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4th Edition International Conference on

CATALYSIS AND CHEMICAL ENGINEERING

27-28 Mar 2023 | London, UK

Hosted By:
CATCHEM 2023
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Scientific Program

Day 1 | March 27, 2023
Westminster 1

08:30-09:00 Registrations
09:00-09:15 Opening Ceremony

Keynote Forum

09:15-09:45

Zhendong Dai
Nanjing University of Aeronautics and Astronautics, China

Title: Bioinspired Adhesive Materials and Micro-structures for Extremely Harsh Environments

Biography: Dr Zhendong Dai, professor, director and founder of the Institute of Bio-inspired Structure and Surface Engineering (IBSS) at Nanjing University of Aeronautics and Astronautics (NUAA), Fellow of International Society of Bionic Engineering.

09:45-10:15

Shiro Ryu
Meiji University, Japan

Title: Optical Time Domain Reflectometry for Continuous Time-Domain Measurement of Rayleigh Backscattered Light

Biography: Shiro Ryu received a Ph.D. in electronic engineering from the University of Tokyo in 1993. After that, he researched coherent optical fiber submarine cable systems in KDD R&D Laboratories (1985-1995). After that, Dr. Ryumanageda research group in Japan Telecom and Soft Bank Telecom R&D Laboratories regarding next-generation photonic networks (2000-2009).

10:15-10:45

Eli Kapon
Federal Institute of Technology in Lausanne, Switzerland

Title: Integrated Quantum Photonics Using Site-Controlled Quantum Dots

Biography: Eli Kapon received his PhD in physics from Tel Aviv University, Israel, in 1982. After a Postdoc at Caltech, where he investigated semiconductor lasers and laser arrays, he joined Bell core in 1984, where he worked on integrated photonics and quantum nanostructures, Demonstrating the first quantum wire lasers in 1988.

10:45-11:15

Farida Selim
Bowling Green State University, United States

Title: Advanced thermoluminescence spectroscopy as a research tool for semiconductor and photonic materials

Biography: Farida Selim is a professor of Physics at the department of Physics and the Center for Photochemical Sciences at BGSU. She has a broad research program in the field of semiconductors and electronic and photonic materials; and has been active in constructing beam lines and developing new instrumentation for advanced material research.

Group Photo

Networking and Refreshments Break @ 11:15-11:35

11:35-12:05

Pallab Banerji
Indian Institute of Technology Kharagpur, India

Title: Gallium nano droplet catalyzed growth of ternary nanowires

Biography: Dr. P. Banerji is a Professor in Materials Science in Indian Institute of Technology Kharagpur, India. His area of specialization is semiconductor materials and low dimensional systems for various applications in the field of thermoelectrics and optoelectronics. Prof. Banerji supervised twenty-five doctoral students and several Masters thesis. He has published around 150 research papers in peer reviewed journals.

Speaker Sessions:
Session Chair: Zhendong Dai, Nanjing University of Aeronautics and Astronautics, China

12:05-12:25

Jan Atienza-Garriga
University of Barcelona, Spain

Title: Analysis of the Protection of Protein- only Nanoparticles containing Antimicrobial peptides with Liposomes and Micelles

Biography: Jan Atienza-Garriga graduated in biotechnology and obtained his Master's in Food Biotechnology at the University of Girona (Spain).

12:25-12:45

Florian Pape
Leibniz University Hannover, Germany

Title: Investigation on Graphene Platelet based Dry Lubricating Film Formation in Tribological Contacts

Biography: Dr Florian Pape works at the Institute of Machine Design and Tribology, Leibniz University, Hannover, as a Post-Doc. His research is in Materials Engineering, Manufacturing Engineering, and Tribology.

12:45-13:05

Joseph Boon Han
University Sains Malaysia, Penang, Malaysia

Title: Numerical Assessment of Horizontal Scanning LIDAR Performance via Comparative Study Method

Biography: Joseph Boon Han Ooi received his B.Sc. (Hons.) degree in Natural Sciences (Physical) from the University of Cambridge, United Kingdom in 2021, specializing in Physics. He is currently pursuing the Ph.D. in Physics degree at University Science Malaysia, Penang, Malaysia on a fast-track programmer.

Lunch Break: 13:05-13:45

13:45-14:05

Oluwatoyin Joseph Gbadeyan
Durban University of Technology, South Africa

Title: Thermomechanical characterization of Bioplastic films produced using a combination of Polylactic acid and Bionano calcium carbonate

Biography: Oluwatoyin Joseph Gbadeyan Ph.D. is a Postdoctoral researcher his research interest lie in mechanical engineering, material development (composite, biocomposite, nanocomposite), Nanotechnology, bioeconomics, additive manufacturing, and tribology.

14:05-14:25

Dana Alsulaiman
King Abdullah University of Science and Technology, KSA

Title: Rational Design of PNA-functionalized 2D and 3D Nanomaterials for Ultrasensitive Electrochemical Detection of microRNA Biomarkers

Biography: Dana Alsulaiman is an Assistant Professor of Material Science and Bioengineering at KAUST. Her group focuses on developing advanced biomaterials and next-generation technologies for minimally-invasive disease diagnosis and personalized therapy.

14:25-14:45

Siriwan Chokkha
Suranaree University of Technology, Thailand

Title: Conductive Material from Automotive Industrial Waste

Biography: Siriwan Chokkha was born in Nakhon Ratchasima, Thailand, in 1987. She received the B.Eng, M.Eng and Ph.D. degrees in ceramic Engineering from Suranaree University of Technology, Thailand, in 2008, 2011 and 2015 respectively.

14:45-15:05

Rebeca Natale
University of Erlangen-Nuremberg, Germany

Title: Improving the optical properties of achromatic lenses due to the process conditions

Biography: Rebeca Natale is scientific assistance at the Institute of Polymer Technology, Friedrich-Alexander-Universität Erlangen-Nürnberg. Her current focus is a DFG (German Research Foundation) project on the production of achromatic lenses using composite injection molding of transparent polymers.

15:05-15:25

Swetha Madamala
MVJ College of Engineering, India

Title: In-vitro Cytotoxicity of Ursolic Acid, 6 Methyl Chromone Hydrate and Gymnemic Acid on MCF7 and A549 Cell Lines

Biography: Dr Swetha Madamala recently did her Doctoral studies at JNTUA. She did her doctoral studies on "Phytochemical Investigation, Method Development and Validation of Anti-Cancer Herbal Plants GymnemaSlyvestrae, MorindaCitrifolia and Aegle Marmeleous Using RP HPLC Techniques.

15:25-15:45

S Jhaumeer Laulloo
University of Mauritius, Mauritius

Title: Structure, Biological and Catalytic acitivities of Diphenylsulfide derivatives

Biography: S Jhaumeer Laulloo has a Personal Chair in Organic Chemistry at University of Mauritius. She is recognized nationally and internationally for her research contributions and achievements in Organic and Surfactant Chemistry and also Organometallic compounds. She is also interested in Forensic Science. She has published over 80 papers in peer reviewed journals.

15:45-16:05

Hadas Shtrikman
Weizmann Institute of Science, Israel

Title: Novel (EuIn)As/InAsSb Nanowires Grown by MBE

Biography: Hadas Shtrikman is an academic researcher. She has contributed to research in topic(s): Nanowire & Electron and has an index of 55, co-authored 237 publication(s) receiving 14890 citation(s). Presently she is at Weizmann Institute of Science, Israel.

Networking and Refreshments Break @ 16:05-16:25

16:25-16:45

Vidushi Adlakha
University of Illinois Urbana-Champaign, United States

Title: Decomposition of Anomalous Diffusion in Generalized Levy Walks into its Constitutive Effects

Biography: Vidushi Adlakha is a Postdoctoral Research Associate in the Department of Physics at the University of Illinois Urbana-Champaign, USA.

16:45-17:05

Khalil El Bourakadi
Casablanca Hassan II University, Morocco

Title: Primordial black holes and gravitational waves from the early Universe

Biography: Dr. Khalil El Bourakadi is a researcher in the field of Cosmology Astrophysics. He earned his PhD from the University of Hassan II Casablanca Morocco.

17:05-17:25

Mohamed Yasir
California Institute of Behavioral Neurosciences and Psychology LLC, CA

Title: Application of Nanotechnology for Diagnosis and Drug Delivery in Atherosclerosis: A New Horizon of Treatment

Biography: Mohamed Yasir is a physician and researcher at VJ hospital, Tirunelveli, India. He received his medical degree from Kursk State Medical University, Russian Federation and is pursuing his Internal Medicine residency in the US. Currently, a remote researcher at California Institute of Behavioural Neurosciences and Psychology, US.

17:25-17:45

Ahmad Tariq Jameel
Aligarh Muslim University, India

Title: Enzyme-Inhibition Based Electrochemical Bio-sensing of Organophosphorus Pesticides – Theory and Mechanism

Biography: Dr. Ahmad Tariq Jameel is currently Professor at the Department of Chemical Engineering, Aligarh Muslim University (AMU), India. Dr. Jameel obtained his Ph.D. in Chemical Engineering from the Indian Institute of Technology Kanpur. He has served in the past as full time faculty at several universities in India, Malaysia, Oman and Saudi Arabia.

Scientific Program

Day 2 | March 28, 2023
Virtual | GMT

09:00-09:15 Opening Ceremony

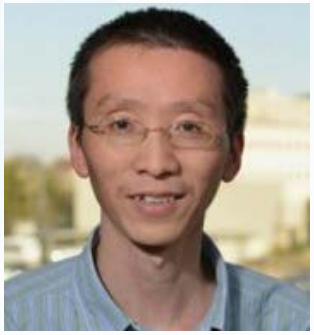
Keynote Forum

09:30-10:00

Osman ADIGUZEL
Firat University, Turkey

Title: Shape Reversibility and Structural Reactions in Shape Memory Alloys

Biography: Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied were focused on shape memory effect in shape memory alloys.



10:00-10:30

Haibo Ge
Texas Tech University, USA

Title: Distal Functionalization via Transition Metal Catalysis

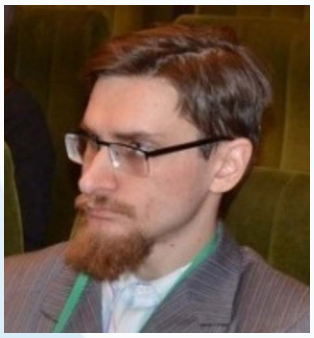
Biography: Haibo Ge received his PhD degree in Medicinal Chemistry from The University of Kansas in 2006, and then moved to The Scripps Research Institute for postdoctoral study. In 2009, he began his independent academic career at the Indiana University – Purdue University Indianapolis and relocated to Texas Tech University in 2020.

10:30-11:00

EKT Sivakumar
Anna University, India

Title: Green synthesis of cellulose/ZrO2 Nano composite: Assessment of photocatalytic activity

Biography: Dr. E.K.T. Sivakumar, Visiting Professor Department of Ceramic Technology, Anna University, Chennai, India s a /Scientist / Philanthropist/ Educationalist/ and an academician-cum-researcher with an immense passion for serving Motherland and its people. He has authored more than 24 books in English and Tamil.



11:00-11:30

Oleg V Gradov
Semenov Institute of Chemical Physics-RAS, Russia

Title: Microfluidic Polarographic Catalymetry

Biography: 2019-now – senior researcher, Semenov Institute of Chemical Physics of Russian Academy of Sciences | N.N. Semenov Federal Research Center for Chemical Physics, Russian Academy of Sciences, Laboratory 0412;

Refreshments Break @ 11:30-11:40

11:40-12:10

Anatolii Startsev
G.K. Boreskov Institute of Catalysis, Russia

Title: H2S: A new Inside into its Role in Human Activity

Biography: 1972 – Graduated from the Tomsk Poly-technical University, Russia, 1972 – 2016 – researcher at the G.K. Boreskov Institute of Catalysis, Novosibirsk, Russia 1977- PhD.: Title of the thesis: Properties of the supported catalysts prepared via organometallic and alkoxide complexes of Mo, W, Re and Pt. 1997- Professor of Chemistry. Title of the thesis: Sulfide HDS catalysts: synthesis, structure, properties. Since 2017 - Pensioner.

12:10-12:40

Rehana Asghar
Mirpur University of Science and Technology (MUST), Pakistan

Title: Enhanced Thermostability and Enzymatic Activity of Cel6A Variants from Thermobifida fusca by Empirical Domain Engineering (Short Title: Domain Engineering of Cel6A)

Biography: Rehana Asghar is presently serving as Professor Emeritus in the Mirpur University of Science and Technology (MUST), Mirpur. She did her Ph.D. and Post- Doctorates from University of California, Riverside USA.

12:40-13:10

Seongwoo Woo
Ethiopian Technical University, Ethiopia

Title: Improving the Reliability Design of Mechanical Systems

Biography: Dr SeongwooWoo has a BS and MS in Mechanical Engineering, and he has obtained PhD in Mechanical Engineering from Texas A&M. He majors in energy system such as HVAC and its heat transfer, optimal design and control of refrigerator.

13:10-13:40

A C Matin
Stanford School of Medicine, USA

Title: mRNA-based systemically delivered directed gene therapy using nanomaterials

Biography: Dr. Matin has been a full professor in Stanford Medical School for several years and is affiliatedwith several programs, including the Stanford Cancer Research Institute; he elected to becomeemeritus, July 1, '21.

Break @ 13:40-14:00

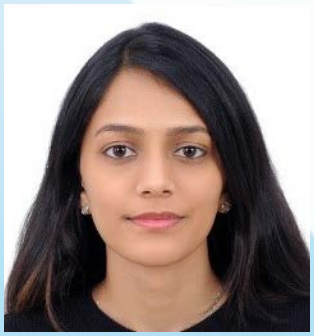
Speaker Sessions:
Session Chair: Osman ADIGUZEL, Firat University, Turkey

14:00-14:20

Suresh Aluvihara
University of Peradeniya, Sri Lanka

Title: Investigations and Analysis of Earth Materials towards the Developments in Some Advanced Chemical and Catalytic Uses

Biography: Mr. Suresh Aluvihara is a postgraduate research scholar at the Department of Chemical and Process Engineering, University of Peradeniya, Sri Lanka since the year 2018 under the disciplines of Environmental Engineering, Chemical and Water Engineering.



14:20-14:40

Rakshitha Srinivasan
University of Southampton, UK

Title: Green Surfactants and Sustainability

Biography: Rakshitha Srinivasan is an Advanced Chemical Engineering postgraduate student at the University of Southampton. She was born in India and raised in Oman and India. She worked as a Research Associate in a skincare start-up company for over a year. She then briefly worked as a Process Engineer in a petrochemical consultancy before moving tothe United Kingdom to pursue her master's degree.

14:40-15:00

Bokon Alexis Akakpo
UAC, Benin

Title: Impact of seasonal urban greening variability on land surface temperature: A case study from Benin (West Africa)

Biography: Akakpo Bokon Alexis is the doctoral candidate at WASCAL, Climate Change and Human Habitat, Federal University of Technology of Minna, Nigeria. His research interests include development of agriculture, forest and biodiversity conservation and climate change and human areas sustainability.

15:00-15:20

Sai P Katke
University of Mumbai, India

Title: Repercussion of Conflicts caused through Chemical Defilement and Eradication in Contemporary Existence

Biography: Sai P Katke lives in Mumbai, India. Completed B.Sc. and M.Sc. in the subject of Chemistry specializing in Organic Chemistry from Bhavans Hazarimal Somani College, Mumbai, India. Pursuing Ph.D. from 'The Department of chemistry, University of Mumbai, Mumbai, India.

15:20-15:40

Karim Tanji
Sidi Mohamed Ben Abdellah University, Morocco

Title: Novel River Sediment@ZnO-Co nanocomposite for photocatalytic degradation and COD reduction of crystal violet under visible light

Biography: Tanji Karim Doctor in Chemistry and engineering process. Three years as a temporary professor at High School of Technology University Sidi Mohamed Ben Abdellah University, Fez, Morocco. Tanji does many investigations in the catalysis field for wastewater treatment using adsorption, wet oxidation, and photocatalysis.

15:40-16:00

Ismail Alhassan Auwal
Sule Lamido University, Nigeria

Title: Effects of Synthesis Parameters on the Crystallization Profile and Morphological Properties of SAPO-5 Templated by 1-Benzyl-2,3-Dimethylimidazolium Hydroxide

Biography: Ismail Alhassan Auwal studied for B.Sc. Chemistry at Kano University of Science and Technology in 2012. In 2014, he secured a full-time faculty position at Sule Lamido University Jigawa Nigeria. He was then awarded a Prestigious Scholarship for master degree where he studied MSc Chemistry at Fatih University (now Istanbul University) 2014-2016.

16:00-16:20

V J Law
University College Dublin, Ireland

Title:Historical 'thermal' and 'Non-thermal' microwave-assisted processes within microwave ovens

Biography: Victor John Law was born in London, U.K., on August 1, 1957. He received the B.Scs. degree from The Open University, Milton Keynes, U.K., in 1985 while he was with the Cavendish Laboratory Semiconductor Physics Group, University of Cambridge U.K., and obtained a Ph.D. degree (by published works) from the University of Ulster, Belfast, Northern Ireland, in 2005.

Poster Session

16:20-16:30

Oluchukwu Igboenyesi
The University of Texas at Arlington, USA

Title: Direct partial oxidation of methane to methanol over Nickel-Ceria/Alumina catalyst

Biography: Oluchukwu Virginia Igboenyesi is currently a PhD candidate at the University of Texas Arlington with research focused on Heterogenous Catalysis.

16:30-16:50

Caio Miranda
PUC - MG, Brazil

Title: FCAW X CWG PROCESS

Biography: Caio César Melo de Sousa Miranda is Mechanical/mechatronics engineering student at the Pontificia Universidade Católica de Minas Gerais, I am completely passionate about my course and I love to learn. I consider myself a disciplined and organized person, I have been working at Alicerce Educação since I was 19 years old as a professional in the field of education, I also worked in the automation sector autonomously,.

16:30-16:50

Gustavo Megale
PUC - MG, Brazil

Title: FCAW X CWG PROCESS

Biography: Gustavo de Pádua Megale is Student of Mechanical Engineering at the Pontifical Catholic University of Minas Gerais, with emphasis on Mechatronics Engineering. My father is also a mechanical engineer, so I've been in contact with the area and I've liked it since I was a child. I studied high school in Lima, Peru. I have a lot of experience with multiple cultures, and today I'm currently doing an exchange in Germany.

16:50-17:00

Maryam Samanian
Shiraz University, Iran

Title: A novel Carbon Dioxide Capture Based on Co-Decorated Molybdenum Disulfide: Boosting Efficiency of Porous 2D Material

Biography: I am Maryam Samanian holding a Ph.D. in Physical Chemistry from Shiraz University, Iran, and a master's degree in the same field and university. I'm searching precisely for the surface chemistry and interfacial phenomenon as well as properties and applications of 2D-materials.

Panel Discussions | Day 02 End | Closing Ceremony

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KEYNOTE SPEAKERS Day 1

Zhendong Dai
Nanjing University of Aeronautics and Astronautics, China

Biography

Dr. Zhendong Dai, professor, director and founder of the Institute of Bio-inspired Structure and Surface Engineering (IBSS) at Nanjing University of Aeronautics and Astronautics (NUAA), Fellow of International Society of Bionic Engineering. His contribution including: 1) developed 3D force sensors and set up a facility to measure the 3D reaction force and to observe the motion behaviors simultaneously, discovered the reaction force pattern when gecko moving on floor, wall, ceiling and even various inclined surfaces, which greatly inspired the design of gecko-mimicking robots, and set up a company to develop and sell the 6 D force sensors; 2) investigated the adhesive mechanism and the detaching technique used by gecko; 3) fabricated the adhesive structures mimicking setae by self-growing carbon nanotube array technology, and modelling technology; 4) patented gecko mimicking adhesive devices and the robots for the applications in space and vacuum.

Bioinspired Adhesive Materials and Micro-structures for Extremely Harsh Environments

Many animals, such as beetles, flies and geckos, have evolved abilities to adhere on vertical or inverted substrates by frictional interlock, wet adhesion based capillary force and dry adhesion-based van der Waals force, thus can move in the ubiquitous three-dimensional space. Adhesive materials and micro-structures inspired by adhesive organs of the animals have great potential for various applications, such as wall-climbing robots, wound adhesive, wearable electronics, debris cleaning on space orbits and routine inspection for manned space station. However, there are few reports which studied the performance of polymeric adhesive micro-structures under so harsh environments.

Here we report a new approach to fabricate the adhesive structure, which possess the adhesive strength 25.47 N/cm2 at -100 ℃, and at the same time excellent adhesive durability under thermal cycling, from -100 to +100 ℃ per 90 minutes. It, for the first time, performed excellent reversible attachment and detachment on ice substrate at -98.5 ℃. To meet the requirement of space applications, we have studied the various performance of the adhesive, including normal adhesive force at room temperature and -100℃, adhesive durability under thermal cycling, adhesion on ice substrate, and radiation resistance. Results show that our products are better than the literature reported. The studies show that bio-inspired adhesive can be beyond limits of the creature, we believe that the adhesive structure would meet wide applications range in space exploration, glacier rescue and in daily life.

ShiroRyu
Meiji University, Japan

Biography

ShiroRyureceived a Ph.D. in electronic engineering from the University of Tokyo in 1993. After that, he researched coherent optical fiber submarine cable systems in KDD R&D Laboratories (1985-1995).After that, Dr. Ryumanageda research group in Japan Telecom and SoftBank Telecom R&D Laboratories regarding next-generation photonic networks (2000-2009). Then, he worked at SoftBank HQs (2009-2016) in charge of designing and deploying long-haul DWDM systems. He now serves as a Professor at the School of Interdisciplinary Mathematical Sciences of Meiji University. His current research interests are optical measurement techniques and optical wireless communication systems.

Optical time domain reflectometry for continuous time-domain measurement of Rayleigh backscattered light

Research efforts have been made on the phase-sensitive optical time-domain reflectometry (Φ-OTDR). In Φ-OTDR technique, the phase change of Rayleigh backscattered light at a certain point of the fibers due to a perturbation is detected by the intensity change of the backscattered light. One of the Φ-OTDR technique problems is that a pulse repetition rate limits the maximum detectable bandwidth of the vibration below about 1kHz. However, it is known that high-speed vibrations of about 10kHz or more are generated in optical fibers laid in a real environment due to vibrations caused by trains running on bridges. Hence, the countermeasures for the above problem have been desired.

The OTDR technique using coherent heterodyne detection, in which signal light and local oscillator light sources are frequency swept linearly, is proposed and experimentally demonstrated to solve the problem above. Experimental results have shown that the technique makes it possible to continuously measure the backscattered light at a specific distance along the fibers in the time domain.

We conducted an experiment by introducing a fiber stretcher that can apply high-speed vibration using a structure in which optical fibers are wound in multiple layers on a piezo element. In the experiment, we placed a fiber stretcher between two 20-km-long optical fiber reels and vibrated the fiber stretcher at a frequency of 140kHz. As a result of the investigation, we continuously observed the vibration component of 140kHz at the 20-km point in a time domain.

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Eli Kapon
Federal Institute of Technology in Lausanne, Switzerland

Biography

Eli Kapon received his PhD in physics from Tel Aviv University, Israel, in 1982. After a Postdoc at Caltech, where he investigated semiconductor lasers and laser arrays, he joined Bell core in 1984, where he worked on integrated photonics and quantum nanostructures, Demonstrating the first quantum wire lasers in 1988. Since 1993 he is professor of physics of Nanostructures at EPFL, Switzerland, where he has worked on quantum wires and dots, Photonic crystals, and vertical cavity surface emitting lasers. He is Fellow of the Optical Society of America, the American Physical Society and the Institute of electrical and Electronics Engineers.

Integrated Quantum Photonics Using Site-Controlled Quantum Dots

Development of means for manipulation of quantum states of light on a chip constitutes an important platform for quantum information technologies. Attractive techniques for producing and controlling such states of light employ photon emission from semiconductor quantum dots (QDs) and their guidance using photonic crystal (Ph.C.) cavities and waveguides. This talk covers recent progress in the integration of site-controlled, pyramidal InGaAs/GaAs QDs with Ph.C. structures nanofabricated on GaAs chips. The fabrication of the structures consists first of growth of InGaAs/GaAs QDs emitting in the ~900nm wavelength inside pyramidal pits produced at prescribed locations on B-oriented GaAs substrates using electron beam lithography, etching and organometallic vapor phase epitaxial. Various Ph.C. cavities and waveguides are then nanofabricated around the QDs with positioning precision as good as ~20nm. The QDs are photo-excited at low temperatures and the photons emitted at various Ph.C. nodes are analyzed using optical spectroscopy. Several cavity-electrodynamics effects due to coupling into the Ph.C. cavities are observed, including new features of the Purcell effect related to quantum interference among confined and radiation modes. Integration of such QDs with more complex Ph.C. structures comprising coupled cavities and waveguides for single-photon routing are presented and discussed.

Farida Selim
Bowling Green State University, United States

Biography

Farida Selim is a professor of Physics at the department of Physics and the Center for Photochemical Sciences at BGSU. She has a broad research program in the field of semiconductors and electronic and photonic materials; andhas been active in constructing beam lines and developing new instrumentation for advanced material research. She authored 135 peer review journal articles, published two books, and numerous patents. She is on the advisory boards of six international scientific committees related to positron annihilation spectroscopy, oxide semiconductors, photonic materials, and radiation. She plays a leading role in national research projects including two new Energy Frontier Research Centers (EFRC) from Department of Energy

Advanced thermoluminescence spectroscopy as a research tool for semiconductor and photonic materials

Thermo-luminescence (TL) or thermally stimulated photoemission spectroscopy is based on liberating charge carriers from traps in the band gap by providing enough thermal energy to overcome the potential barrier of the traps. It provides a powerful tool to measure the positions of the localized states/traps in the band gap. Despite that, its applications in semiconductors have been very limited.

Here we describe the development of cryogenic thermally stimulated photoemission spectroscopy (C-TSPS)for the low temperature regime from 9 K to room temperature to extend TL measurements to cover the entire range of shallow and deep levels in band gap materials and show how it can be used for the characterization of deep and shallow donors and acceptors in semiconductors. Examples of its applications in measuring/donor ionization enegies in Ga2O3 and ZnO films and bulk crystals are demonstrated.

This newly developed spectrometer providesa powerful characterization tool for a wide range of semiconductors and electronic and photonic materials. It can be used to measure the electrical transport properties of semiconductors and study exciton dynamics in photonic materials and reveal their interesting characteristics. It will advance material characterization and development for a wide range of applications including lasers, electronic and illumination devices, and detectors for medical diagnostic and nuclear applications.

This work has been funded in part by the US National Science Foundation (NSF)under grant number DMR-2005064.

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Pallab Banerji
Indian Institute of Technology Kharagpur, India

Biography

Dr. P. Banerji is a Professor in Materials Science in Indian Institute of Technology Kharagpur, India. His area of specialization is semiconductor materials and low dimensional systems for various applications in the field of thermoelectrics and optoelectronics. Prof. Banerji supervised twenty-five doctoral students and several Masters theses. He has published around 150 research papers in peer reviewed journals. Prof. Banerji is a recipient of MRSI medal instituted by the Materials Research Society of India.

Gallium nano droplet catalyzed growth of ternary nanowires

Gallium (Ga) nano droplets were deposited on silicon (Si) substrate by pyrolysis of tri-methyl gallium (TMGa) for the self-assisted growth of InGaAs nanowires via vapor solid liquid technique using metal organic chemical vapor deposition (MOCVD) system. Group V hydride such as arsine, and group III alkyls, viz. TMGa and tri-methyl indium were used as precursors. It was observed that at a temperature of 450 0C, the growth rate is very small, whereas it is very high at 550 0C due to higher cracking efficiency of TMGa. At an intermediate temperature of 550 0C, Ga droplets are found uniform throughout the substrate with an average diameter of 27 nm and a density of 2.8 x 109 cm-2. The effect of growth temperature and duration on the shape and size of the droplets were demonstrated on the basis of Oswald ripening based coalescence mechanism. It was found that partial coalescence of smaller droplets leads to the formation of valve-shaped nanostructures whereas complete coalescence of droplets gives rise to spherical nanomorphology. Self-catalyzed InGaAs nanowires were grown on Si substrate by a two steps process in MOCVD using Ga nano droplets as catalyst. Growth temperature and V/III ratio were optimized to obtain vertically stranded nanowires. Growth morphology showed that with increasing V/III ratio, the diameter of the nanowires decreases. It was also found that the indium and gallium fraction varies along the length of the grown nanowires. The TEM fringe pattern revealed that the nanowires were grown along the (111) direction.

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SPEAKERS Day 1

Jan Atienza-Garriga
University of Barcelona, Spain

Biography

Jan Atienza-Garriga graduated in biotechnology and obtained his Master's in Food Biotechnology at the University of Girona (Spain). He is currently studying for a PhD thesis at the Nanobiotechnology group at the Institute of Biotechnology and Biomedicine (IBB) from the Autonomous University of Barcelona (Spain), working on the use of antimicrobial peptides and multivalent protein complexes to be administered through lipid structures (e.g., liposomes) and micelles.

Analysis of the protection of protein-only nanoparticles containing antimicrobial Peptides with liposomes and micelles

Antimicrobial peptides (AMPs) are secreted factors involved in the innate and acquired immune system, providing potent efficacy against bacteria, fungi, and viruses. A small peptide like an AMP is difficult to be recombinantly produced at large scale, but their fusion to a scaffold protein is an approach used to overcome this limitation. A modular recombinant protein derived from this process can be efficiently produced and purified.Recombinant gene engineering can direct the synthesis of proteins that form protein nanoparticles (NPs) through the expression of novel genes. When recombinant AMPs are forming part of NPs, they retain their biological activityand are envisioned as potential therapeutic formulations against infectious diseases.In the context of the treatment of respiratory tract infections, the administration of antimicrobial drugs is hampered by the presence of the mucus barrier. Therefore, novel formulations need to be developed to overcome these limitations and the use of nanoparticles could be a protective alternative to degradation.

Florian Pape
Leibniz University Hannover, Germany

Biography

Dr Florian Pape works at the Institute of Machine Design and Tribology, Leibniz Universität Hannover, as a Post-Doc. His research is in Materials Engineering, Manufacturing Engineering, and Tribology. Besides the influence of residual stresses on bearing fatigue life and hybrid bearing materials he works on the influence of Tribofilms and micro-textures regarding friction and wear. His current projects include studies on sensor integration to bearings (direct deposited) and graphene as dry-lubricant or grease additive for roller bearings.

Investigation on graphene platelet based dry lubricating film formation in tribological contacts

The application of dry lubrication in rolling contacts is challenging due to wear. In previous studies graphene platelets as, dry lubricants applied on angular contact ball bearing surfaces proved superior properties. In these specific bearings besides rolling also spinning motion results in harsher conditions for dry lubricants. The applied graphene platelets have a thickness of few graphene layers in the nm range and a diameter in the µm range. They can be produced by mechanical exfoliation from graphite allowing to achieve affordable graphene platelets. To gain deeper insights in the lubrication effects investigations on a Milli Tribometer were performed. In the tests, a fixed steel ball is placed against an oscillating counterpart under defined load. During the measurements, the applied load and tangential forces on the ball are recorded to calculate the friction. In our case, a steel ball with a diameter of 6 mm was used against graphene-based films on flat bearing surfaces (axial bearing washers). To increase the adhesion of the films on the surfaces a pre-rolling process was conducted. Afterwards the friction on the compressed films was measured. It could be shown, that such a pre-rolling process helps to reduce the friction of the system. After the tests, the surfaces were analysed in terms of laser scanning microscopy to conclude on the formed films and wear as well as material transfer. It could be shown, that by pre-rolling a very thin compacted film is formed. On the ball partly graphene platelets form a transfer film on the surface on the contacting zone.

Joseph Boon HanOoi
University of Science, Malaysia

Biography

Joseph Boon Han Ooi received his B.Sc. (Hons.) degree in Natural Sciences (Physical) from the University of Cambridge, United Kingdom in 2021, specializing in Physics. He is currently pursuing the Ph.D. in Physics degree at University Science Malaysia, Penang, Malaysia on a fast-track programmer. His research focusses on the development of a low-cost LIDAR for atmospheric aerosol detection.

Numerical Assessment of Horizontal Scanning LIDAR Performance Via Comparative Study Method (published in Optics and Lasers in Engineering)

LIDAR performance is often evaluated after assembled prototypes are deployed for field tests. However, this approach is resource-intensive, which necessitates more cost-effective ways to detect flaws and improve LIDAR design. In this work, we present numerical assessment of horizontal scanning LIDAR performance via comparative study method. This assessment method could evaluate LIDAR performance without physically assembling the unit, hence save resources and time. We demonstrate this using a hypothetical atmospheric LIDAR. In our assessment, Python™ was used to develop simulation algorithm based on LIDAR equation, while Koschmieder visibility theory was used in atmosphere modelling. Daytime visibility and MODTRAN® solar spectral radiance data were also incorporated for analysis. We then evaluated LIDAR performance based on signal-to-noise and range-corrected signal profiles. Lastly, we conducted comparative study of this hypothetical LIDAR setup with Shiina (light emitting diode) LIDAR and VAST (ground-based) LIDAR for horizontal distance of 1 km. Numerical analysis showed that hypothetical LIDAR could operate up to 1 km at night. During daytime, detection was limited to 94 m and 220 m for 532 nm and 808 nm channels respectively. Comparative study demonstrated that the hypothetical LIDAR excelled in night-time detection range with acceptable daytime performance. Overall, the hypothetical LIDAR has met case study requirements. We demonstrate the feasibility of this numerical assessment via comparative study method by identifying possible improvements in laser module without experimental data verification.

O J Gbadeyan
Durban University of Technology, South Africa

Biography

Oluwatoyin Joseph Gbadeyan Ph.D. is a Postdoctoral researcher his research interest lie in mechanical engineering, material development (composite, biocomposite, nanocomposite), Nanotechnology, bioeconomics, additive manufacturing, and tribology.

Thermomechanical characterization of bioplastic films produced using a combination of polylactic acid and bionano calcium carbonate

The present study focuses on the thermomechanical investigation of bioplastic firms produced from a combination of polylactic acid and nano-calcium carbonated (nano-CaCO3) synthesized from the Achatina Fulica snail shell. The bioplastic films fabricated with nano-CaCO3 content ranging from 1 to 5 wt.% were prepared using a solvent casting method. Thermal stability and degradation with temperature-dependent mechanical properties such as stiffness, storage modulus, and loss modulus of the developed bioplastic films were determined. The conformation changes in the functional group of the developed bioplastic films after incorporating nano-CaCO3 were also investigated. It was observed that incorporating nano-CaCO3 improved the thermal stability and temperature-dependent mechanical properties of neat polylactic acid, regardless of the percentage weight added. An 85.67% improvement in thermal stability was observed. The temperature-dependent stiffness increased by 84%, whereas the storage modulus improved by 240%.

On the other hand, loss modulus improved by 50% due to nano-CaCO3 incorporation into polylactic acid (PLA). The FTIR curves of bioplastic films incorporated with nano-CaCO3 present insignificant conformation changes in the functional group of the resulting bioplastic films. This is presumable due to the compatibility of the matrix and the reinforcement. As a result, the resulting materials' thermal and temperature-dependent mechanical properties improved significantly, demonstrating that the developed bioplastic films could be used for package applications.

Dana Alsulaiman
King Abdullah University of Science and Technology, KSA

Biography

Dana Alsulaiman is an Assistant Professor of Material Science and Bioengineering at KAUST. Her group focuses on developing advanced biomaterials and next-generation technologies for minimally-invasive disease diagnosis and personalized therapy. Her research includesadvancements in encoded hydrogel microparticles, stimuli-responsive microneedles and pointof-care optical and electrochemical biosensors. She completed her PhD inBioengineering, supported by the Imperial College London President's PhD Scholarship. In 2019, shemoved to the USA to pursue her postdoctoral training at MIT. She is the recipient of multipleprestigious awards including the IET Healthcare Technologies Award (2019) and MITTechnology Review's Innovator's Under 35 Award (2021).

Rational Design of PNA-functionalized 2D and 3D Nanomaterials for UltrasensitiveElectrochemical Detection of microRNA Biomarkers

MicroRNA represent a class of short (22-25 nt) non-coding RNA, which hold great promise as clinical biomarkers due to their gene regulatory functions and dysregulated patterns in many diseases including cancer. Notably, circulating cell-free microRNA have emerged as highly

promising 'liquid biopsy' biomarkers for cancer; however, their short lengths and lowconcentrations make them challenging to detect reliably, even with gold standard techniques

like RT-qPCR. There is thus an urgent need to develop simple and robust microRNAbiosensors that offer high sensitivity (picomolar to femtomolar regime) and specificity (singlenucleotideresolution), while being amenable for point-of-care testing. Herein, I will presenttwo platforms for electrochemical detection of microRNA which exploit the specificity ofPeptide Nucleic Acid (PNA) probes and the sensitivity of advanced 2D and 3D nanomaterials.PNAs, which are synthetic pseudo-peptide analogues of DNA or RNA, offer greater stability,sequence specificity, and resistance to degradation when compared to their natural counterparts.Using solid phase peptide synthesis methods, we have prepared bespoke PNA probes with twotypes of functionalities enabling either bio-orthogonal click chemistry or π-π stacking on thebiosensing surface. Successful fabrication and biofunctionalization were validated throughphysicochemical and surface characterization techniques including XPS, SEM, and Ramanspectroscopy. During the proof-of-concept studies, the biosensors demonstrated highsensitivity (low femtomolar limits of detection), high specificity, and a large dynamic range.Ultimately, this talk will demonstrate the immense potential of PNA-functionalizednanomaterials in the development of highly sensitive point-of-care biosensors for microRNAdetection, enabling the next generation of minimally-invasive cancer diagnostic tools.

Siriwan Chokkha
Suranaree University of Technology, Thailand

Biography

She was born in Nakhon Ratchasima, Thailand, in 1987. I received the B.Eng, M.Eng and Ph.D. degrees in ceramic Engineering from Suranaree University of Technology, Thailand, in 2008, 2011 and 2015 respectively. She is currently engaged as an Assist professor in the school of Ceramic engineering, Institute of Engineering, Suranaree University of Technology. Nevertheless, She is a member of the Center of Excellence in Biomechanics Medicine. Her research interests include all traditional and advanced ceramics, bio-material, Electronic and Energy material, Zero waste and sustainability and medical device.

Conductive Material from Automotive Industrial Waste

Automotive industrial waste is increasing rapidly to meet the demand for using an automobile, resulting in subsequent environmental problems because the waste will be disposed by landfill. To solve sustainable environmental problems, strong acid of HNO3 is utilized to transform the chemical composition of iron-rich automotive manufacturing waste. The final outcome of the chemical interaction between Fe-waste and HNO3 strong acid is a pure form of Fe_2O_3 that is insoluble in water. Then, a conductive perovskite material with the chemical formula of $LaNi_{0.6}Fe0._4O_3+_5$ is used mechanical grinding synthesized technique by substituting Fe_2O_3-waste in Ni-metal site (B-site). The mixed phases of $LaNi_0.6Fe_{0.4}O_{3+5}$, $LaNi_{0.75}Fe_{0.25}O_{3+5}$and $LaNiO_{3+5}$ from automotive industrial waste after sintering at 1200oC for 2 hrs is detected by XRD with using TOPAS software analysis in the amount of 53.13%, 29.41% and 17.46%, respectively. The $LaNi_{0.6}Fe_{0.4}O_{3+5}$ calculated perovskite material from automotive industrial waste is presented the highest electrical conductivity with a value of 42 S/cm at 550oC. Additionally, the electrical conducting property is mixed of metallic and semiconducting behavior with a transition point of electrical conductivity at 550oC. Moreover, the coefficient of thermal expansion of $LaNi_{0.6}Fe_{0.4}O_3+_5$ synthesized sample from automotive industrial waste is represented in the range of 12-13 1/°C, which is similar to the electrolyte materials used in an Intermediate temperature solid oxide fuel cell (IT-SOFC) components. The results suggested that the strong acid could change the chemical composition of automotive industrial waste, which could then be utilized as a starting material for synthesis of IT-SOFC conductive materials. The experiment can reduce the amount of waste, offer additional value of industrial waste, as well as provide a long-term sustainable solution to environmental problems.

Rebeca Natale
University Of Erlangen-Nuremberg, Germany

Biography

Rebecca Natale is a scientific assistance at the Institute of Polymer Technology, Friedrich-Alexander-Universität Erlangen-Nürnberg. Her current focus is a DFG (German Research Foundation) project on the production of achromatic lenses using composite injection molding of transparent polymers. She hold a Bachelor's degree in Industrial Engineering with a major in Mechanics which she graduated in April 2020 and a Master's degree in Applied Plastics Technology which She graduated in November 2021, both from Schmalkalden University of Applied Sciences. She is originally from Venezuela and have been living in Germany since 2015.

Improving the optical properties of achromatic lenses due to the process conditions

Transparent polymers have gained considerable attention as materials for precision optical components due to their light weight and ability to be produced in large quantities by injection molding. Another advantage of using an injection molding process is the possibility to produce multicomponent parts without the need for an additional adhesive. A good example is the production of achromatic lenses. Achromatic lenses are often used in optical applications, such as car headlights and cameras, to correct chromatic aberrations. This study focuses on the influence of process parameters on the optical properties of achromatic lenses manufactured by isothermal and variothermal injection molding processes. The lenses were made from a combination of two materials, polycarbonate (PC) and polymethal methylacrylate (PMMA). The process parameters were systematically varied and the resulting material optical properties were analyzed using appropriate analytical methods. The use of high holding pressure (700 bar) for the first component (PC) combined with the variothermal injection molding process exhibits good optical properties in achromats, and an additional step of oven bedding to reduce residual stresses improves these optical properties further. The results of this study will provide insight into the optimal choice of process parameters for the injection molding of high-quality achromatic lenses made of PC and PMMA.

Swetha Madamala
MVJ College of Engineering, INDIA

Biography

Dr Swetha Madamala recently did her Doctoral studies at JNTUA. She did her doctoral studies on "Phytochemical Investigation, Method Development and Validation of Anti-Cancer Herbal Plants GymnemaSylvestrae, MorindaCitrifolia and Aegle Marmeleous Using RP HPLC Techniques. Her area of research interest in HPLC techniques, Herbal Chemistry, Nanotechnology. she is having 10 years' experience in teaching graduate students. She attended various conferences on national and international and published a few papers on reputed journals, she is an active member in various professional bodies. Currently working as Assistant Professor in MVJ College of Engineering.

Invitro Cytotoxicity of Ursolic Acid, 6 Methyl Chromone HydrateAndGymnemic Acid on Mcf7 Anda549 Cell Lines

In modern medicine, chemotherapy, radiotherapy, and surgery are the major existing modes oftreatments. The toxicity and severe adverse effects associated with cancer chemotherapy and radio therapy create new avenues for discovering and developing nontoxic agents for prophylaxis, mitigation, and treatment of cancer. One of the best approaches in searching for novel anticancer agents from plant resources is selection of plants based on ethnomedical practices and testing their efficacy and safety considering modern science. In the past two decades, systemic ethno botanicaldocumentation has been prioritized in India and recent studies indicate that plants used by herbal healers have beenscientifically shown to possess chemotherapeutic value. This added todeep belief that these treatments are safe because they are" natural" and fit into the image of a gentle and therefore, harmless alternative to conventional medicine and hence are staging a comeback and herbal renaissance in treating canceris happening all over the world. As most of the blockbuster agents are from botanicals.

Ursolic Acid, 6Methyl chromone hydrate, Gynmemic Acid were tested forinvitro cytotoxicity, using A549 cell Lines and MCF7 cell Lines by using MTT assay. The monolayer cell culture of the employed cell lines was trypsinized, cell count was adjusted to 100,000 cells/ml with MEM containing 10% FBS. To each well

of the 96 well microtiter plate, 100 µL of the diluted cell suspension was added. After 24 h, when apartial monolayer was formed, the supernatant was flicked off, monolayer was he donce with medium and100 µL of different test concentration softestsubstanceswereaddedonto the partial monolayer. 200 µL of cells (A549 &MCF7) without test substance treatment were taken as control. Each sample was replicated thrice, and cells were incubated at 37° C for 72 h in a humidified 5% CO_2 incubator and microscopic examination was carried out and observations were noted every 24 h interval.

After72hincubation,thedrugsolutionsinthewellswerediscardedand50 L of MTTin PBS was added to each well. The plates were gentlyshaken and incubated for 3 h at 37° C in 5% CO_2 atmosphere. The supernatant was removedand100µL of propanol was added and the plates were gently shaken to solubilize the formed formazan. The absorbance was measuredusingamicroplatereaderatawavelengthof540nm.Thepercentagegrowth inhibition was calculated using the standard formula and concentration of test substances needed to inhibit cell growth by 50% (CTC_{50}) values was generated from the dose-response curves for each cell and the percentage viability (CV)was calculated manually using formula:

$$CV = \frac{\text{Average absorbance of treated drug wells- Absorbance of Blank}}{\text{Average absorbance of control drug wells- Absorbance of BlankBlank}} \times 100\%$$

cells contain media alone with no plating of cells and control group cells are nothing but untreated cells.

% Cytotoxicity = 100- % of cell viability

The mean of absorbance values that are lower than control group indicates reduction in cell viability. Conversely, a higher mean absorbance indicates increase in cell proliferation.A dose response curve was plotted to enable the calculation of the concentrations that kill 50%of the A549 and MCF7 cells. (IC_{50})

S Jhaumeer Laulloo
University of Mauritius, Mauritius

Biography

S Jhaumeer Laulloo has a Personal Chair in Organic Chemistry at University of Mauritius. She is recogized nationally and internationally for her research contributions and achievements in Organic and Surfactant Chemistry and aslo Organometallic compounds. She is also interested in Forensic Science. She has published over 80 papers in peer reviewed journals.

Structure, Biological and Catalytic acitivities of Diphenylsulfide derivatives

Diphenyl disulfide scaffold is considered among one of the most momentous structural motifs in chemistry that have sparked a growing interest among researchers due to the interesting biological and catalytical properties. Multiple studies have demonstrated the effectiveness of diaryl disulfides as promising anticancer, herbicidal and antibacterial agents. Diaryl sulfides possess flexible Sn spacer groups giving rise to mononuclear, binuclear or polynuclear complexes when coordinated to metal centers.

Diaryl disulfide derivatives with varying alkyl chain length showed interesting physicochemical properties and antibacterial activities. The C10/C12 alkyl chains showed optimum activity as a result of an ideal hydrophobic-hydrophilic balance that enhanced interaction and penetration of the molecule inside the bacterial membrane. An increase in chain length caused an increase in the affinity with (Bovine Serum Albumin) BSA up to a chain length of C12, above which the binding ability decreased and the interaction were mainly via van der Waals' forces and hydrogen bonding. Increasing hydrophobicity of diphenyldisulfide salicyldiimine derivatives by introducing t-butyl group contributed to higher anti-oxidant properties.

Co-ordination of metals to these diaryl sulfides occurs either with or without the S-S cleavage. Many of these metal complexes exhibited promising antibacterial and antioxidant activities which were due to the presence of larger planar geometries and S–S linkages. These complexes also act as potential catalyst in C-C bond formation in organic reactions such as Mizori-Heck and Suzuki -Miyaura.

The biological and distribution of these diary disulfides in plasma proteins were influenced by their lipophilicity. Their metal complexes also proved to be efficient catalysts.

Hadas Shtrikman
Weizmann Institute of Science, Israel

Biography

Hadas Shtrikman is an academic researcher from Weizmann Institute of Science.She has contributed to research in topic(s): Nanowire & Electron andhas an index of 55, co-authored 237 publication(s) receiving 14890 citation(s). Presently she is at Weizmann Institute of Science, Israel.

Novel (EuIn)As/InAsSb Nanowires Grown by MBE

EuIn2As2 is among a vast list of emerging Zentil compounds. It is predicted to be a magnetic topological crystalline insulator consisting of alternating layers of divalent Eu (Eu2+) and In2As2 layers. EuIn2As2 bulk single crystals have been grow by a flux method with a by-product which includes trivalent Eu (Eu3+). This work focuses on growth and study of novel, (EuIn)As/InAsSb nanowires produced by molecular beam epitaxy (MBE). In particular, the so called gold assisted vapor liquid solid (VLS) MBE growth of such reclining nanowires. This is a powerful tool for producing various binary and ternary nanowires as well as core/shell structures. These can support hybrid nanoscale devices such as superconductor-semiconductor or ferromagnetic insulator-semiconductor materials with a materials and geometrical variety. Growth of an (EuIn)As on a wurtzite (WZ) InAs core results in a rough shell in which a unique zinc blende (ZB) like crystal structure is observed. Nevertheless, the so-called stalactites ZB InAs nanowires, which emerge from the merged intersections of two reclining WZ InAs nanowires turn out to have a smooth and uniform surface as seen in Figure. This inspired us to incorporate Sb into the core nanowires in order to transform the core crystal structure from WZ to ZB and thus assure a smooth coating by the (EuIn)As shell. ZB InAs0.9Sb0.1 nanowires were grown by the gold-assisted vapor–liquid–solid (VLS) MBE, on InAs with and without a WZ InAs stem. Theoretical modeling using Molecular Dynamics simulations strongly support the substantial difference between the (EuIn)As shell formation on WZ and ZB, where the latter proves to be a significantly better host for the Eu atoms. Morphology, structure and composition of the Eu containing NWs were studied using SEM, HR-TEM, HAADF-STEM and EDS. The unique ZB mosaic structure is typical of the EuInAs regardless of the core and to the best of our knowledge is observed for the first time in our nanowire structures. We obtained particularly interesting information regarding the atomic coordination of the eight fold Eu situated between two As layers. Interestingly, Eu ions form inversion domain boundaries (IDB) (as can be seen in and schematically illustrated in, thus inducing a flip of the InAs lattice, similarly to what has been reported in bulk.

Vidushi Adlakha
University of Illinois Urbana-Champaign, USA

Biography

Vidushi Adlakha is a Postdoctoral Research Associate in the Department of Physics at the University of Illinois Urbana-Champaign, USA. Her research interests include physics education, statistical physics, and computational physics. She is a member of the Committee on Status of Women in Physics by the American Physical Society (APS). She has previously conducted research with institutions and universities across the globe, including Max Planck Institute (Germany), the University of Palermo (Italy), the University of Houston (USA), and Jawaharlal Nehru University (India). She is also a recipient of the prestigious American Association for University Women (AAUW) International fellowship.

Decomposition of Anomalous Diffusion in Generalized Lévy Walks into its ConstitutiveEffects

Anomalous diffusion is observed in a variety of physical and social systems, includingblinking quantum dots, animal locomotion, intra-day trades in financial markets and cold atoms indissipative optical lattices. Generalized Lévy walks can be used to model their dynamics. Thisresearch shows that the anomalous diffusive behaviour found in these systems can be decomposedinto three fundamental constitutive causes. These causes, or effects, are related to ways that theCentral Limit Theorem fails. The increments generated through the stochastic process can haveeither long-time correlations, infinite variance, or be non-stationary. Each of these properties cancause anomalous diffusion and is characterized by what is known as the Joseph, Noah and Moseseffects, respectively. In generalized Lévy walks, a complex combination of these effects leads tothe observed sub- and super-diffusive behaviours. We analytically calculate the scaling exponentsdetermining each of the three constitutive effects and confirm the results with numericalsimulations. The results satisfy a fundamental scaling relation between the exponents. This studyof stochastic processes will open a new frontier for data-driven innovation, which will extendbeyond physics to include relevant and critical systems such as biological and socio-economicsystems.My current research focuses on applying causal inference principles to the analysis ofobservational studies in physics education.

Khalil El Bourakadi
Casablanca Hassan II University, Morocco

Biography

Dr. Khalil El Bourakadi is a researcher in the field of Cosmology Astrophysics. He earned his PhD from the University of Hassan II Casablanca Morocco. He participated in several international conferences where he talks about the evolution of the early Universe and the astrophysical events that occurred at the end of inflation and the subsequent eras of the early Universe. He is a member of a Moroccan association that supports African Scientists and phd candidates as well as students who are interested in development of personal qualifications.

Primordial black holes and gravitational waves from the early Universe

We study the spectrum of the energy density of gravitational wavesproduced during the preheating phase, at the end of inflation inhomogeneities ofthe time-dependent field act as a source ofgravitational, and the spectrum of GWs canbe linked directly to the duration of preheating. Moreover, the amplification of fieldfluctuations during the preheating process can lead to the amplificationof sufficientlylarge curvature perturbations which lead to the overproduction of primordial blackholes (PBHs). In our work, we study PBH and GWs production from preheating. Weshow that gravitational wave generation during preheating can be constrained fromPlanck's data, and PBHs that are overpopulated during the radiation-dominatedera are affected by the preheating efolds number.

Mohamed Yasir
California Institute of Behavioral Neurosciences and Psychology LLC, CA

Biography

Dr Mohamed Yasir is a young physician and researcher at VJ hospital, Tirunelveli, India. He received his medical degree from Kursk State Medical University, Russian Federation and is pursuing his Internal Medicine residency in the US. Currently, as a remote researcher at California Institute of Behavioural Neurosciences and Psychology, US.Heis co-authoring several papers and has already published two articles in high-indexed journals. Heplans to become a physician-scientist in the field of Critical Care Medicine.

Application of Nanotechnology for Diagnosis and Drug Delivery in Atherosclerosis: A New Horizon of Treatment

Background: Cardiovascular diseases are the leading cause of death worldwide, with atherosclerosis being a prominent risk factor for their development. The current diagnostic criteria for atherosclerosis rely primarily on imaging techniques, including an angiogram. However, current diagnostic procedures fail to provide insights into the plaque's burden and composition. Therefore, nanotechnology is recommended as a novel drug delivery method in treating atherosclerosis and resulting cardiovascular diseases to enhance clinical outcomes.

Aims and Objectives: This review discusses the different approaches in which nanotechnology can be applied in the diagnosis and drug delivery of cardiovascular diseases.

Methods: A systematic review was carried out in line with the PRISMA reporting guidelines, with the literature databases PubMed, Scopus, and Web of Science being screened for relevant literature. Any study that discussed and reported on the application of nanotechnology for either the diagnosis or drug delivery in atherosclerotic patients was included in this review, with each novel design identified in the citations being contrasted to that of the other literature. Moreover, the efficacy of this technology was compared to current diagnostic and drug delivery methods.

Results: The search strategy yielded fourteen studies relevant to the aims of this review. Nine assessed the therapeutic applications of nanotechnology, three solely assessed the diagnostic applications of nanotechnology, and two discussed the diagnostic and therapeutic applications. The nanoparticle designs differed significantly between studies; however, all noted a superior therapeutic and diagnostic benefit compared to current approaches to diagnosing and treating atherosclerosis.

Conclusion: Multifunctional nanoparticles are a feasible and appropriate novel approach to diagnosing and treating atherosclerosis.

Ahmad Tariq Jameel
Aligarh Muslim University, Aligarh, India

Biography

Dr. Ahmad Tariq Jameel is currently Professor at the Department of Chemical Engineering, Aligarh Muslim University (AMU), India. Dr. Jameel obtained his Ph.D. in Chemical Engineering from the Indian Institute of Technology Kanpur. He has served in the past as full time faculty at several universities in India, Malaysia, Oman and Saudi Arabia.

Dr. Jameel's current research interests include: Development of immobilized enzyme based nano-biosensors; convection-diffusion-reaction in biocatalyst pellets/nano-biocatalyst; immobilization of enzymes/cells on nanostructures/gel matrices; nonlinear stability & dynamics of thin liquid film flows, etc. He has published and/or presented over 80 research papers in international and national journals and conference proceedings, besides several book chapters and edited books to his credit. He is a member of the International Association of Colloid and Interface Scientists (IACIS) and the Canadian Society for Chemical Engineering (CSChE). He has been actively involved in curricula development for Chemical and Bioengineering programs.

Enzyme-Inhibition Based Electrochemical Bio-sensing of Organophosphorus Pesticides – Theory and Mechanism

In modern agricultural practices, organophosphorus compounds (OPs) are widely used as pesticide and insecticide. However, an excess of OPs may become nero-toxic to humans and many other live forms. Traditional methods of detection of OPs are cumbersome and expensive. Lately, biosensor technology being developed are portable, efficient and economical. Currently, most biosensors for OPs are based on the inhibition of acetylcholinesterase (AChE) extracted from animal sources. This can be easily replaced with the plant-esterase as sensing material because plant esterase can be extracted easily from plant sources. Metal and carbon based nanomaterials are being widely used as immobilization support owing to biocompatibility and enhanced electron transfer ability for sensitive electrochemical detection. This study aims to explore and quantify the effectiveness of an immobilized plant esterase (alpha-naphthyl acetate esterase (ANAE)) on multi-walled carbon nanotube (MWCNT) coated on Screen Printed Carbon Electrode (SPCE) for efficient detection of pesticides in food and environment. The OPs are known to inhibit the plant esterase. The ANAE was extracted from wheat flour and purified by polyethylene glycol (PEG)/salt aqueous two-phase separation process. The Michaelis-Menten kinetics and inhibition kinetics of free ANAE was investigated, and appropriate kinetic models proposed. An irreversible inhibition mechanism lead to the determination of the kinetic constants for the inhibition of ANAE by OPs. The kinetics of immobilized ANAE-MWCNT is being investigated. The hydrolysis of alpha naphthyl acetate by ANAE in the presence of inhibitors, i.e., OP pesticides produces an electrical signal that depends on the OPs concentration and is measured amperometrically. Sensitivity, detection limit and response time of the biosensor in the presence of OPs will be quantified. The research outcomes include: identification of appropriate kinetic model for the inhibition of ANAE; the characterization of the ANAE-MWCNT-SPCE electrode for the efficient detection of OPs; the identification of optimal parameters.

4th Edition International Conference on

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KEYNOTE SPEAKERS Day 2

O. Adiguzel
Firat University, Turkey

Biography

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD-degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied were focused on shape memory effect in shape memory alloys. His academic life started following graduation by attending an assistant to Dicle University in January 1975. He became professor in 1996 at Firat University in Turkey, and retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He supervised 5 PhD- theses and 3 M. Sc- theses and published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international level with contribution. He served the program chair or conference chair/co-chair in some of these activities. Also, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Additionally, he joined over 120 online conferences in the same way in pandemic period of 2020-2022.

Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data)

Shape Reversibility and Structural Reactions in Shape Memory Alloys

A series of alloy materials take place in a class of advanced smart materials with the stimulus response to external effect. Shape memory alloys take place in this class by exhibiting a peculiar property called shape memory effect, with the chemical compositions in the β- phase field in phase diagrams. This phenomenon is characterized by the recoverability of two certain shapes of material in reversible way at different conditions. This phenomenon is initiated with thermomechanical processes on cooling and deformation and performed thermally in a temperature interval on heating and cooling, with which shape of materials cycles between original and deformed shapes in reversible way. Therefore, this behavior is called thermoelasticity. This is plastic deformation; the strain energy is stored in the material and releases upon heating by recovering the original shape. This phenomenon is result of structural reactions, thermally and stress induced martensitic transformations. Thermal induced martensitic transformation occurs on cooling with cooperative movements of atoms in <110 > -type directions on the {110} - type planes of austenite matric, along with the lattice twinning reaction, and ordered parent phase structures turn into the twinned martensite structures. Twinned structures turn into the detwinned structures by means of stress induced martensitic transformation with deformation in the martensitic condition.

These alloys exhibit another property, called superelasticity, which is performed with stressing and releasing the material in elasticity limit at a constant temperature in parent phase region, and shape recovery is performed instantly and simultaneously upon releasing the applied stress, by exhibiting elastic material behavior. Stress-strain profile is nonlinear in stress-strain diagram, also stressing and releasing paths are different, and hysteresis loops refers to energy dissipation. Superelasticity is also result of stress

induced martensitic transformation and ordered parent phase structure turns into the detwinned martensite structure with stressing.

Copper based alloys exhibit this property in metastable β-phase region, which has bcc-based structures at high temperature parent phase field. Lattice invariant shear and twinning is not uniform in these alloys and gives rise to the formation of complex layered structures. These structures can be described by different unit cells as 3R, 9R or 18R depending on the stacking sequences.

In the present contribution, x-ray diffraction and transmission electron microscopy (TEM) studies were carried out on copper based CuAlMn and CuZnAl alloys. X-ray diffraction profiles and electron diffraction patterns exhibit super lattice reflections. X-ray diffractograms taken in a long-time interval show that diffraction angles and peak intensities change with aging duration at room temperature. This result refers to the rearrangement of atoms in diffusive manner.

Haibo Ge
Texas Tech University, USA.

Biography

Haibo Ge received his PhD degree in Medicinal Chemistry from The University of Kansas in 2006, and then moved to The Scripps Research Institute for postdoctoral study. In 2009, he began his independent academic career at the Indiana University – Purdue University Indianapolis and relocated to Texas Tech University in 2020. Research by his group is mainly focused on the development of novel methods for carbon–carbon and carbon–heteroatom bond formation through transition metal catalyzed C–H functionalization.

Distal Functionalization via Transition Metal Catalysis

The ubiquitous presence of sp3 C–H bonds in natural feedstock makes them inexpensive, easily accessible, and attractive synthons for the preparation of common and/or complex molecular frameworks in biologically active natural products, pharmaceutics, agrochemicals, and materials. However, the inertness of these bonds due to the high bond dissociation energies and low polarity difference between the carbon and hydrogen atoms makes them challenging reaction partners. Moreover, the desired site-selectivity is often an issue in reactions with multiple analogous sp3 C–H bonds. To overcome these problems, transition metal-catalyzed C–H functionalization has been developed with the assistance of various well-designed directing groups which can coordinate to a metal center to deliver it on a targeted C–H bond through an appropriate spatial arrangement, enabling C–H activation via the formation of a cyclometalated species. However, the requirement of often additional steps for the construction of the directing groups and their subsequent removal after the desired operation severely hampers the efficacy and compatibility of the reactions. A promising solution would be the utilization of a transient ligand which can bind to the substrate and coordinate to the metal center in a reversible fashion. In this way, the directing group is installed, sp3 C–H functionalization occurs, and the directing group is then removed in situ without affecting the substrate function after the catalysis is finished. Overall, the whole process occurs in a single reaction pot. Herein, we are presenting our studies on transition metal-catalyzed transient directing group-enabled C–H functionalization reaction.

Dr. EKT SIVAKUMAR
Anna University, India

Biography

Dr. E.K.T. Sivakumar, Visiting Professor Department of Ceramic Technology, Anna University, Chennai, India s a /Scientist / Philanthropist/ Educationalist/ and an academician-cum-researcher with an immense passion for serving Motherland and its people.He has authored more than 24 books in English and Tamil. He has participated in various national and international seminars, workshops, and scientific conferences and presented papers on a range of scientific topics globally. He received Scientist of the year 2008 by NESA New Delhi He is a recipient of many such awards. SSCE's Eminent Scientist Award 2020 is another feather to his cap and a motivation to serve society even more. Dr. E.K.T. Siva Kumar, as a Scientist with his scientific temperament and achievements has been well documented in an English Book Titled "Scientist on a Social Mission" He is also the Editor of Valarum Ariviyal, a quarterly magazine in Tamil that propagates information and knowledge on Science and Technology to the general audience.

Dr. Siva Kumar has donned multiple roles so far including Educationalist, Scientist, Journalist and Philanthropist. Let us dwell in detail how he has scaled greater heights and now global scientist fraternity praise him for his career achievements. Moreover, he is a much sought-after personality in science and Technology.

Green synthesis of cellulose/ZrO_2 Nano composite: Assessment of photocatalytic activity

Alternative method, including green chemistry has been popular for the preparation of nanostructures is important to maintain sustainable development. The present work reports, green synthesis of cellulose/ zirconium oxide nanocomposite (1:1 ratio) and assess its photo catalytic activity. Cellulose/ZrO2 nanocomposite was characterized by X-ray Diffractometer (XRD), Fourier Transform Infrared spectroscopy (FT-IR), Field Emission Scanning Electron Microscopy (FE-SEM), Transmission Electron Microscopy (TEM), UV-Vis spectrophotometers. Physical parameters such as shape and size have been characterized using UV-Vis spectrophotometers. The XRD results confirm the tetragonal structure of ZrO_2 and addition of ZrO2 into cellulose does not affect the crystal phase of cellulose and the FE-SEM confirmed the presence of ZrO_2 in cellulose polymer matrix. TEM analysis showed that the green synthesized nanocomposite was uniformly dispersed without any aggregation. Additionally FT-IR analysis was carried out for the analysis of biomolecules which involved in the capping and reducing agents of cellulose/ZrO2 nanocomposite. Notably, the cellulose/ZrO2 nanocomposite exhibited mush improved photocatalyic efficiency than their pure ZrO_2 nanoparticels. The present work provided effective, low cost and green method for synthesis of cellulose-zirconium oxide nanocomposite which was utilized as versatile sustainable efficiency, dye removal, wastewater treatment and biomedical application.

Oleg V. Gradov
FRC CP RAS, Moscow, Russia

Biography

Oleg V. Gradov, 2019-now – senior researcher, Semenov Institute of Chemical Physics of Russian Academy of Sciences | N.N. Semenov Federal Research Center for Chemical Physics, Russian Academy of Sciences, Laboratory 0412; 2013-2019 – from chief engineer to senior researcher, Talroze Institute of Energy Problems of Chemical Physics, Russian Academy of Sciences;

Microfluidic Polarographic Catalymetry

Polarographic catalymetry is an analytical method where parallel to the measurements, the analyte precipitates on the platinum electrode, changing the detector parameters. To eliminate this problem, chemists often use rotating platinum electrodes and a limitation on the analysis polarity (using them only in oxidation schemes, as, in the reducing conditions, the sediment on the electrode surface is formed). In the case of using microfluidic technology that combines the properties of an analytical sensor and a microreactor, it is possible to treat sedimentation not only as a problem but also as an opportunity to introduce an adaptive manufacturing process in which the properties of the enthrakometer surface exposed to microwave radiation are controllably modified during its operation on a chip. Moreover, it is possible to create rotational sensor systems (similar to centrifugated and so-called "spin-coating-assisted" planar microfluidics) based on the rotation modes of the Pt-electrode-bearing platform in the microwave device. It is well known that platinum is widely used as a sublayer/underlayer for film deposition. Sedimentation and growth of other metals on the platinum electrode are controlled by electrochemical methods, in particular, by cyclic voltammetry, synchronously with methods based on non-electrochemical principles. As a consequence, it is possible to combine electrochemical catalymetry on platinum electrodes and microwave enthrakometric catalymetry in a single device.

Due to inertness and the corresponding activation barrier, magnetron sputtering on platinum is less effective for a number of structured films with a perovskite-like structure than for other inert substrates/carriers (300 °C for Au versus 650 °C for Pt). This is confirmed by the morphology of the films and the results of X-ray diffractometry and X-ray photoelectron spectroscopy (XPS). However, the production of piezoelectric films based on similar technologies on platinum (and platinum-coated silica) substrates, in a multilayer technique allowing one to obtain capacitors with a very high dielectric constant, makes it possible to introduce new descriptors into the analysis performed by the modified enthrakometer in situ. Its surface properties are controllably changed in the course of the ongoing analysis. The change in surface-coupled properties alters the nature of the reactivity of the enthrakometer. The above compounds with a perovskite structure obtained by the magnetron sputtering methods which can be controllably crystallized in a microwave field, are used in the design of triboelectric photodetectors (including hybrid ones with other materials), gas sensors, and non-enzymatic sensors for a number of important biochemical agents (glucose, peroxide), etc.

Despite the difference in the methods of production and technical processes in specific cases, it is possible to design an enthrakometric sensor with a complex of active properties in electrochemical processes at the microwave field. In this case, we do not consider non-chemometric applications (such as the design of mechanoelectrical transducers or acoustic sensors), but it is yet enough to confirm the possibility of on-chip implementation, in a microwave field, of multifactor chemical microanalytical techniques that require chemometric approaches to data analysis.

A.N. Startsev
Pensioner, G.K. Boreskov Institute of Catalysis, 630090 Novosibirsk, Russia

Biography

1972 – Graduated from the Tomsk Poly-technical University, Russia
1972 – 2016 – researcher at the G.K. Boreskov Institute of Catalysis, Novosibirsk, Russia
1977- PhD.: Title of the thesis: Properties of the supported catalysts prepared via organometallic and alkoxide complexes of Mo, W, Re and Pt.
1997- Professor of Chemistry. Title of the thesis: Sulfide HDS catalysts: synthesis, structure, properties.
Since 2017 - Pensioner

PROFESIONAL POSITIONS:

Since 1995 - Head of the laboratory at the Boreskov Institute of Catalysis.
Since 1990 - Senior Researcher
1990 - Head of the Research Group
1978/90 - Researcher
1974/77 - Junior Researcher
1972/74 - Postgraduate Student

H2S: a new Inside into its Role in Human Activity

The concept on the decisive role of solid catalysts in the reaction of low-temperature decomposition of H2S is considered in the framework of non-equilibrium thermodynamics of an irreversible process in an open system. The reaction proceeds at room temperature without the use of external energy sources due to the internal (kinetic and potential) energy of hydrogen sulfide molecules. In the gas phase, this reaction is thermodynamically impossible. The reaction products are, along with hydrogen, either solid sulfur (sulfide catalysts) or diatomic gaseous sulfur in the ground triplet state (metal catalysts). The concept makes it possible to solve not only the problem of efficient utilization of H2S, but also opens new pages in the chemistry of this substance as both a source of atomic hydrogen and an energy supplier for activation of the chemically inert molecules. Moreover, the gaseous triplet sulfur discovered by us can be used in various fields of chemistry, pharmacology, medicine, etc. Therefore, “useless” H2S acquires the status of a “useful” chemical that will be probably in demand to solve problems which could not be realized within the framework of the previous paradigm of the high-energy disposal of H2S.

Rehana Asghar
Mirpur University of Science and Technology (MUST), Pakistan.

Biography

Dr. Rehana Asghar is presently serving as Professor Emeritus of The Mirpur University of Science and Technology (MUST), Mirpur. She did her M.Sc. in Botany from the University of Balochistan, Quetta in 1982. She not only got 1st Class 1st Position in M.Sc. Botany but also scored 1st Position in the Faculty of Science. She joined the Department of Botany, University of Balochista n as lecturer in 1984. She was awarded the Quaid-i-Azam merit scholarship for higher studies in the USA. She did her MS and Ph.D. from the University of California, USA in 1988 and 1992, respectively. On returning from the USA, she joined her parent depa1tment at the University of Balochistan. She did her first Post Doctorate from the University of California in 1993 where she worked as Research Associate from the 29”’ Jw1e, 1992 to 24’h Marci1, 1993. She was promoted to the position of Assistant Professor in 1994. After serving for 16 years from the 2”0 April, 1984 to 28”’ September, 2000) in the University of Balochistan, she shifted to d1e PMAS Arid Agriculture University, Rawalpindi. She was appointed as Associate Professor in 2000. She did her second Post-doctorate again from d1e University of California where she worked as Research Associate from the 1st June, 2004 to 31” May, 2005.

Enhanced Thermostability and Enzymatic Activity of Cel6A Variants from Thermobifida fusca by Empirical Domain Engineering (Short Title: Domain Engineering of Cel6A)

Cellulases are a set of lignocellulolytic enzymes, capable of producing eco-friendly low-cost renewable bioethanol. However, low stability and hydrolytic activity limit their wide-scale applicability at the industrial scale. In this work, we report the domain engineering of endoglucanase (Cel6A) of Thermobifida fusca to improve their catalytic activity and thermal stability. Later, enzymatic activity and thermostability of the most efficient variant named as Cel6A.CBC was analyzed by molecular dynamics simulations. This variant demonstrated profound activity against soluble and insoluble cellulosic substrates like filter paper, alkali-treated bagasse, regenerated amorphous cellulose (RAC), and bacterial microcrystalline cellulose. The variant Cel6A.CBC showed the highest catalysis of carboxymethyl cellulose (CMC) and other related insoluble substrates at a pH of 6.0 and a temperature of 60 °C. Furthermore, a sound rationale was observed between experimental findings and molecular modeling of Cel6A.CBC which revealed thermostability of Cel6A.CBC at 26.85, 60.85, and 74.85 °C as well as structural flexibility at 126.85 °C. Therefore, a thermostable derivative of Cel6A engineered in the present work has enhanced biological performance and can be a useful construct for the mass production of bioethanol from plant biomass. Keywords: endoglucanase (Cel6A); domain engineering; Thermobifida fusca; molecular dynamics simulations; thermostable enzymes.

Seongwoo Woo
Ethiopian Technical University, Ethiopia

Biography

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

Improving the Reliability Design of Mechanical Systems

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

A C Matin
Stanford School of Medicine, USA

Biography

Dr. Matin has been a full professor in Stanford Medical School for several years and is affiliated with several programs, including the Stanford Cancer Research Institute; he elected to become emeritus, July 1, '21. His research contributions are numerous, including discovery of new drugs, therapeutic enzymes, and their improvement as well as their specific targeting to cancer (and other diseases). He did his Ph. D. at UCLA, spent some years in the Netherlands (State University of Groningen), where he directed a research group, before joining Stanford. He is recipient of numerous awards and honors.

mRNA-based systemically delivered directed gene therapy using nanomaterials

The presentation focuses on systemically administered targeted gene therapy using mRNA instead of DNA; why the former is superior for this purpose will be discussed. Lipid nanoparticles (LNPs) and, more recently, extracellular vesicles (EVs, aka exosomes) have proven effective vectors. An example of LNP-mediated directed mRNA delivery is that of Cas9 gene for editing of PTEN by the CRISPR/Cas system. Also, an mRNA-LNP drug, NTLA-2001, is in clinical trial for treating transthyretin amyloidosis. EVs are nature's own antigen delivery system, posing minimal mmunogenicity/toxicity risk and their surface integrins confer intrinsic tissue tropism. They have been engineered to display targeting moieties, which are fused to EV anchor domains. Emphasis here will be on the lactadherin C1-C2 anchor domain (which binds to the EV surface) and its fusion to a high affinity anti-HER2 scFv, resulting in HER2 receptor targeting EVs. These were loaded with mRNA that encodes the enzyme HChrR6, which can activate several prodrugs, including CNOB and CB1954 (tretazicar). (The loaded and targeted EVs are called 'EXODEPTs'.) Systemic delivery of EXODEPTs along with either CNOB or tretazicar resulted in the killing of ER2+ breast cancer xenografts in mice without any off-target effects, indicating gene delivery xclusively to the cancer. Attaining specific tumor targeting and loading of the EVs with the HChrR6 mRNA were greatly facilitated by the fact that the activated drug of CNOB, MCHB, is highly fluorescent and can be visualized non-invasively in living mice. Tretazicar (whose activation could also be visualized vicariously by MCHB) was effective at its safe dose; the EVs needed to be delivered only twice; and there were no side effects. Thus, the results augment clinical transfer potential of this regimen. Examples of EV targeting using other anchor proteins, e.g., Lamp2b and CD47, will also be briefly discussed. As the EV anchor domains can be fused to other targeting moieties, the approach is generic for specific gene delivery also in other diseases.

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SPEAKERS Day 2

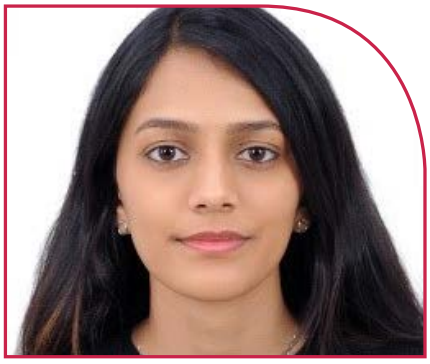
Suresh Aluvihara
University of Peradeniya, Sri Lanka

Biography

Mr. Suresh Aluvihara is a postgraduate research scholar at the Department of Chemical and Process Engineering, University of Peradeniya, Sri Lanka since the year 2018 under the disciplines of Environmental Engineering, Chemical and Water Engineering. He received his B.Sc. (Hon's) degree in Mineral Science in the year 2017 from a recognized state government university in Sri Lanka. When considering his academic background, he is having a large number of research publications under the modes of abstracts, full papers and conference papers while incorporating with some reputed research symposiums, international research conferences and journals. In addition that he has taken a part of the roles of keynote speaker, invited speaker, featured speaker and organizing committee member of some world recognized conference and webinars. His research interests are Earth Engineering, Environmental Engineering, Water Engineering, Chemical Engineering, Material Engineering and Soil Science in Agriculture. He has been awarded as a best young scientist, best scholar and excellence in research in a few of research awarding schemes held in the year 2022.

Investigations and Analysis of Earth Materials towards the Developments in Some Advanced Chemical and Catalytic Uses

Earth materials are some sort of valuable resources with some multiples uses in some of industrial purposes and they are obtaining some economical values based upon the demand and the abundance. According to the most of research and experiments that relevant with the characteristics of solid earth materials, mainly there were obtained and disclosed some various outstanding physic-chemical characteristics of a large number of earth materials including the applications of material processing, nano-materials, composite materials and hard materials. In the existing research there were expected to characterize some selected clay varieties, a dolomite variety and a feldspar variety which are available in Sri Lanka towards the developments especially in some advanced chemical and catalytic applications. The X-ray fluorescence (XRF) spectroscopic analysis and Scanning electron microscopic (SEM) analysis were done for all of selected materials. The X-ray diffraction (XRD) analysis was done for three different selected clays and the Fourier transforms infrared (FT-IR) spectroscopic analysis was done for three different clay types and for a dolomite variety. According to the obtained results for the research, there were found the presence of at least 75% of Fe as the major element in each of clay with some other trace metallic elements such as K, Ti, Ca, Ba and Zr in such clays, kaolinite, montmorillonite and some of Fe minerals namely as muscovite and glauconite in such clays with quartz as a non-clayey mineral. There were found some higher amount of calcite in the selected dolomite with a trace amount of K and also there were found some higher K and Ca amounts presence in the selected feldspar rocks. When comparing the obtained results with past research out comes and modifications of materials, it seems that these materials will be much useful in the industrial applications such as the catalytic activities, waste water treatment applications in the removal of heavy metals due to the adsorption capacity, ion exchanging materials to remove unnecessary ions from waste water and in the removal of hardness from waste water due to the adsorption capacity of dolomite.



Rakshitha Srinivasan
University of Southampton, United Kingdom

Biography

Rakshitha Srinivasan is an Advanced Chemical Engineering postgraduate student at the University of Southampton. She was born in India and raised in Oman and India. She worked as a Research Associate in a skincare start-up company for over a year. She then briefly worked as a Process Engineer in a petrochemical consultancy before moving to the United Kingdom to pursue her master's degree.

Growing up in the Middle East, she was always passionate about pursuing a career in the petrochemical and energy sectors. She wanted to prove the importance of chemical engineers in society. With the current transitions with respect to energy and emphasis on sustainability, Rakshitha wants to design innovative processes with safety considerations to meet the current needs of the people and make life better for the upcoming generations.

In her free time, she enjoys hiking, traveling and practicing yoga.

Green Surfactants and Sustainability

In recent times there has been a huge rise in the number of problems caused by surfactants. Surfactants are surface active agents that reduce the interfacial tension between two surfaces. They have several applications, and they are predominantly used in the laundry industry. Since the use of conventional surfactants causes many environmental issues such as water pollution, threat to aquatic life, climate change, etc., a shift towards green and sustainable surfactants is required.

In order to emphasize the need for green surfactants, a case study was chosen. The case study highlights the problems caused by conventional surfactants which led to the foaming of a lake in India. The foams were highly toxic and flammable and eventually caused a fire to break out over the lake as a result of a spark. It was found that the foams contained a large amount of methane gas which is highly inflammable. Samples of the lake water were collected and studied. It was noticed that the lake's surface tension was much lower than that of pure water, this indicated the presence of surfactant content. It was found that high levels of anionic surfactants along with phosphorus content led to the foaming of the lake. Additionally, the study showed that the BOD & COD levels surpassed the permissible limit.

From the case study, it is evident that green surfactants are highly necessary to overcome the pollution caused by conventional surfactants. Green surfactants are eco-friendly, plant-based surfactants that are synthesized using the principles of green chemistry. Alkyl Polyglucoside (APG) is one such surfactant that is popular. The raw material consists of an alcohol and sugar which react to form APG. Since the raw materials are plant-derived, it is biodegradable. It is less foaming and has a good cleansing ability. Currently, the APG process uses vegetable oils and wheat as raw materials. However, using these raw materials can be energy intensive and lead to emissions.

Though green surfactants are gaining popularity, more research is needed to develop surfactants with less energy consumption and aim at zero emissions. One way to achieve this is by the use of innovative catalysts. This will greatly affect the processing cost and the product cost, making it a more affordable alternative in the future.

Bokon Alexis Akakpo
University of Abomey-Calavi, Benin Republic

Biography

Akakpo Bokon Alexis is the doctoral candidate at WASCAL, Climate Change and Human Habitat, Federal University of Technology of Minna, Nigeria. His research interests include development of agriculture, forest and biodiversity conservation and climate change and human areas sustainability. He is the Research Assistant at the Laboratory of Applied Ecology, Faculty of Agricultural Sciences (FSA) at University of Abomey-Calavi (UAC), Benin. He has five (05) papers in international peer-reviews; three (03) in national review; two (02) books and one (01) conference paper. Address: Laboratory of Applied Ecology, 01 BP 526, Cotonou Benin Republic.

Impact of seasonal urban greening variability on land surface temperature: A case study from Benin (West Africa)

In the Republic of Benin, the seasonality of urban greening and its impact on the reduction of land surface temperature have received little attention. In order to get more precise information regarding the vegetation variation and its ability to reduce urban surface temperature, this study sought to evaluate seasonal variations of the normalized difference vegetation index (NDVI) using Landsat 7 and 8 data. Monthly NDVI series were collected using Google Earth Engine open-source while observed air temperatures were obtained at the National Meteorological Agency of Benin for the cities. A Mann-Kendall test was applied to assess the trends of NDVI and surface temperature in the two cities. The analysis of variance, followed by the Student-Newman-Keuls (SNK) test, was used to examine the significance of seasonal variation in the NDVI. Afterwards, a simple linear regression was performed to show the relationship between surface temperature and NDVI. The results of Mann-Kendall test showed no significant linear trends (P-values > 0.05), and NDVI was decreasing from 2000 to 2011 and increased up until 2020. A significant difference was shown between seasonal variations of vegetation index (NDVI) (P-Value < 0.001) in the study cities, and the months of January through March had the lowest mean NDVI values (Table). This finding can be justified by season-wise vegetation statuses in the cities. The analysis also revealed a moderate positive correlation between annual mean land surface temperature and NDVI for the dry seasons in each study city (January to March in Porto-Novo and April to June in Parakou, respectively Fig. 1 and 2). This finding implies that the state of urban vegetation in these cities during these months could not decrease the LST. This study, therefore suggests that a careful management of the cities' urban vegetation be practised through irrigation to ensure a long-term abatement of land surface temperature.

Sai. P. Katke
University Of Mumbai, India.

Biography

My name is Sai Prakash Katke living in Mumbai, India. Completed Bachelors of Science in the subject of Chemistry, Zoology & Botany from Bhavans Hazarimal Somani College, Mumbai, India. Further Completed Master of Science in the subject of Chemistry specialization in Organic Chemistry from Bhavans Hazarimal somani college, Mumbai, India. Completed a Research Project in Corrosion Inhibitor and following to which published 2 Research paper. Pursuing PhD from The Department of chemistry, University of Mumbai, Mumbai, India. Working extensively on various studies from chemistry background. Interest Area: Organic synthesis, Corrosion Inhibitor, Metal Organic Framework, etc.

Repercussion of Conflicts caused through Chemical Defilement and Eradication in Contemporary Existence.

Conflicts can occur because of any natural phenomena or any man-made activity that causes anguish in human brains; comprehending chemical contamination and elimination is the goal for global security. Many worldwide conferences attempt to balance and regulate such incidents; yet, prolonging any such event is a monumental task; however, and therefore learning and preventing for knowledge of any repercussions is a debate. It is difficult to summarize chemical conflicts, hazards, toxic gases, weapons, warfare, chemical mixtures/compositions contamination, conversions, and so on. We have briefly covered their literature, repercussions, risks, and preventions for any confrontations resulting in chemical outbursts below.

International treaties such as the Prevention of Chemical Defilement and Eradication Convention should help control the proliferation of chemical weapons, contaminations, warfare, and so on [causing tremendous pollution, radiation, exposures, and so on and affecting lives, from harmful diseases] and verify disarmament, but it would be naive to believe the threat will last until any naturally occurring outburst.

K. Tanji
Sidi Mohamed Ben Abdellah University, Morocco

Biography

Tanji Karim Doctor in Chemistry and engineering process. Three years as a temporary professor at High School of Technology University Sidi Mohamed Ben Abdellah University, Fez, Morocco. Tanji does many investigations in the catalysis field for wastewater treatment using adsorption, wet oxidation, and photocatalysis. Currently, works on the development of a new photocatalysts based on zinc spinel phases for wastewater treatment.

Novel River Sediment@ZnO-Co nanocomposite for photocatalytic degradation and COD reduction of crystal violet under visible light

This work aims to evaluate the adsorption and photocatalysis efficiency of the composite river Sediment (S)@Cobalt-doped ZnO (ZCo) with two weight ratios of 10 and 20% of ZCo/river sediment. The S@ZCo was successfully prepared using the chemical precipitation method followed by the wet impregnation method. The structure and morphology of the synthesized materials were examined using, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), X-Ray fluorescence technique (XRF), BET surface area, scanning electron microscopy (SEM), and UV–Vis diffuse reflectance spectra (DRS). The Box-Behnken model was effective for modeling the experimental data of crystal violet dye (CV) photodegradation according to the analysis of variances (ANOVA) results and showed that the ZCo amount and CV solution pH are the most influencing parameters on the process efficiency. A total removal (100%) of CV has been attained for 60 min with a high percentage (93%) of chemical oxygen demand (COD) removal using S@ZnO-Co20% under visible light illumination and the optimum conditions obtained from the Box-Behnken. S@ZCo20% displayed high stability after five cycles. Furthermore, the activity of superoxide ions ($O_2^{\cdot-}$) and hydroxyl radicals (OH.) as the responsible spices for CV degradation were well affirmed by the radical's scavenging tests. Overall, these discoveries could offer additional contributions to the elaboration of new composites based on modified ZnO for various potential applications and especially photocatalysis.

I.A Auwal
Sule Lamido University, Nigeria

Biography

Ismail Alhassan Auwal studied for B.Sc. Chemistry at Kano University of Science and Technology in 2012. In 2014, he secured a full-time faculty position at Sule Lamido University Jigawa Nigeria. He was then awarded a Prestigious Scholarship for master degree where he studied MSc Chemistry at Fatih University (now Istanbul University) 2014-2016. In 2018 was awarded a TETFund fellowship where he studied PhD Chemistry in the field of Surface Chemistry and Catalysis at Universiti Sains Malaysia in 2021. In September 2021 he was promoted to Lecturer I at Sule Lamido University Kafin Hausa Nigeria.

Ismail is currently teaching Physical chemistry courses and serves as a Level Coordinator of third year students. His research group focus on synthesis and studies of zeolite and zeolite-like porous materials as well as magnetic nanoparticles.

Effects of Synthesis Parameters on the Crystallization Profile and Morphological Properties of SAPO-5 Templated by 1-Benzyl-2, 3-Dimethylimidazolium Hydroxide

The formation of SAPO-5 molecular sieves is studied under hydrothermal conditions in the presence of a new templating agent, 1-benzyl-2,3-dimethylimidazolium hydroxide ([bzmIm]OH). The syntheses were carried out by varying the synthesis parameters, viz. crystallization temperature, heating time and reactants molar composition (SiO_2, Al_2O_3, P_2O_5, [bzmIm]+, H_2O) in order to investigate the role of each synthesis parameter on the formation of SAPO-5. The results showed that these synthesis parameters had significant influences on the entire crystallization process (induction, nucleation, crystal growth, and Ostwald ripening) and physicochemical properties of SAPO-5 (morphology and crystal size). Moreover, this study also demonstrated a fast hydrothermal synthesis approach where a SAPO-5 molecular sieve with hexagonal prism morphology could be crystallized within 10 h instead of days using a novel [bzmIm]OH heterocyclic template, thus offering an alternative route for synthesizing zeolite-like materials for advanced applications.

V J Law
University College Dublin, Ireland

Biography

Victor John Law was born in London, U.K., on August 1, 1957. He received the B.Scs. degree from The Open University, Milton Keynes, U.K., in 1985 while he was with the Cavendish Laboratory Semiconductor Physics Group, University of Cambridge U.K., and obtained a Ph.D. degree (by published works) from the University of Ulster, Belfast, Northern Ireland, in 2005. Between 1999 and 2003, he was a Senior Research Fellow with University College London (UCL) U.K., and from 2003 to 2011, he held the post of Senior Research Fellow with Dublin City University (DCU) Ireland. Since 2012, he has held the post of Senior Research Engineer with the Surface Engineering Group, University College Dublin (UCD) Ireland. He has authored over 160 publications, with an H-index of 20, 10-index of 37, and an average of 18.5 for the first 100 papers. He is holder of one patent (US. 8.242789B2).

Historical 'thermal' and 'Non-thermal' microwave-assisted processes within microwave ovens

Some of the earliest reports of multimode domestic microwave oven (fo = 2.45 ± 0.05 GHz (□o = 12.2 cm) used for 'non-thermal' microwave-assisted inactivation of bacteria and bacteriophage began to be published in food processing and microbiology journals in the late 1990s. In these publications the ambiguous term 'non-thermal' or 'athermal' were used in an attempt to differentiate between dielectric volume heating (and ionic conduction) of the material under irradiation, and the obscured direct microwave interaction with the material itself, typical below bulk temperatures of 40oC.

This work presents a novel non-invasive acoustic measurement (that is easy to implement by non-electrical engineers) of the pulse width modulation (PWM) waveform of a domestic microwave oven. The acoustic measurement is applied to a Bluesky (BMG20-8) microwave oven to obtain the PWM time-base waveform. This information is applied to publications pertaining to 'thermal' microwave disruption of partially sliced grape and cherry tomato, and 'non-thermal' microwave disruption of microorganism suspensions.

Under these bio-material conditions, the following outcomes occur. For grapes and cherry tomatoes an imposed standing wave of □m that approximates to n ¼, of □o, simultaneously induces dielectric volume heating and Ohmic heating ('non-thermal') within 8 seconds of 440 W of microwave irradiation: either in continuous mode or 55% duty cycle in PWM mode. For the historical microorganism studies, the given ice and ice / water bath data is insufficient to make a complete thermodynamic analysis. Reverse engineering is performed to obtain the missing data and then used to calculate the heat transfer to and away the microorganism suspensions.

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Posters

Oluchukwu Virginia Igboenyesi
The University of Texas at Arlington, USA.

Biography

Oluchukwu Virginia Igboenyesi obtained her master's degree in Material Science and Engineering from the University of Texas at Arlington where her research work was based on synthesis and characterization of alpha-manganese dioxide thin film as electrode material in supercapacitors. She is currently pursuing her PhD in Materials Chemistry under Frederick M MacDonnell Research lab at the Chemistry department in the University of Texas at Arlington. Her research work and experience are focused on synthesis, characterization, and modification of novel catalyst for the conversion of gases such as methane, syngas into liquid transportation fuels with appreciable volumetric energy density

Direct partial oxidation of methane to methanol over Nickel-Ceria/Alumina catalyst

Practical processes for the conversion of methane to methanol via partial oxidation with air would be transformative for our energy economy and have numerous positive environmental impacts. Liquid methanol is attractive fuel with appreciable energy density (15MJ/L), is easily transported, and can be adapted to many engine types.

$$CH_4\,(g) + \tfrac{1}{2}\,O_2\,(g) \quad CH_3OH\,(l) \qquad \Delta G = -115.4\ kJ/mol$$

We explored the partial oxidation of methane over supported nickel catalysts under low conversion conditions, temperatures below 300°C, pressures near 1 bar, and steam flow rate less than 20ml/hour.

Our preliminary study was focused on finding the right catalyst and reaction conditions. Our catalyst was synthesized by insipient wetness impregnation of the nickel salts on alumina support followed by calcination to convert to the metal oxide which was then reduced in the presence of hydrogen to activate the catalyst. The activity and productivity of our catalyst was tested in a tubular fixed bed reactor under CH_4, O_2 and H_2O at different flow rates and temperatures to optimize the reaction condition.

The reaction conditions gave only methanol productivity of 17µg/ghr and up to 60% activity to methane conversion at temperature below 300°C and pressure less than 2 bar after a 20hour reaction of CH_4 and O_2 in the presence of H_2O. Only low yields have been observed but the parametric study is ongoing.

Caio Miranda and Gustavo Megale
Pontifícia Universidade Católica de Minas Gerais, Brazil

Biography

Caio César Melo de Sousa Miranda is Mechanical/mechatronics engineering student at the Pontificia Universidade Católica de Minas Gerais, I am completely passionate about my course and I love to learn. I consider myself a disciplined and organized person, I have been working at Alicerce Educação since I was 19 years old as a professional in the field of education, I also worked in the automation sector autonomously, and recently I worked at KSB Brazil as a maintenance intern for centrifugal pumps. I have a great interest mainly in electronics knowledge; I dream of specializing in the future in the field of mechanical prostheses and try to make a difference in people's lives using engineering knowledge

Gustavo de Pádua Megale is Student of Mechanical Engineering at the Pontifical Catholic University of Minas Gerais, with emphasis on Mechatronics Engineering. My father is also a mechanical engineer, so I've been in contact with the area and I've liked it since I was a child. I studied high school in Lima, Peru. I have a lot of experience with multiple cultures, and today I'm currently doing an exchange in Germany. I worked as an intern at the Companhia Brasileira de Trens Urbanos (CBTU) where I could apply and see all the theory studied at the university. I hope to graduate and work in the field of mechatronics or aviation, as it is the area that I have loved the most since high school.

FCAW X CWG PROCESS

This presentation explores the technical characteristics of welding processes and analyzes the structure of the welded joint (base metal, heat-affected zone, and weld metal) in terms of structure, mechanical properties, and penetration profile, using samples welded by the flux-cored arc welding (FCAW) and cold wire gas (CWG) processes. The evaluation of the system (welded joint) is based on the best weldability from tensile tests, analysis of the bead penetration profile, deposition rate, and heat added to the process. Welded joint performance comparisons are made using ABNT 1020 carbon steel with E-71T1 and E-70S6 wires, respectively. The specimens were welded in a flat position and chamfered, using different gas mixtures in both the FCAW and CWG processes. As a result, no discontinuity was observed in the welded joints, and the values of the mechanical properties tested did not indicate material embrittlement. Therefore, the values presented in the penetration profile and deposition rate were higher for the CWG process. The heat input in the welded joint was also lower for the CWG process, demonstrating a better performance for the process.

Maryam Samanian
Shiraz University, Iran

Biography

I am Maryam Samanian holding a Ph.D. in Physical Chemistry from Shiraz University, Iran, and a master's degree in the same field and university. I'm searching precisely for the surface chemistry and interfacial phenomenon as well as properties and applications of 2D-materials.

A novel Carbon Dioxide Capture Based on Co-Decorated Molybdenum Disulfide: Boosting Efficiency of Porous 2D Material

Stable and efficient conversion of CO2 into useful products provides a desirable path towards achieving green fuel. In this study, the electronic and structural properties of cobalt (Co) transition metal doped over the porous-molybdenum disulfide (P-MoS2) surface toward carbon dioxide (CO2) adsorption were studied using the D3-corrected density functional theory (DFT-D3) method. Results confirm that there is three most stable site for Co decoration over P-MoS2 with a maximum number of adsorbed CO2 molecules in each Co atoms molecule. Co atom intends to bind to P-MoS2 surface as a single, double, and quadric atoms (double sides) catalyst. The Co binding capacity and CO2 adsorption ability on the Co/P-MoS2 including the most stable CO2 possible structure were investigated. This work demonstrates maximizing CO2 capture by providing the possibility of CO2 adsorption on a double-sided Co-decorated P-MoS2. This thin-layer 2D catalyst has great potential for CO2 capture and storage. The charge transfer in the process of CO2 adsorption complexation on Co/P-MoS2 is high and encourages the development of high-quality 2D materials for well-organized applications based on gas sensing too.

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