30 kg m^{-2} h^{-1}, which is 5 times higher than that of the freshwater under 1 sun illumination. The outdoor experiment has shown an excellent solar evaporation efficiency of 79.98%, which is significantly higher than other low-cost materials. Such SM-LS can be further applied to desalinate the seawater, where it has been examined that 1 m^2 of surface-modified LS can produce 7.5–8 L of freshwater per day. Hence, the proposed system can be utilized in remote areas and refugee camps.

What will audience learn from your presentation?

- The audience will be able to learn about the interfacial solar steam generation technique and will observe how a simple biodegradable material can be converted into an efficient solar absorber that can convert seawater into drinkable water.
- There is a huge demand of this water desalination system specially in the remote areas. Therefore, the audience can get an idea which can help them to implement in real life.
- This also provide a practical solution for the water desalination problem which can be implemented in African countries and in refugee camps.

The benefits are as follows:

- 1st demonstration of chemically treated luffa sponge as an efficient solar photothermal conversion material.
- 5 times higher solar evaporation efficiency than the natural process.
- Solar evaporation rate as high as 1.30 kg m-2 h-1 was achieved under 1 sun.
- 79.98% evaporation efficiency was achieved during outdoor desalination experiment.
- The prototype can produce 7.5–8 L of clean water daily with 1m2 material.
- Cost-effective solution for producing freshwater in remote locations and refugee camps.

Biography

Ahmed M. Saleque received BSc. in Electrical & Electronic Engineering and MEngg in Telecommunications from American International University-Bangladesh (AIUB) in 2010 and 2012 respectively. In 2015, he received joint Erasmus Mundus MSc degree from University of Nottingham, University of Oviedo, and University of Rome and also a visiting scholar at the WEMPEC laboratory, University of Wisconsin Madison, USA. He was an Assistant Professor at AIUB. In 2019, he was awarded the Hong Kong Ph.D. fellowship and currently pursuing Ph.D. in Applied Physics from The Hong Kong Polytechnic University. His research interests include Interfacial Steam Generation, Perovskite solar cell and biosensors.

KEYNOTE FORUM

DAY 03

4TH EDITION OF

WORLD NANOTECHNOLOGY CONFERENCE

25-27 APR

Vladimir G. Chigrinov

The Hong Kong University of Science and Technology, China

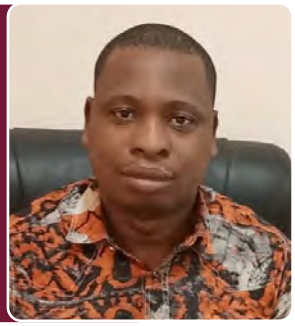
Liquid crystal photoaligned by azodye nano layers: Physics and applications in displays and photonics

Photoalignment and photopatterning has been proposed and studied for a long time. Light is responsible for the delivery of energy as well as phase and polarization information to materials systems. It was shown that photoalignment liquid crystals by azodye nanolayers could provide high quality alignment of molecules in a liquid crystal (LC) cell. Over the past years, a lot of improvements and variations of the photoalignment and photopatterning technology has been made for photonics applications. In particular, the application of this technology to active optical elements in optical signal processing and communications is currently a hot topic in photonics research. Sensors of external electric field, pressure and water and air velocity based on liquid crystal photonics devices can be very helpful for the indicators of the climate change.

We will demonstrate a physical model of photoalignment and photopatterning based on rotational diffusion in solid azodye nanolayers. We will also highlight the new applications of photoalignment and photopatterning in display and photonics such as: (i) fast high resolution LC display devices, such as field sequential color ferroelectric LCD; (ii) LC sensors; (iii) LC lenses; (iv) LC E-paper devices, including electrically and optically rewritable LC E-paper; (v) photo induced semiconductor quantum rods alignment for new LC display applications; (vi)100% polarizers based on photoalignment; (vii) LC smart windows based on photopatterned diffraction structures; (vii) LC antenna elements with a voltage controllable frequency.

Biography

Professor Vladimir G. Chigrinov is Professor of Hong Kong University of Science and Technology since 1999. He is an Expert in Flat Panel Technology in Russia, recognized by the World Technology Evaluation Centre, 1994, and SID Fellow since 2008. He is an author of 6 books, 31 reviews and book chapters, about 317 journal papers, more than 668 Conference presentations, and 121 patents and patent applications including 36 US patents in the field of liquid crystals since 1974. He got Excellent Research Award of HKUST School of Engineering in 2012. He obtained Gold Medal and The Best Award in the Invention & Innovation Awards 2014 held at the Malaysia Technology Expo (MTE) 2014, which was hosted in Kuala Lumpur, Malaysia, on 20-22 Feb 2014. He is a Member of EU Academy of Sciences (EUAS) since July 2017. He got A Slottow Owaki Prize of SID in 2018. He is 2019 Distinguished Fellow of IETI (International Engineering and Technology Institute).



Simplice Koudjina*, Tariq Mahmood, David Beljonne, Guy Y. S. Atohoun and Joachim D. Gbenou

National University of Sciences, Technology, Engineering and Mathematics (UNSTIM), Benin

Fingerprints of chiral/helical nanostructures applied to functionalized helicenes for chiral waveguides

The energy transfer and radar waves are effective thanks to optoelectronic materials. In recent technology, Helicenes, marine sponge components and helical molecules are ideal candidates for the realization of circular waveguides. A fingerprint design of four chiral/helical nanostructures of the Helicenes group has been implemented by quantum modeling. The Infrared and Raman fingerprints were elucidated on the Helicene-4N, Helicene-4O, Helicene-4S and Hexa-Helicene molecules, under the wheel of ab initio methods CP-TDHF and DFT functionals under the wavelength of 532 nm. Vibrational signatures analysis showed that identical and non-equivalent normal modes between two calculating methods of the same molecule are differently represented between two GGA exchange-correlation functional units and GGA hybrids by their overlaps sign with respect to experience and under the influence of geometry modification and vibrational intensities. This quantum modeling illustrates these Helicenes synthesis candidates of chiral waveguides.

What will audience learn from your presentation?

- Audience will learn about how chiral/helical nanostructures as Helicenes compounds react with the light.
- Audience will discover how to use two non-destructive IR and Raman spectroscopies to identify perturbed and identical normal modes of vibration after the reaction of the Helicenes with light.
- Audience will discover how to use multiscale computational simulation to explain and predict the fingerprints of functionalized Helicenes used as materials in waveguides

Biography

Dr. Simplice Koudjina has been working as an Assistant Professor in Chemistry at the National University of Sciences, Technology, Engineering and Mathematics (UNSTIM) in Benin, where he works since 2019. He holds a Ph.D. degree in Theoretical Chemistry and Molecular Modeling at the University of Abomey-Calavi since 2016. He obtained M.Sc. in Nanotechnology at the University of Namur in Belgium. He then joined the research group of Prof. Guy Atohoun at the UCT2M. His fields of expertise are surface modeling and computational simulation and molecular fingerprints. He has published more than 12 research articles in theoretical chemistry journal.

Sergey Suchkov*, William Thilly, Robert Langer, Daniel Scherman, Shawn Murphy, David Smith, Hiroyuki Abe, Holland Cheng, Trevor Marshall, and Noel Rose

Institute for Global Health of MGUPP, Russia

Personalized and precision medicine (PPM) as a unique healthcare model to be set up through biodesign, unique translational applications and upgraded business marketing to secure the human healthcare, wellness and biosafety

Traditionally a disease has been defined by its clinical presentation and observable characteristics, not by the underlying molecular mechanisms, pathways and systems biology-related processes specific to a particular patient (ignoring persons-at-risk). A new systems approach to subclinical and/or diseased states and wellness resulted in a new trend in the healthcare services, namely, personalized and precision medicine (PPM).

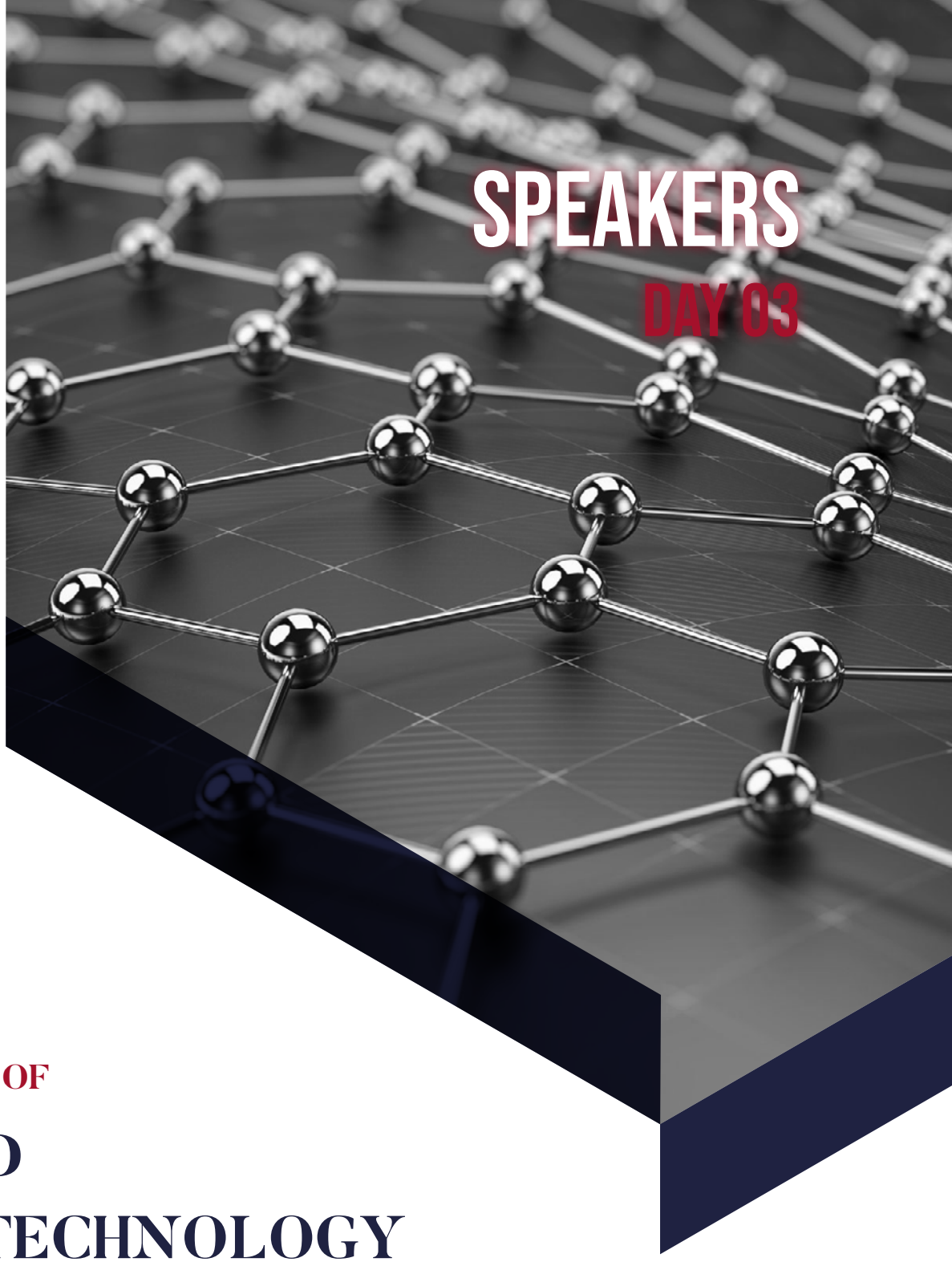
To achieve the implementation of PPM concept, it is necessary to create a fundamentally new strategy based upon the biomarkers and targets to have a unique impact for the implementation of PPM model into the daily clinical practice and pharma. In this sense, despite breakthroughs in research that have led to an increased understanding of PPM-based human disease, the translation of discoveries into therapies for patients has not kept pace with medical need. It would be extremely useful to integrate data harvesting from different databanks for applications such as prediction and personalization of further treatment to thus provide more tailored measures for the patients and persons-at-risk resulting in improved outcomes and more cost effective use of the latest health care resources including diagnostic (companion ones), preventive and therapeutic (targeted molecular and cellular) etc.

Translational researchers, bio-designers and manufacturers are beginning to realize the promise of PPM, translating to direct benefit to patients or persons-at-risk. For instance, companion diagnostics tools and targeted therapies and biomarkers represent important stakes for the pharma, in terms of market access, of return on investment and of image among the prescribers. At the same time, they probably represent only the generation of products resulting translational research and applications. So, developing medicines and predictive diagnostic tools requires changes to traditional clinical trial designs, as well as the use of innovative (adaptive) testing procedures that result in new types of data. Making the best use of those innovations and being ready to demonstrate results for regulatory bodies requires specialized knowledge that many clinical development teams don't have. The areas where companies are most likely to encounter challenges, are data analysis and workforce expertise, biomarker and diagnostic test development, and cultural awareness. Navigating those complexities and ever-evolving technologies will pass regulatory muster and provide sufficient data for a successful launch of PPM, is a huge task. So, partnering and forming strategic alliances between researchers, bio-designers, clinicians, business, regulatory bodies and government can help ensure an optimal development program that leverages the Academia and industry experience and FDA's new and evolving toolkit to speed our way to getting new tools into the innovative markets.

Healthcare is undergoing a transformation, and it is imperative to leverage new technologies to support the advent of PPM. This is the reason for developing global scientific, clinical, social, and educational projects in the area of PPM and TraMed to elicit the content of the new trend. The latter would provide a unique platform for dialogue and collaboration among thought leaders and stakeholders in government, academia, industry, foundations, and disease and patient advocacy with an interest in improving the system of healthcare delivery on one hand and drug discovery, development, and translation, on the other one, whilst educating the policy community about issues where biomedical science and policy intersect.

Biography

Sergey Suchkov was born in the City of Astrakhan, Russia, in a family of dynasty medical doctors. In 1980, graduated from Astrakhan State Medical University and was awarded with MD. In 1985, Suchkov maintained his PhD as a PhD student of the I.M. Sechenov Moscow Medical Academy and Institute of Medical Enzymology. In 2001, Suchkov maintained his Doctor Degree at the National Institute of Immunology, Russia. From 1989 through 1995, Dr Suchkov was being a Head of the Lab of Clinical Immunology, Helmholtz Eye Research Institute in Moscow. From 1995 through 2004 - a Chair of the Dept for Clinical Immunology, Moscow Clinical Research Institute (MONIKI). In 1993-1996, Dr Suchkov was a Secretary-in-Chief of the Editorial Board, Biomedical Science, an international journal published jointly by the USSR Academy of Sciences and the Royal Society of Chemistry, UK.



SPEAKERS

DAY 03

4TH EDITION OF

WORLD NANOTECHNOLOGY CONFERENCE

25-27 APR

M. A. Motalib Hossain*[1], Abu Hashem[1], Ab Rahman Marlinda[1], Mohammad Al Mamun[1], Khanom Simarani[2] and Mohd Rafie Johan[2]

[1]Nanotechnology and Catalysis Research Centre, Malaysia

[2]University of Malaya, Malaysia

Nanocomposite-based DNA-biosensor to detect animal species in food

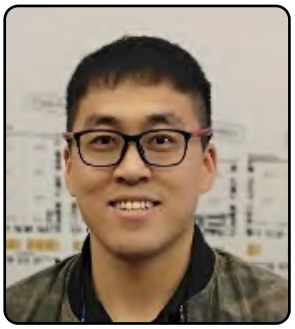
Food adulteration is a serious concern all over the world as it has a significant impact on customers' health, religion, lifestyle, and economy. In the previous decade, several food fraud instances have emerged, emphasising the necessity of food authenticity. Therefore, the detection of animal species in food products is an important issue that should be addressed in order to promote fair trade and allow customers to make informed decisions. In addition, species identification is directly linked to food safety monitoring. Until now, polymerase chain reaction (PCR) based methods are widely used and popular methods for detecting animal species. However, PCR-based techniques are laboratory-oriented, laborious, time-consuming and need skilled personnel to perform the test. On the other hand, DNA biosensors-based approaches are field-based, rapid, sensitive, low cost, and there is no need for skilled personnel. Therefore, the demand for DNA biosensors-based methods is increasing day by day. We developed electrochemical DNA biosensors for the detection of pork DNA in food products using gold nanoparticles (AuNPs) and graphene (Gr) composite modified screen-printed carbon electrode (SPCE) as a detection platform. To hybridize the target DNA, the thiol modified DNA probes were immobilized on modified SPCE. The nanocomposite was characterized using UV-Vis, Fourier Transform Infrared Spectroscopy (FTIR), Field Emission Scanning Electron Microscopy (FESEM) and energy dispersive X-ray (EDX) methods. The cyclic voltammetry (CV), differential pulse voltammetry (DPV) and electrochemical impedance spectroscopy (EIS) were carried out to characterize the modified electrodes. The developed biosensor showed high specificity toward target DNA and could discriminate pork DNA from other species. The system was highly sensitive and able to detect up to 0.85×10-12 M.

What will audience learn from your presentation?

- How to modify screen-printed carbon electrode (SPCE) with nanocomposite.
- How to design the specific probe for DNA biosensors.
- How to develop DNA biosensors for the authentication of food products.

Biography

Dr. M. A. Motalib Hossain is working as a Postdoctoral Research Fellow at Nanotechnology & Catalysis Research Centre, University of Malaya, Malaysia. He received his Ph.D. from the University of Malaya in 2017 at the same institute. His research focuses on the synthesis of nanomaterials, the development of DNA biosensors, DNA Biomarkers, conventional and real-time multiplex PCR systems, and food authentication. For the first time, he developed double genes targeted multiplex PCR assay; this new concept has enhanced security in molecular diagnosis. He has contributed 43 papers in ISI top-ranking journals with 5 international Conference Proceedings. His work made two patents and one international science news.



Hao Wu

Shandong University, China

Kinetics regulation enables novel nanostructured materials for water electrolysis

Novel nanostructured materials have attracted intense research interests in the field of electrochemical catalysis. Many efforts have been devoted to achieving novel nanostructured materials, among which the regulation of reaction kinetics plays a key role in constructing unconventional nanostructures. Understanding how the structures are influenced by the varied reaction kinetics, has therefore become critically important. Within this context, we show that the kinetics regulation has enabled unconventional and novel nanostructures that exhibit distinct performances towards water electrolysis, that are oxygen evolution reaction (OER) and hydrogen evolution reaction (HER). Particularly, several novel nanostructured materials, including ultrathin two-dimensional (2D) nonlayered NiSe nanosheets, high-index faceted Fe_2O_3 nanocrystals, multi-component Co complex, and 2D metal-organic framework (MOF) nanosheets are obtained by acidity regulation, which exhibit unique merits beyond the traditional ones. For example, ultrathin 2D nonlayered nanomaterials are endowed with chemically active surfaces because they are occupied with dangling bonds; high-index facets are endowed with favourable atomic arrangement, termination, and coordination; 2D MOF nanosheets enable shortened electron pathways, facilitated diffusion of electrolyte and the access to interior catalytic sites. All these features are beneficial for electrochemical catalytic reactions. By means of regulating the reaction kinetics, these novel nanostructured materials have been readily realized, which showed advanced electrocatalytic performance.

What will audience learn from your presentation?

- A strategy to regulate the structure of nanomaterial in an atomic level.
- A new family of metal precursor is proposed to prepare nanosized MOFs.
- A strategy to construct high-index facet exposed crystal is provided.
- Crystal facet as a descriptor for oxygen evolution reaction catalysis is elucidated.

Biography

Dr. Wu studied Inorganic Chemistry at the Fudan University, China. He obtained his Ph.D. degree under the guidance of Prof. Gengfeng Zheng in 2016. He then joined the research group of Prof. Ghim Wei Ho at the National University of Singapore and Prof. Husam N. Alshareef at the King Abdullah University of Science and Technology as a postdoctoral fellow. He joined Shandong University as a full professor in 2020. Dr. Wu has published more than 30 research articles in SCI journals.

Vitaliy Grudtsov*, Oksana Gubanova, Dmitriy Ryazantsev and Alexander Kuznetsov

Scientific-Manufacturing Complex Technological Centre, Russia

Optimization of ISFET structure formation technology for use in biochemical analysis systems

Currently, the creation of biosensors compatible with CMOS IC technology is of practical interest. One of the possible solutions for the creation of microanalytical systems of a new generation is the use of ion-sensitive field-effect transistors (ISFET) as a detecting element, which provides the possibility of integration with semiconductor technologies for the creation of IC.

In this work, we show the concept of creating an ISFET transistor in which the sensitive surface directly in contact with the electrolyte solution is moved outside the transistor body, and the connection between them is carried out using a floating gate. This design makes it possible to fit the sensor manufacturing into the standard route within the framework of post BEOL treatments, bringing the sensitive surface above the signal processing circuit. This saves the area of the entire crystal, while not changing the speed and power consumption of the IC.

The described ISFET manufacturing approach fully fits into the standard CMOS process, with the exception of finishing operations: opening the surface of the aluminum floating gate in the passivation layer and subsequent formation of the dielectric layer, which is the sensitive surface of the biosensor. Our experiments show that the sensor characteristics of the final device are largely determined by the quality of the interface between the dielectric and the aluminum floating gate formed at the CMOS factory. We have developed a surface preparation operation before deposition of a dielectric layer based on argon stripping followed by annealing. The argon stripping operation was carried out in order to activate the surface and form additional bonds for the subsequent formation of dielectric layers using APEX SLR high density plasma chemical vapor deposition system at a temperature of 160 °C for 5 minutes. Then, in the same chamber, low-temperature annealing of structures in an oxygen atmosphere at 160 °C for 10 minutes was carried out in order to passivate the surface and form stable aluminum oxide. After preliminary preparation of the floating gate surface, sensitive surface fabrication was done using the atomic layer deposition method, which allows us to create uniform films with a controlled thickness.

Ta_2O_5 was chosen as the ISFET sensitive surface material because of its chemical resistance to aqueous solutions and the possibility of creating structures with a low subthreshold swing. The film was deposited thermally using Fiji G2 ALD system, using pentakis(dimethylamino)tantalum(V) (PDMAT) precursor and deionized water at 250 °C. The thickness of the resulting film was controlled by ellipsometry, and the chemical composition was controlled by Auger spectroscopy.

For the proposed floating-gate ISFET design, we selected the subthreshold mode of transistor operation, which is characterized by a higher sensitivity to changes in the surface potential compared to operation in the strong inversion mode. Another advantage of the subthreshold mode is the minimum value of the input capacitance. That is why the means for assessing the quality of the preparation of the ISFET sensitive surface are the analysis of the I-V characteristics, and the determination of the values of subthreshold swing and hysteresis. The proposed method of surface preparation demonstrates an improvement in the subthreshold swing value after the formation of the tantalum oxide film by 7% and a significant decrease of the hysteresis from 20 to 5 mV, which subsequently has a huge impact on the stability and repeatability of biosensor readings.

For the discussed transistor with the tantalum oxide film formed by the ALD method, the pH dependence equal to 55 mV/pH was obtained, which corresponds to theoretical data.

The discussed ISFET designs can be used as structural elements for the creation of highly selective chemical detectors and

biosensors with the possibility of use in complex analytical systems such as “lab-on-a-chip” with sample delivery system integration.

What will audience learn from your presentation?

- A method for optimizing the route of ISFET structure fabrication for use in biochemical analysis systems is described.
- It can be used to improve the critical parameters of ISFET structures: subthreshold swing, hysteresis.
- It is also possible to adapt the method for other sensitive surface materials obtained by atomic layer deposition, such as HfO_2 and ZrO_2.

Biography

Vitaliy Grudtsov studied Nanoelectronics at the National Research University of Electronic Technology (MIET) and graduated as MS in 2014. He is with the research groups of Dr. Kuznetsov, affiliated with INME RAS and SMC Technological Centre, working in the field of biosensor fabrication technology.

Chandana Rath*, Deepti Gangwar

Indian Institute of Technology (BHU), India

Hydrothermally synthesized novel δ-MnO2 nanowhiskers: Microstructure and magnetic properties

We will discuss about one of the novel 2D monoclinic, P63/mnm, δ-MnO2 phase which were synthesized in the form of nanowhiskers through a simple and facile hydrothermal route under the optimized condition without using any template. The X-ray diffraction pattern showed the formation of the δ phase of MnO2 which was further confirmed from Fourier transform infrared spectroscopy (FT-IR) and Raman spectroscopy. Transmission electron micrograph revealed nanowhiskers of diameter ~7 nm and high- resolution TEM and SAED pattern demonstrated the interplanar spacing and distinguished diffraction rings corresponding to the monoclinic phase of δ-MnO2. Temperature dependent magnetization showed magnetic transition to paramagnetic phase at 13.2K which decreased to lower temperature with increasing the applied field. Temperature dependent susceptibility after fitted with Curie-Weiss law confirmed the strong antiferromagnetic ordering and high effective magnetic moment than that of Mn4+ present in δ-MnO2. A large effective magnetic moment is attributed to the presence of both Mn3+ and Mn4+ as confirmed from XPS. Reduced valency of Mn from 4+ to 3+ is accompanied with oxygen vacancies giving the exact composition as MnO1.58. The dynamic magnetic properties of δ-MnO2 nanowhiskers investigated using frequencydependent ac susceptibility fitted with various phenomenological models like Vogel-Fulcher law and power law clearly indicates the existence of the interacting spin clusters which freezes at ~ 11.2 K. Time dependence of thermoremanent magnetization, fitted well with stretched exponential function, supports the existence of relaxing spin clusters. Thus, spin glass relaxation in δ-MnO2 nanowhiskers was attributed to the interaction between Mn4+ and Mn3+ which results in an intrinsic magnetic frustration and weak ferromagnetism with finite coercivity below Tf.

What will audience learn from your presentation?

- Can use the unique synthesis technique.
- Synthesize different dimension materials like nanowires of various aspect ratio, nanoparticles of various size and quantum dots.
- Vary the shapes from spherical to non-spherical.
- Magnetic properties can vary from super-paramagnetic to ferromagnetic depending on its size and shape.
- In job requirement if anything required for varying the size of particle from nanosize to micron size then this method can be used.
- Certainly, they can use this unique technique for other materials as well as we do in our laboratory.
- Many unusual properties one could obtain through this technique for example we observe coercivity of ~4-6 kOe in an antiferromagnetic pseudocubic shape hematitite particles of different sizes.

Biography

Dr. Chandana Rath received her Ph.D. degree in Physics from Utkal University, India and was a Post Doctoral fellow in University of Girona, Spain for 2 years. Her area of Research is Nanomagnetics , Multiferroics, Ion Irradiation, Semiconducting Nanostructured Materials. She has gained distinctions as Women Achiever in STEM in 2021, MRSI MEDAL 2015 from Materials Society of India, Young Researcher Award-1998 in IUMRS-ICA, India. She has completed several national projects and an international project from National Foundries of Fine Analysis, Europe. She has published three national patents and published more than 100 research articles in SCI(E) journals.

Bashir M. Jarrar
Jerash university, Jordan

On the toxicity of copper oxide nanoparticles

Copper oxide nanomaterials (CuO NPs) have been widely utilized in many fields, including antibacterial materials, anti-tumor, osteoporosis treatment, imaging, drug delivery, cosmetics, lubricants for metallic coating, food industry, and electronics with probable potential risk to human health and the ecosystems.The present work was conducted to investigate the toxicity of CuO NPs in the vital organs. Methods: Adult healthy male Wister Albino rats were exposed to 36 intraperitoneal (ip) injections of CuO NPs (2 mg/kg bw). All rats were subjected to morphometric, biochemical, haematological, behavioural, histological, histochemical and transmission electron microscopy (TEM) and examinations. Chronic exposure to CuO NPs induced morphometric alterations mainly body weigh reduction and organ indices, back arching, Urinary bladder ballooning, lung abscess and renal calculi formation.

- The renal tissues of rats exposed to chronic CuO NPs demonstrated proximal renal tubules degeneration, glomerular atrophy and hypercellularity, interstitial edema, renal blood vessels dilatation and congestion, occasional fibrosis and hyaline casts precipitation. In addition, chronic subjection to CuO NPs induced mitochondrial swelling and crystolysis, hydropic degeneration, lysosomal hypertrophy, apoptotic activity, nuclear deformity, chromatin dissolution and nucleoli enlargement. Moreover, erosion and disorganization of the apical microvilli, basement membrane thickening and crystals precipitation the glomerular capillary were also detected. On the other hand, the hepatic tissue of rats exposed to nano copper oxide exhibited hepatocytes injury, Kupffer cells hyperplasia, sinusoidal alterations and inflammatory cells inflammation. Moreover, the injured hepatocytes showed mitochondrial swelling, cristolysis and matrix lysis, formation of phagocytized bodies and myelin multilayer figures, lysosomal hyperplasia, cytoplasmic degeneration and vacuolation, and hepatocytes nuclear alteration. The findings indicate that copper oxide nanoparticles interact with the hepatic tissue components and could induce alterations in the liver with the mitochondria as the main target organelles to the toxicity of copper nanomaterials. More work is recommended for better understanding the pathogenesis of copper oxide nanoparticles and nano products.The findings indicate that CuO NPs interact with the tissue components and the macromolecules of the vital organs and could induce alterations may affect the functions of these vital organs. More work is recommended for better understanding the pathogenesis of nanoparticles in general and copper oxide nanomaterials in specific.

What will audience learn from your presentation?

- The morphometric, histological, histochemical and ultrastructural alterations that might be induced by chronic exposure to copper oxide nanoparticle.
- The effects of copper nanomaterial in the vital organs of the body.
- Application and potential risks of copper nano materials.

Biography

Bashir Jarrar is a professor of histocytotechnology at Jerash University, Jordan. He received his PhD in 1999 and by then Joined King Saud University and after Jouf University, Saudi Arabia as a senior researcher. Prof Jarrar is an author of 37 books and published 101 research articles in ISI Journals. He used the tools of histocytotechnology to answer some questions on the toxicity of pollutants, drugs and nanomaterials.

Pragya Baghel*[1], Sanjib Bahadur[2]

[1]Columbia Institute of Pharmacy, India

[2]Himalayan Pharmacy Institute, India

Self-emulsification systems – A nanotranforming of poor aqueous solubility towards enhanced bioavailaility of drugs

High lipophilicity and poor aqueous solubility are the endemic problems of new drug molecules. 60-70% of these drugs are unable to solubilize completely in aqueous media, or have very low permeability. Oral route has been the major route of drug delivery for the chronic treatment of many diseases as it offers a high degree of patient compliance. Nearly 40% of new drug candidate exhibit low solubility in water. This is a challenge in development of optimum oral solid dosage form in terms of formulation design and bioavailability of new pharmaceutical products, this hampers their oral absorption and further leads to their poor bioavailability. Various researches are in progress to overcome these limitations. Novel Technologies like nano-carrier systems have become popular for improving the solubility of drugs. Lipid based formulations, among nano systems, are taking pace for the enhancement of solubility, oral absorption and hence the bioavailability of drugs. Among the lipid formulations, Self-emulsification systems are gaining popularity by offering various advantages to delivery systems. Self-emulsifying drug delivery systems are isotropic blends of oil and surfactant/ co-surfactants, which, upon gentle agitation on watery media shape o/w emulsion.

What will audience learn from your presentation?

- Inspite of many works published in SEDDS, the major concerns of this presentation is to discuss about the various approaches to formulate a good lipid based carrier system for poorly aqueous soluble drugs, role of various polymers and their categories used in the formulation along-with the modern technologies used for enhancing the stability of liquid SEDDS.

Biography

Dr. Pragya Baghel, is graduated from University Institute of Pharmacy, Pt. Ravi Shankar Shukla University, Raipur, Chhattisgarh, India, and completed her post-graduation in Pharmaceutics branch from Columbia Institute of Pharmacy, Raipur, Chhattisgarh, India. Right now she is pursuing PhD from Chhattisgarh swami Vivekananda Technical University, Bhilai, Chhattisgarh. Presently she is working as Assistant Professor, Columbia Institute of Pharmacy. She has more than 20 publications. She has conducted one National Conference under the sanctioned authority Chhattisgarh council of science & Technology.

D. Nagasamy Venkatesh
JSS College of Pharmacy, India

Formulation and characterization of trihexyphendiyl hydro chloride loaded solid lipid nanoparticles

The aim of the present work was to enhance therapeutic efficacy, prevent from hepatic first pass metabolism and prevention from intestinal degradation and also overcome the drawbacks of the conventional tablet dosage form and to ensure the sustained release of Trihexyphenidyl Hydrochloride, used in the treatment of Parkinson's disease. Trihexyphenidyl loaded solid lipid nanoparticles (SLN) were prepared by double emulsion method. The mean particle size of the formulation was found to be 359.3 nm, with a zeta potential value of -9.94mV and Polydispersity index values were found to be 0.163. DSC and FTIR studies revealed change in the crystallinity index of drug when incorporated into SLN. Cell lines studies and *In-vitro* cytotoxicity studies was carried out to assess the safety of the formulation.

What will audience learn from your presentation?

- They audience can learn about the method of preparation of trihexyphenidyl loaded solid lipid nanoparticles.
- Characterization technique's involved in the nanoparticles loaded with drug.
- Understanding the *in vitro* cytotoxicity studies of the formulation using an appropriate cell lines.

Biography

Dr. D. Nagasamy Venkatesh is working as Associate Professor at Department of Pharmaceutics, JSS College of Pharmacy, Udhagamandalam. India. Dr. D.Nagasamy Venkatesh is interested in developing certain nanobased drug delivery systems for antiviral and anticancer drugs. His research is also extended in developing oral sustained/controlled drug delivery systems for certain drugs of therapeutic interest and analytical and bio-analytical method development for such drugs. He serves as a reviewer of more than 25 peer reviewed journals including AAPS, Carbohydrate polymer, Indian Journal of Pharmaceutical Sciences. He has authored more than 50 peer-reviewed publications. He has received three best awards for his presentations/publications in national and international level conferences.

Sharda Sundaram Sanjay
Ewing Christian College, India

Surface functionalization : A key factor for the synthesis of nanomaterials for applicatory purposes

The ability to modify the surface of nanomaterials by functionalization has steered in a new era in nanotechnology, particularly in the pharmaceutical and biomedical sciences. According to the clinical findings, functionalizing nanoparticles with certain chemical species resulted in multifunctional nanoparticles with improved efficacy. Functionalized nanoparticles that have been precisely created are being used as optical materials, sensor components, catalyst precursors, for targeted drug delivery, and a variety of other applications. In the creation of advanced nano-materials, functionalizing host molecules with inorganic/organic functional groups is a promising technique for integrating the substrate's optoelectronic and surface capabilities with the molecular selectivity of the covering groups. As an example, functionalization of gold nanoparticles with amino acids such as lysine, polylysine, and glycine, among others, bind DNA more efficiently for gene delivery without creating any toxicity. Surface-functionalization first links nanoparticles with diverse organic and inorganic functionalities, then enhances nanoparticle solubility so that they can be utilised as carriers for hydrophobic species, and can be employed for uniform distribution in organic matrix. Surface functionalization can be accomplished through variety of methods that include post-functionalization, which is applied to already created inorganic nanoparticles, or in-situ functionalization, which is done during the synthesis process. Hydroxy-, thio-, amino-, nitro-, carboxy-, or primary alkyl groups, for example, are commonly used for tailoring surface functionality. Hydrophobic, hydrophilic, ionic, nonionic, van der Waal's, and hydrogen bond interactions are the basic working forces that lies behind functionalization.

What will audience learn from your presentation?

- My presentation will give a comprehensive overview of nanoparticle synthesis, functionalization and characterization for various applications.
- With the knowledge of functionalization, various water soluble nanoparticles can be prepared and can be utilized for various purposes accordingly.
- Knowing how to functionalize, the synthetic process can be designed accordingly . Hope this will simplify their practical problems may improve their efficiency.
- With the help of the presentation , one may chalk out proper layout for designing functionalized nanoparticles.

Biography

Dr. Sharda Sundaram Sanjay has done M.Sc in Analytical Chemistry and acquired D.Phil. degree from University of Allahabad, Allahabad, India in1992. Presently she is working on mixed ligand complexes. and Synthesis, Characterization and functionalization of nanomaterials for various applications. She has successfully completed a major research project, authored 2 books on Nanotechnology, published 31 papers and 08 Book Chapters in National & International publications. She has delivered more than 40 invited talks in National and International conferences, seminars, workshops and webinars. She is 'Life Member and fellow of various science academies. She has reviewed papers for various scientific Journals.

Mohammad Owais
Aligarh Muslim University, India

Potential of siRNA-bearing nanoparticles in the treatment of hepatocellular carcinoma in the model animals

Therapeutics based on small interfering RNA (siRNA) have demonstrated tremendous potential for treating cancer. However, non-specific targeting, premature degradation, and intrinsic toxicity of the siRNAs have to be solved before applying them in translational medicines. To address these challenges, nanotechnology-based tools might help shield siRNA and ensure its specific delivery to the target site. Besides playing a crucial role in prostaglandin synthesis, the cyclo-oxygenase-2 (COX-2) enzyme has been reported to mediate carcinogenesis in various types of cancer, including hepatocellular carcinoma (HCC). Similarly, another regulatory enzyme polo like kinase-1 (Plk-1) has been found to be crucial for cancer cells to propagate and survive in the patients. We encapsulated COX-2 specific siRNA in *Bacillus subtilis* membrane lipid-based liposomes (subtilosomes) and evaluated their potential in the treatment of di-ethyl nitrosamine (DEN)-induced hepato-carcinoma. We also developed Plk-1 specific siRNA-bearing lipid-based nanocarriers. Our findings corroborated that the nanoparticle-based formulation was stable, releasing specific siRNA in a sustained manner. For example, the subtilosome-based formulation was successful in inhibiting TNF-α expression in the experimental animals, while Plk-1 specific siRNA inhibited target enzyme. The apoptosis study indicated that the subtilosomized siRNA inhibits DEN-induced carcinogenesis more effectively than free siRNA. The as-developed formulation also suppressed COX-2 expression, which in turn up-regulated expression of p53 wild-type and Bax on the one hand and downregulated Bcl-2 expression on the other. Histopathological studies also revealed better tumor regression in liver cells with standard cellular architecture. The survival data established increased efficacy of subtilosome-encapsulated COX-2 siRNA against hepatocellular carcinoma.

Biography

Dr. Owais has successfully developed nano-particle-based novel delivery systems including dendrimers/virosomes for gene packaging and liposomes, niosomes, microspheres and solid core lipid nano-particles for vaccine delivery, targeted gene/drug delivery etc; with a view to increase the efficacy and safety of encapsulated chemo-therapeutic agents/sub-unit vaccines for some important infectious diseases specially those inflicted by intracellular pathogens Dr. Owais has employed an autologous plasma bead based dual antigen delivery system as a prophylactic strategy against intracellular infections. The liposome/microsphere entrapped antigen further co-entrapped in dual core fibrin beads based vaccine was shown to eliminate intracellular pathogens from systemic circulation. The significant contribution of Dr Owais group is recognized by various academic platforms on the regular basis. He is the first recipient of NBios Award, a coveted recognition bestowed by DBT Govt of India, in the AMU, Aligarh.

Rosa Peñalver*[1], Isabel costa-gómez[2], Natalia arroyo-manzanares[1], José maría moreno[2], Ignacio lópez-garcía[1], Stella moreno-grau[2] and Manuel hernández córdoba[1]

[1]University of Murcia, Spain

[2]Technical University of Cartagena , Spain

Novel analytical methodology for the determination of micro and nano polystyrene particles in air

The usage of plastic materials may generate small plastic fragments known as micro and nano plastics (MPs/NPs) which affect the quality of the air we breathe. Pollution due to micro and nano plastics has become a global concern due to their ubiquity and potential effects on health and ecosystems. In this study, a procedure based on thermogravimetry coupled to mass spectrometry (TGA-MS) has been developed to quantify polystyrene (PS) microplastics found in the atmosphere nearby an agricultural area. The quantification of PM10 fractions of airborne PS microplastics has been scarcely studied. For this purpose, around 50 mg of the fiberglass filters used for the airborne sample collection were pyrolyzed on the TGA instrument (40-800 ºC) at 10 ºC min^{-1} under nitrogen atmosphere. At the same time, sample mass loss and MS signal intensity of typical PS pyrolysis compounds (m/z 78 and m/z 104) were recorded. Limits of detection and quantification were 7.7 and 25.8 ng m^{-3}, respectively. PS microplastic has been found in the studied atmosphere area at an average of 35.97 ng m^{-3}, the potential contamination source being mainly related to agricultural activities. This works shows the potential of the hyphenated TGA-MS capability for the quantification of low levels of micro and nano plastics in the air, making this technique suitable for the investigation of these emerging pollutants in different environments. Knowing the concentrations of airborne PS micro and nano particles will allow the extrapolation to human exposure and risk analysis studies which in turn allow the development of air quality policies and other regulatory instruments.

What will audience learn from your presentation?

- This research helps the audience to develop risk analysis studies for human health regarding micro and nano plastic particles in the environment.
- This work supports the development of a legislation associated to the presence of these emerging contaminants in the atmosphere.
- The audience may apply the analytical methodology proposed in this study to the determination of other micro and nano pollutants in the different environments and other samples like food.

Biography

Rosa Peñalver Soler is an assistant Lecture at the Department of Analytical Chemistry at University of Murcia. Her research focuses on the development and validation of analytical methods for the determination of emerging pollutants in different environmental samples and food being her focus area the determination of microplastics. She worked for two years on the Institute of Refence Materials and Measurements from the European Commission in Belgium. She has been working for eight years in a global petrochemical company (SABIC) leading the Analytical Department. She is the author of 22 publications journals of high impact indexes in the JRC.

Zafar Iqbal*[1], Sumaira Irum Khan[2] and Nabeela Niaz[1]

[1]Sarhad University of Science and Information Technology, Pakistan

[2]University of Peshawar, Pakistan

Preparation of surface modified polymeric nanoparticles of doxorubicin

Doxorubicin loaded PLGA nanoparticles were prepared and surface functionalization using trastuzumab, for targeted delivery. Nanoformulations were prepared by double emulsion solvent evaporation method using various stabilizers and size, PDI, zeta potential, entrapment efficiency was evaluated amount of drug loaded into the nanoparticles. The selected nanoformulations were surface functionalized by anti-HER2 antibody trastuzumab and SDS-PAGE analysis was applied to evaluate the activity and stability of antibody after surface modification. In-vitro release profile of selected nanoformulations exhibited biphasic release mechanism with moderate initial burst release followed by sustained release up to ten days. In-vivo pharmacokinetics of doxorubicin nanoparticles in comparison with reference drug ROBOL® in albino mice model exhibited significant increase in C max, AUC, AUMC, MRT and half life and decrease in volume of distribution and clearance was observed in comparison to reference drug.

The in-vitro cellular uptake of these nanoformulations was studied usingy breast cancer cell line AU-565 and MCF-7. The results showed the cytotoxicity and IC50 factors were significantly improved in comparison with the control and without surface functionalized doxorubicin loaded PLGA nanoparticles. The prepared surface modified drug delivery system is designed to be administered through intravenous route for the better and improved results.

What will audience learn from your presentation?

- Use and development nanoparticles in pharmaceuticals sciences.
- Studies on the surface modified nanoparticles.
- Evaluation of the surface modified nanoparticles.

Biography

Meritorious Professor Dr. Zafar Iqbal completed his B. Pharm. and M. Pharm. from Pakistan and then Ph.D. and Post Doc. in Pharmaceutical Sciences from University of Strathclyde, U.K. Then, joined production department in pharmaceutical industry followed by the teaching and research in the University of Peshawar. Now working as Dean of Life Sciences at Sarhad University of Science and Information Technology, Peshawar. He received Tamgha-e-Imtiaz, prestigious National Award, from the President of Pakistan. He has also been awarded Best University Teacher by HEC in 2007 and HEC Outstanding Research Paper Award 2011-2012. He established the laboratories and research facilities in the field of pharmaceutical sciences. Dr. Zafar Iqbal contributed to evaluate new DDIs, developed new drug-formulations with sustained release of drugs and on nano-pharmaceuticals. He supervised 31 Ph.D. and 12 M.Phil. Scholars and published more than 167 research articles. He is also co-author two chapters of the book published by Springer, New York. He served as a member of Central drug Licensing and Registration Board and currently is member of Drug Registration Board, Drug Expert Committee of Pakistan and Advance Studies and Research Boards of different universities. He has been awarded Best University Teacher by HEC in 2007 and HEC Outstanding Research Paper Award 2011-2012.

Luz María Rivera*[1], Luisa Agudelo[1], Alexander Hernández[1], Cristina Ruíz[1] and Cristiam Santa[1]

[1]Glasst Innovation Company, Colombia

Nanostructured materials for thermal insulation paint

Thermal conditioning of interior spaces has been a fundamental issue for the development of societies, although the location of our planet allows us to enjoy conditions suitable for life, most geographical locations go through periods of cold and heat with different intensities, for which certain modifications to the rooms we inhabit are required to reach thermal comfort. Currently the most used way to thermally condition interior spaces is the installation of air conditioning equipment, which can modify the temperature and relative humidity, however, this equipment involves a large energy consumption, which is detrimental to environmental conservation and generates high costs for its users. This difficulty has been partially solved through the creation of thermal insulation coatings, which help reduce energy consumption, but at the same time these coatings present disadvantages, such as loss of usable space due to the great thicknesses, high costs, expertise necessary for its installation and in some cases also its manufacturing or handling processes are dangerous. For these reasons, nanotechnology that has made its way into many markets and applications, offers an alternative to paint and covers market to fulfill such needs. Functional paint is a promising market that has reinforced during the last years the growing idea of more green and sustainable products; nanostructured materials such as different types of aerogels are perfect vehicles to achieve that goal. Aerogel, the lightest material in the world has also another important characteristic, it has the lowest known thermal conductivity due to its nanometric holes full of air that prevents the transmission of heat. The use of aerogel in a waterborne paint formulation partially isolates the interior environment of an enclosure from the exterior climate (cold/heat) achieving thermal comfort, in addition to energy and economic savings by reducing the need of air conditioning or heating and also brings together the best characteristics of both aspects of thermal insulation: the high efficiency in insulation of conventional coatings but with low thicknesses, ease of installation, use of non-polluting or non-hazardous materials for the health. Nevertheless, some important issues must be solved before the aerogel can be successfully incorporated into de paint such as its high hydrophobicity and extremely low density. The present work explains solutions for the incorporation of aerogel in waterborne paint and partial results of an important reduction of temperature when using the developed paint to isolate interior environments are presented.

What will audience learn from your presentation?

- Working mechanism of nanostructured materials such as aerogel, which has several applications not only in thermal insulation but also in acoustic insulation, impermeabilization, oil spills, among others.
- Basic needs in special functional paint formulation regarding the specific modifications necessary to incorporate high surface area and high hydrophobic nanocomponents to waterborne formulations.
- New perspectives on energy saving efforts from a novel and fresh vision.
- New ideas using nanomaterials that help to reduce the urban heating island and the huge energy consumption derived from the heating and cooling systems around the world.

Biography

Dr. Rivera studied Mechanical Engineering at Universidad Pontificia Bolivariana, Colombia and graduated as Magister in 2016. She then joined the Nanotechnology and biomaterials research group of Prof. Hoyos (Universidad Pontificia Bolivariana, Colombia) and the Synthesis and modification of nanostructures and 2D materials of Prof. García (Centro de Investigación en Materiales Avanzados, México). She received her PhD degree in nanotechnology in 2019 and her PhD degree in medical science in 2020. Then she joined the research and development group of Glasst Innovation.

Eva Pinho

National Institute for Agrarian and Veterinarian Research, Portugal

Nanotechnology and the controlled release of natural antimicrobials

Microbial infections are still a major threat to human and animal health, mainly due to microbial resistance and tolerance to antimicrobial compounds. Antimicrobial resistance increases hospitalization periods, therapy costs and mortality rates. Currently, we are facing an unbalance battle against multidrug resistant microorganism where few antibiotics are effective. Resistant microorganisms have emerged as consequence of the intensive use of antimicrobials and horizontal gene transfer mediated by mobile genetic elements. Researchers have been developing innovative solutions able to modulate microbial virulence, prevent the formation of biofilms and reduce the risk of resistant microorganism selection. Thus, pharmaceutical research, both academia and industrial, are experiencing difficulties on the discovery and development of new drugs, mainly due to the demanding, time-consuming, and expensive tasks required to put a new molecule on the market. Thus, optimization of existing formulations by enhancing their therapeutic effectiveness has been used as a viable and less costly alternative.

Nanotechnology can improve currently existing therapies or create novel strategies to improve the efficacy of antibiotic therapy, such as drug-delivery systems, antimicrobial, and antifouling surfaces. Nanosystems can create powerful alternative approaches with increased antimicrobial efficiency, fine tuning of drug release over extended periods of time, circumventing resistance mechanisms and mitigate patient toxicity.

Cyclodextrins, truncated-shaped oligosaccharides, have taken an active role in the development of new delivery systems capable of meeting the specific needs necessary to enhance molecules' therapeutic effectiveness. Typically, they have been used as drug carriers to improve solubility, stability, and bioavailability of bioactive molecules. Moreover, cyclodextrins can modulate the release of a wide range of drugs through the inclusion complex formation.

What will audience learn from your presentation?

- Identify the major limitations of delivery antimicrobials, nowdays.
- Recognized the new strategies to improve the delivery of antimicrobial compounds.
- How cyclodextrins can be used to improve hydrogels.

Biography

Eva Pinho is from National Institute for Agrarian and Veterinarian Research, Portugal.

Salvatore Petralia*, Giuseppe Forte
University of Catania, Italy

Photothermal-responsive nanostructured materials for biomedical applications

Luminescent and photothermal nanostructured materials are one of the most important achievements in the fast-growing field of nanotechnology. The combination of multi-responsive Shell with luminescent and photothermal Core has led to promising applications in various fields. These nanosystems are largely studied as promising photothermal agents in emerging nanotechnologies such as photoinduced-enzymatic reaction, photothermal antibacterial effect, photothermal and photodynamic therapies (PTT and PDT), gene-therapy and photothermal triggered drug and gene delivery.

In our laboratories we have developed innovative photochemical and chemical preparation methods for the production of photothermal nanostructured materials including: i) photothermal carbon based core-shell nanocomposites ii) Carbonized polymers nanodots, iii) gold-nanostructures, iv) water-soluble β-cyclodextrin/metal (Pt) and β-cyclodextrin/metal oxide (Co3O4) nanoparticles as photothermal agents for photo-induced enzymatic reaction, v) multicolors and photothermal boron-doped carbon dots for bioimaging and vi) TiO2/AuNPs/PNIPAM nanocomposites for photothermal and photocatalytic dual-effect triggered by visible/UV light exposition.

The nanostructured materials, whose design was supported by Molecular Dynamic simulation investigations, exhibited high photothermal conversion efficiency and no toxicity to eukaryotic cells. Experiments confirmed also an excellent thermally induced activity to be used for biomedical applications.

What will audience learn from your presentation?

- To increase the knowledge about the photothermal effect and the photothermal nanostructured materials.
- How to perform photothermal experiments.
- How to design photothermal materials.

Biography

Salvatore Petralia, received the PhD in Chemistry from University of Catania (Italy), in 2003. In 2020 he joined University of Catania as Researcher of Chemistry. From 2004-2020 he was Technology Development sect. Manager at STMicroelectronics, covering several R&D positions and leading multidisciplinary teams focused on the development of nanostructured materials and chemical processes for biosensing applications. The research activity over the years has covered multidisciplinary aspects of chemistry, photochemistry, nanostructured materials, biosensing and bioMEMS silicon technology. In this field he is co-author of 120 peer reviewed scientific publications, 1 chapter of book and co-inventor of 11 patent applications.

Jasim Mohammed Salman*[1], Alaa Jasim Mohammed[2]

[1]Iraq University College, Iraq

[2]University of Putra Malaysia, Malaysia

Preparation of nano adsorbent derivative from date palm fronds for the removal of pollutants from aqueous solutions

A new type of nano adsorbent was prepared from date palm fronds with iron oxide nanoparticles (IONPs). Cadmium ions were selected as heavy metals in this work with Concentration of 100 ppm. Four different initial concentrations flasks of cadmium ion were prepared (25, 20, 15, and 10 ppm). The adsorption equilibrium experiments of cadmium onto nano adsorbents were analyzed by the Langmuir, Freundlich, and the Temkin isotherm models, and the equilibrium data fitted well by the Langmuir model with a maximum adsorption capacity of 20 mg/g for Cd (II). The adsorption of cadmium onto prepared nano adsorbent was studied concerning pH and Cd (II) initial concentration in the batch process. The percent removal of cadmium ion onto prepared nano adsorbent decreased with the increase of initial concertation.

What will audience learn from your presentation?

- With the widespread use of nanomaterials (NMs) in everyday life, consumer knowledge about the functionality, benefits, and possible dangers of nanotechnology (NT) is still modest. As with any developing technology, its public perception has direct implications on future policies and has to be taken into account by academia and industry alike.
- The fast development of nanotechnology is often defined as a fundamental revolution in technology compared to discovery of antibiotics, television, nuclear weapons, or computer technologies. The workshop discussed the current situation and the development potential of this technology and new technologies as such. The aim was to focus on approaches and first results to identify future skill requirements and new emerging occupations. Nanotechnology is a cross-sectoral and highly interdisciplinary field and its development brings along several completely new tasks, and even jobs and occupations whose requirements have to be identified and transferred into education and training without delay. The workshop attempted to tackle some of the concerns in the area of skill needs.
- Nanotechnology is an interdisciplinary technology of manipulation or self-assembly of individual atoms, molecules, or molecular clusters into structures to create materials and devices with control geometry and at least one component below 100 nm (nanometer) including advanced equipment that allow controlled fabrication, measurement and visualisation with high resolution. Nanotechnology can work in the top-down approach (which means reducing the size of the smallest structures to the nanoscale) or the bottom-up approach (which involves manipulating individual atoms and molecules into nanostructures and more closely integrates chemistry or biology with microelectronics).

Biography

Jasim Mohammed Salman, the head of the energy department – at Iraq university college, and the managing director of Al Rawabi Al-Khadra (Green Barrows) company for chemical, environmental & engineering studies and consultations, previously worked as a dean of Al-Kunooze university college for two years and scientific deputy dean in Al Nisour university college for three years and as a professor in Madinat Al Ilim university college for six years- Iraq.

K. Lazarova*[1], S. Boycheva[2], M. Vasileva[1], D. Zgureva-Filipova[2] and T. Babeva[1]

[1]Bulgarian Academy of Sciences, Bulgaria
[2]Technical University of Sofia, Bulgaria

Coal fly ashes zeolites as a foundation towards functional nanocomposites

In the context of the circular economy for environmentally friendly waste management and saving of raw materials, the production of zeolites from fly ash (FA) from combustion of coal, which is generated as a byproduct in the energy production from coal-fired thermal power plants (TPPs), is intensively studied. Mostly used method for recycling of waste of coal is the synthesis of zeolites from this waste material as the zeolites thus obtained can be used for a variety of purposes. In this study lignite coal fly ash collected from the electrostatic precipitators of one of the biggest TPPs in Bulgaria was used in order to synthesize Na-X type zeolites by ultrasonic-assisted double stage fusion-hydrothermal alkaline conversion. In order to reduce the size of the thus obtained zeolites they were wet-milled for 60, 120, and 540 s prior to the incorporation in the sol–gel Nb2O5 matrix.

Surface morphology and structure of the zeolites in form of powder was studied by scanning electron microscopy and X-ray diffraction, their porosity and particle size prior to and after wet-milling - by N2-physisorption and Dynamic Light Scattering, respectively. Spin-coating method was used to deposit niobium pentoxide (Nb2O5)/zeolites composite films in two different volume concentrations (1% and 5%) and a complete optical characterization was made. Sensing properties toward acetone vapors were studied via evaluation of the change in the reflection coefficient ΔR of the films after exposure to the selected analyte.

Acknowledgments: Research equipment of Distributed Research Infrastructure INFRAMAT, part of Bulgarian National Roadmap for Research Infrastructures, supported by Bulgarian Ministry of Education and Science was used in this investigation.

What will audience learn from your presentation?

- How conversion of waste raw fly ash (FA) to a single Na-X phase zeolite is achieved by ultrasonic-assisted double-stage fusion-hydrothermal alkaline conversion.
- What is the effect of zeolites' size on optical and sensing properties of the nanocomposite Nb2O5 thin films and achieved different levels of porosity, after wet-milling of the zeolites prior to the incorporation in the sol–gel matrix.
- Is utilization of Nb2O5/Na- X zeolites thin films as sensitive element for optical detection of acetone possible?

Biography

Dr. Katerina Lazarova has been a scientist at the Bulgarian Academy of Sciences for the last 9 years. In 2013 she began her doctorate in the field of photonic crystals and optical sensors based on zeolites and porous materials. In 2016 she became a chief assistant at the IOMT, and from 2019 to 2021 is a postdoctoral fellow with a scholarship in the same field. Author of 40 articles, with awards for presentations in scientific forums and participation in numerous scientific projects in collaboration with other scientific organizations.

Dibyendu Mondal

Institute of Plant Genetics of the Polish Academy of Sciences, Poland

Strategies for enhanced protein nano-engineering with improved stability and activity

This talk will be focused on two different topics which are (i) strategies for improving the stability and activity of enzymes for facile biocatalysis and (ii) vision for the department of plant nanotechnology and its proposed structure within the scope of NANOPLANT project funded by the European union. Enzymatic biocatalysis has been recognized as key process applied in diverse fields of applications including synthesis of valuable pharmaceutical intermediates and biofuels from renewable resources. However, the fact that enzymes have evolved to work in cellular environments and are therefore usually unstable to harsh process conditions such as temperature, pressure, use of organic solvents and etc.—the major barrier to the use of the enzyme in industrial biotechnology. Consequently, there is a clash between low-temperature aqueous processing (optimal conditions for enzyme stability and selectivity), and organic solvent or high-temperature processing (which favours high substrate solubility and immensely improved reaction kinetics, respectively). First part of the talk majorly will focus fundamentals of protein packaging and some of the interesting results that we developed in our laboratory. We developed a facile protocol for sustainable protein packaging platform using biomass derived functional carbon materials as host and also via manipulation of solvent environment using molecularly crowded ionic liquids.

What will audience learn from your presentation?

- An alternative protein engineering protocol?
- How to improve the kinetics of enzymatic biocatalysis under harsh reaction conditions.

Biography

Dr. Mondal is an ERA chair holder of NANOPLANT in IPG PAS, Poznan, Poland. Dibyendu earned PhD in Chemical Sciences from CSIR-CSMCRI, India in 2015. He was a postdoctoral fellow at CICECO, University of Aveiro, Portugal from 2015-2017 and has been an Assistant Professor at CNMS, Jain University, India since 2017. His research interest include value addition of bio-resources and packaging of biomolecules using green solvents. He is also fascinated with green nanocomposites for task-specific applications such as biocatalysis, water purification and in plant science. He has 70 publications in high impact journals, 5 granted patents, ~2300 citations, 25 h-index.

Ayat F. Hashim*[a], Said F. Hamed[a], Hoda A. Abdel Hamid[b], Kamel A.Abd-Elsalam[c], Iwona Golonka[d],Witold Musiał[d], and Ibrahim M. El-Sherbiny[e]

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Antioxidant and antibacterial activities of omega-3 rich oils/curcumin nanoemulsions loaded in chitosan and alginate-based microbeads

Omega-3 fatty acids can be considered as potential alternative therapeutic agents because of their antimicrobial and antioxidant properties. Two investigated omega-3 rich oils (flaxseed or fish) have been nanoemulsified with and without the natural antioxidant (curcumin, Cur) followed by their incorporation into crosslinked polymeric microbeads. The microbeads were developed from chitosan (CS), alginate (AL) and their combination (CSAL). Results indicated that the mean droplet diameter of the plain and Cur-loaded nanoemulsions ranged from 62.3 to 111.29 nm. The microbeads produced from AL, CS and their combination without Cur had predominantly shriveled surfaces compared to Cur-loaded ones. Addition of Cur was found to enhance oxidative stability, encapsulation efficiency, loading capacity, and antioxidant activity of the formulated microbeads. Plain fish oil revealed more antibacterial activity than plain flaxseed oil. Fish oil nanoemulsion-in-AL microbeads had more antibacterial activity than nanoemulsions of flaxseed oil-in-AL, fish oil-in-CS and the combined (CSAL) microbeads. However, flaxseed oil nanoemulsion-in-CS microbeads showed higher antibacterial activity than nanoemulsions of fish oil-in-CS, flaxseed oil-in-AL and the combined microbeads. The obtained results suggested the suitability of the formulated nanoemulsions-loaded microbeads to be used in food and pharmaceuticals products.

What will audience learn from your presentation?

- Prepare nanoemulsion and Cur-loaded nanoemulsions from omega 3 rich oils (flaxseed or fish)
- Prepare polymeric microbeads from chitosan, alginate, and their combination.
- Study the oxidative stability, encapsulation efficiency, loading capacity, and antioxidant activity of the formulated microbeads.
- Use the suitability of the formulated nanoemulsions-loaded microbeads to be used in food and pharmaceuticals products.
- This research will help the audience to formulate oil-in-water nanoemulsion based microspheres as well as nanocomposite based microspheres using natural biopolymeric wall materials (e.g., sodium alginate and chitosan) and natural clay to encapsulate omega 3 fatty acids-rich oils (e.g., fish and flaxseed oils), in order to enhance their storage stability and bioavailability. This research that other faculty could use to expand their research or teaching.
- This provide a practical solution to a oxidation of omega 3 rich oils problem that could simplify or make a designer's job more efficient.

Biography

Dr. Ayat F. Hashim studied Microbiology and Chemistry at the Ain Shams University, Egypt and graduated with an MS in 2008. She then had her MSc in 2014 in Organic Chemistry at the Tanta University. She received her Ph.D. degree in 2020 at Ain Shams University. She travelled on a scientific mission in Poland and training courses in Brazil. Nowadays, she is a researcher in the fats and oils department, food industry and nutrition division, and national research centre, Egypt. His research outputs are documented by 16 research items and a total citation of 165 according to the Scopus database. She collaborated with 19 international co-authors.

Bahareh Khezri*, Lukáš Děkanovský and Seyyed Mohsen Mousavi Beladi

University of Chemistry and Technology Prague, Czech Republic

2D-based nano/microswimmers: Towards biomedical and environmental applications

Nano/microswimmers with autonomous motion are the frontier of nanotechnology and nanomaterial research. These self-propelled nano/microswimmers convert chemical energy obtained from their surroundings to propulsion. Particularly, the recent progress in targeted drug delivery and efficient water purification systems is very promising.

Graphene and the recently discovered layered materials -beyond graphene- have superior properties and have made a great impact on the new generation of energy, biomedical and environmental applications. Integration of single/few layers materials with extremely high surface area into nano/microswimmers has been created a dynamic platform which could significantly enhance motor's functions in terms of adsorption capacity and mobility. We have employed 2D-based microswimmers to demonstrate (i) organics / heavy metals / ions collection and DOX loading, (ii) a targeted transport system, (iii) the on-demand release mechanism, and (iv) the recovery of the robots for further usage.

What will audience learn from your presentation?

- On this talk I will focus on applications of advanced nano/microswimmers based on graphene and novel layered materials. The single/few-layered materials with extremely high surface area provide additional properties, which could significantly enhance motor's functions in terms of adsorption capacity and mobility. Our efforts were intended to explore unique functionalities of layered materials-based motors with enhanced performance towards:
- Drug delivery systems: pickup (drug-motor interaction), transport (ensured carriage of drugs from pickup point to release point), and release (delivery of the drug to the desired location).
- Environmental applications: pollutant sensing and adsorption, removal and degradation, and recovery of the motors.
- This multidisciplinary research field is still in its early stage as it is completely new. It has been started at 2004 and very few researchers work in this field. This talk can introduce the research to the community and open up the new routes and more collaborations.

Biography

Dr. Bahareh Khezri studied Chemistry at Isfahan University of Technology and Isfahan University, as BSc (1999-2001) and MSc (2003-2006) in Iran. At 2008 she received Singapore International Graduate Award (SINGA) and joined the research group of Prof. Richard D. Webster at Nanyang Technological University (NTU), Singapore. After PhD graduation (2013) she continued as postdoc in the same group. In 2015 she joined at the Cambridge Centre for Advanced Research and Education (CARES), in Singapore. After two years stay at CARES and Cambridge University she moved to Czech Republic and joined department of the Inorganic Chemistry, university of the Chemistry and Technology of Prague (VSCHT) as senior scientist. In December 2019 she received a research grant for "nano/micromotors: Towards Biomedical and Environmental Applications" from the Czech Science Foundation (GACR: GACR No. 20-20201S) and continued at VSCHT as Principal Investigator (PI). She has also received Beatriu de Pinós fellowship (2021, ICIQ) from Spain. As she has granted Ramón y Cajal (RYC) fellowship in August 2021, she will establish her own group at University of Barcelona in September 2022 as RYC. She has published more than 60 research articles in ISI journals.

Kanchan Chauhan*, Rafael Vazquez-Duhalt
Universidad Nacional Autónoma de México, Mexico

Biocatalytic nanoreactors as smart biomedicine

Recent years have seen an exponential growth in the development of drug delivery nanoplatforms that carry the therapeutic cargo to diseased sites. Besides significant progress, only a handful of nanomedicines reached clinical trials. Thus, the future demands the development of new and smart strategies to increase the scope and effectiveness of existing nano supports. Biocatalytic nanoreactors are thus attracting much attention. These nanoreactors basically consist of immobilized enzymes that carry out in situ transformation of prodrugs to more toxic active drugs rather than simple drug delivery. This talk will discuss the development of biocatalytic nanoreactors as biomedicines for smart action against debilitating diseases.

What will audience learn from your presentation?

- Design and synthesis of biocatalytic nanoreactors.
- Their role and potential application in nanomedicine.
- Application of virus like particles as nanocarriers.
- Advancements in the fields of nanobiotechnology and theranostic applications.
- The talk will discuss the development of new nanomedicines offering new tools for an improvement in the conventional therapeutic approaches with minimized adverse effects.

Biography

Dr. Kanchan Chauhan graduated with a PhD in Chemistry (2016) from Indian Institute of Technology (IIT), New Delhi, India. She then joined the research group of Dr. Rafael Vazquez Duhalt at the Centre of Nanoscience and Nanotechnology, National Autonomous University of Mexico (CNyN-UNAM), Mexico. She obtained the position of an Assistant Professor at the same institute in 2018. Currently she is working on different multidisciplinary projects based on the use of virus like nanoparticles as smart delivery vehicles; the development of enzymatic bionanoreactors as targeted and smart multimodality nanomedicines and as efficient catalysts for industrial applications.

Participants List

We wish to meet you again at our upcoming conference

6th Edition of

World Nanotechnology Conference

April 24-25, 2023 | Orlando, USA

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