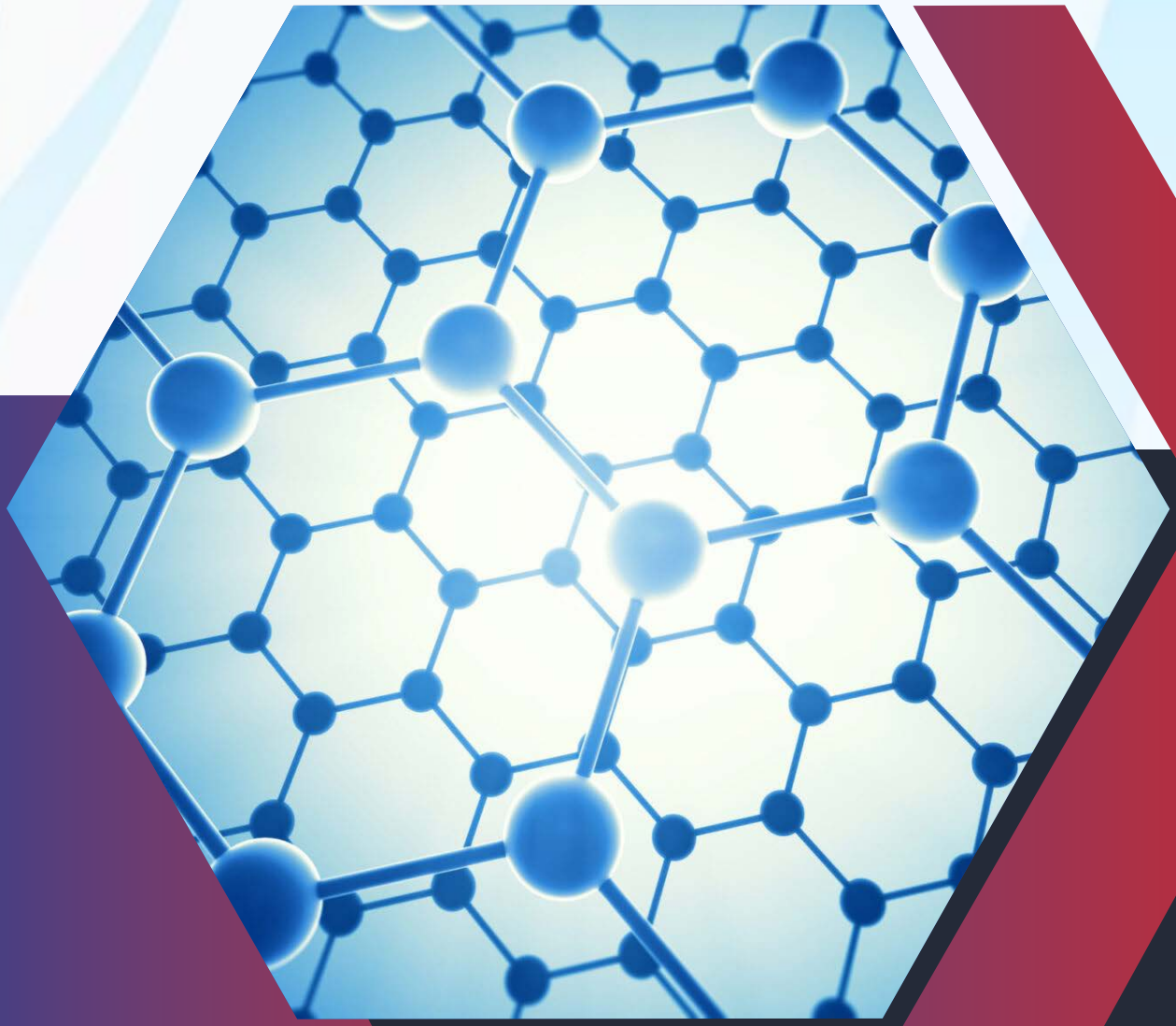
Scholars Frontiers in

NANOSCIENCE AND NANOTECHNOLOGY CONGRESS

27-28 March 2023 | London, UK



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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: 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 thermo luminescence 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: 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
Universitat Autònoma de 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: 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
Univeristy of Mauritius, Maurituis

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: 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

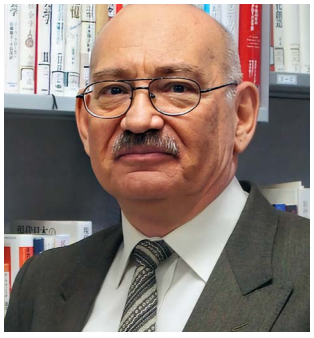
Biography: Dr. Ahmad Tariq Jameel is currently Professor at the Department of Chemical Engineering, Aligarh Muslim University (AMU), India. Dr. Jameel obtained his Ph.D. in Chemical Engineering from the Indian Institute of Technology Kanpur. He has served in the past as full time faculty at several universities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

Michael I Tribelsky
Lomonosov Moscow State University, Russia

Title: New Aspects of Resonant Light Scattering by Small Particles

Biography: MT received his MS from Lomonosov Moscow State University in 1973, PhD from Moscow Institute of Physics and Technology in 1976, and Dr. of Sci. (habilitation) from Landau Institute in 1985. He received numerous national and international awards: Leninsky Komsomol Prize (1979);

10:00-10:30

Vladimir Voronov
Irkutsk National Research Technical University, Russia

Title: Physics at the turn of millennium. Physical foundations of nanotechnologies

Biography: Professor Vladimir Voronov for many years conducts practical and seminar classes on the course of physics, as well as on the discipline "Concepts of modern natural science", published about ten textbooks and teaching aids.

10:30-11:00

Raman Singh
Monash University, Australia

Title: Graphene Coatings: A Disruptive Approach to Remarkable and Durable Corrosion Resistance of Metals and Alloys

Biography: Professor Raman Singh's research expertise is in environment-assisted degradation and its mitigation by nanotechnology (e.g., graphene coating) and environment-assisted.

11:00-11:30

Thomas J Webster
Hebei University of Technology, China

Title: Human Nanomedicine: Nanomaterials in the Clinic

Biography: Thomas J Webster's (H index: 115; Google Scholar) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA).

Refreshments Break @ 11:30-11:40

11:40-12:10

Nagy Habib
Imperial College London, UK

Title: Small activating RNA: From concept to phase II clinical trials

Biography: Nagy is Head of Surgery at the Hammersmith Campus of Imperial College London. Currently, he is driving the development of an saRNA drug which is being trialed in patients with liver cancer (OUTREACH study, ClinicalTrials.gov ID NCT02716012).

12:10-12:40

Jose C Conesa
Institute of Catalysis and Petrochemistry (ICP), Spain

Title: Computing with hybrid DFT methods interfaces between semiconductors

Biography: JC Conesa entered the ICP staff in 1979; he was ICP Vice director, then ICP Director, being now ICP Ad Honorem Professor. He was first in Spain using SR techniques to study heterogeneous catalysis, and first in CSIC to use quantum calculations to understand them.

Speaker Sessions:
Session Chair:

12:40-13:10

Mihaela D Leonida
Fairleigh Dickinson University, USA

Title: Tannic Acid as Modulator of Nisin Release from Composites with Antibacterial Activity

Biography: Dr Mihaela Leonida received a MS and a Ph.D. in Chemical Engineering from the Polytechnic University in Bucharest, Romania and a Ph.D. in Bioorganic Chemistry from Wesleyan University in Middletown, CT, USA.

13:10-13:30

M Mohsen
AMS Layout Design Engineer, Egypt

Title: Nanotechnology Usage Nowadays

Biography: Eng. M Mohsen endeavors to apply her accumulated experience in the field of nano technology in the AMS, and bio-medical fields. She received the B.Sc. degree in electronics and communications engineering from the Faculty of Engineering, Cairo University, Giza, Egypt, in 2018.

Refreshments Break @ 13:20-13:35

13:35-13:55

Hamidreza Siampour
University of Cambridge, UK

Title: Hybrid quantum photonics with nanodiamonds and plasmons

Biography: Hamidreza Siampour is a Research Associate at the University of Cambridge working on diamond-based quantum nano-sensors. He received a PhD degree in Nano-optics from the University of Southern Denmark for his thesis "A Nanophotonic Platform for Quantum Optical Integrated Circuits".

13:55-14:15

Nooshin KianvashRad
University of North Carolina at Greensboro(UNCG), USA

Title: Native Nanostructure Surface from the Wings of Tibicens spp. Cicada sensitized yeast to antifungal drugs

Biography: Nooshin KianvashRad is a PhD student and graduate research assistance at Joint School of Nanoscience and Nanoengineering (JSNN) at the University of North Carolina Greensboro with over 10 years of post-graduate experience in Radiology Technology, in Public and Private Health Centre, and a strong background in Nano-medicine.

14:15-14:35

A Guillermo Bracamonte
National University of Cordoba (UNC), Argentina

Title: Tuning high electromagnetic fields from the Nanoscale towards the far field for Nanophotonics and Biophotonics applications: core-shell and hybrid Nanocomposites

Biography: A Guillermo Bracamonte, PhD in Chemical Sci., holds an assistant professor position at UNC and research position at CONICET (Commission of Research in Science, Argentina). During his research career, he held postdoctoral positions at COPL, Laval University (Quebec), and University of Victoria (British Columbia), Canada.

14:35-14:55

Mirza Muhammad Faran Ashraf Baig
Hong Kong University of Science and Technology, Hong Kong

Title: Recent Advances of Magnetic Gold Hybrids and Nanocomposites, and Their Potential Biological Applications

Biography: Mirza Muhammad Faran Ashraf Baig research work mainly focuses on the construction and function of DNA nanomachines, which are cutting edge and challenging topics. He designed and constructed unique DNA molecular tension probes using a short circular DNA nanotechnology technique and functionalized these probes with fluorophores, gold nanoparticles, small molecular drugs, and peptide ligands.

14:55-15:15

Emine Kaynar
Sivas Cumhuriyet University, Turkey

Title: Investigation on AlN/Si Distributed Bragg Reflector for VECSELs at Telecom Wavelengths

Biography: Emine Kaynar, after completing her undergraduate education in nanotechnology engineering, is doing her master's degree in the same department. She is actively working at the Nanophotonics Application and Research Center during master's degree education.

15:15-15:35

Mohadeseh Madadi Jaberi
Shahid Chamran University, Iran

Title: Freeze Casting at ambient pressure: a step to facilitate the process of fabricating porous materials such as graphene-CNTs aerogels

Biography: Mohadeseh Madadi Jaberi is an active researcher in the field of nanotechnology whose specialty lies in fabrication of 2D and 3D materials. She received her Masters' from Shahid Chamran University of Ahvaz in Solid-State Physics in 2019.Mohadeseh currently serves as technology and innovation expert at Science and Technology Park (STP).

15:35-15:55

Rizwan Asif
Qarshi University, Pakistan

Title: Green Synthesis of Silver Nanoparticles (AgNPs), Structural Characterization, and their Antibacterial Potential

Biography: Rizwan Asif is currently working as an assistant professor at Qarshi University in Lahore, Pakistan. Recently, he have completed his PhD in Microbiology.

Refreshments Break @ 15:55-16:05

16:05-16:25

Seiko Jose
Central Sheep and Wool Research Institute, India

Title: Investigation of effect of nano kaolinite as a filler in the coarse wool - vinyl ester composite

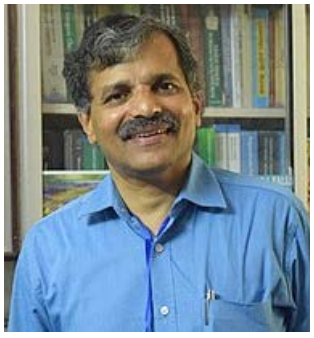
Biography: Seiko Jose is a scientist, working at Central Sheep and Wool Research Institute, Avikanagar, Rajasthan, India. He is specialized in Textile Chemistry and having more than 17 years of experience in textiles.

16:25-16:45

Vladimir Valentinovich Egorov
Russian Academy of Sciences, Russia

Title: Quantum-Classical Mechanics: Principles, Applications, and Prospects

Biography: Vladimir Valentinovich Egorov has his expertise in theoretical molecular and chemical physics. Education: National Research Nuclear University MEPhI, Faculty of Theoretical and Experimental Physics (1966 – 1972), Moscow, USSR. He has completed his PhD from Theoretical Department of Institute of Chemical Physics, USSR Academy of Sciences (1981).



16:45-17:05

Sabu Thomas
Mahatma Gandhi University, India

Title: Engineering at the Nanoscale: A Strategy for Developing High Performance Functional Materials from Agrowaste

Biography: Sabu Thomas is currently the Vice-Chancellor of Mahatma Gandhi University, Kottayam, Kerala, India. He is a Professor at the International and Inter University Centre for Nanoscience and Nanotechnology and Full Professor of Polymer Science and Engineering at the School of Chemical Sciences of Mahatma Gandhi University, Kottayam, Kerala, India.

17:05-17:25

Forough Amiry
Islamic Azad University of Iran, Iran

Title: Smart polymeric nanocomposite based on protonated aluminosilicate, curcumin, and chitosan for mesalamine drug delivery as an anti-inflammatory nanocarrier

Biography: Forough Amiry studied applied chemistry at Payame Nour University during 2010-2015 and graduated as MS in Medicinal chemistry from Islamic Azad University of Iran in 2021. She has published 2 research articles in SCI journals and has three more awaiting article to be published.

17:25-17:45

A.S. Gouralnik
Institute of Automation and Control Processes, Russia

Title: Two innovative paradigms of film growth. Perfect Mg2Si films for light and heat conversion into electricity

Biography: Alexander Gouralnik studied physics in Leningrad (St. Petersburg) State University, Russia, and graduated as MS in 1976. He then joined the research Laboratory of Microstructure Control Growth at the Institute of Automation and Control Processes, Far East Branch of the Russian Academy of Sciences (IACP FEB RAS).

Panel Discussions | Day 02 End | Closing Ceremony

Scholars Frontiers in

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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= Average absorbance of treated drug wells- Absorbance of Blank X 100%
Average absorbance of control drug wells- Absorbance of BlankBlank 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
Univeristy of Mauritius, Maurituis

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.

Scholars Frontiers in

NANOSCIENCE AND NANOTECHNOLOGY CONGRESS

KEYNOTE SPEAKERS Day 2

M I Tribelsky
Lomonosov Moscow State University, Russia

Biography

MT received his MS from Lomonosov Moscow State University in 1973, PhD from Moscow Institute of Physics and Technology in 1976, and Dr. of Sci. (habilitation) from Landau Institute in 1985. He received numerous national and international awards: Leninsky Komsomol Prize (1979); COE Professorship, the University of Tokyo, (2006, 2008) and Kyushu University (2007), Japan; Honorary PhD, Yamaguchi University, Japan (2016), etc. Now he heads a laboratory at Lomonosov Moscow State University. His field is theoretical and mathematical physics. Presently, his interest lies in subwavelength optics. He is the author of several books, book chapters, review articles, and more than 100 research papers. See https://polly.phys.msu.ru/en/labs/Tribelsky/ for more details.

New Aspects of Resonant Light Scattering by Small Particles

Resonant light scattering by nanoparticles provides a unique opportunity to concentrate a high-amplitude electromagnetic field in a subwavelength area of space as well as to tailor and control its pattern. In addition to purely academic interest, this is extremely important for numerous applications ranging from medicine and biology to telecommunication and data processing. Despite more than a hundred years of extensive study, the problem is still far from completion. In this contribution, the author presents a review of his results in this field. In many cases, despite the smallness of the scattering particles, their light scattering has very little in common with the conventional Rayleigh case. New, counterintuitive effects, especially those related to the violation of the quasi-static description of the scattering occurring at the action of (ultra)short laser pulses, are pointed out and inspected, discussed, and classified.

The author acknowledges the financial support of the Russian Science Foundation (Project No. 21-12-00151).

Vladimir Voronov
Irkutsk National Research Technical University, Russia

Biography

Professor Vladimir Voronov for many years conducts practical and seminar classes on the course of physics, as well as on the discipline "Concepts of modern natural science", published about ten textbooks and teaching aids. For the work "Creation of a set of educational publications "Modern Physics" for technical and natural-scientific specialties of universities" to the author's team consisting of V.K. Voronov (head of the work), A.V. Podoplelova, R.Z. Sagdeeva was awarded the Prize of the Government of the Russian Federation in the field of education. For merits in scientific and pedagogical activities, training of qualified specialists and many years of conscientious work, he was awarded the Order of Honor by the Decree of the President of the Russian Federation. He received a number of awards established by the Russian Academy of Natural Sciences, including the Gold Medal "For Innovative Work in the Field of Higher Education".

Physics at the turn of millennium. Physical foundations of nanotechnologies

Nowadays we witness that the development of nanosciences (including nanophysics) is gathering moment. Consequently, the scope of application of scientific advancement in diverse areas of human activity significantly extends. Therefore, the training of skilled engineers represents an urgent challenge for modern education. In this line, publication of study materials (textbooks, manuals, methodical instructions, first of all, for the higher school) is badly needed. There is rather vast scientific literature related to different aspects of micro- and nanoworld physics (original papers and reviews published in specialized journals). However, it is mainly intended for experts. As for the study materials devoted to the abovementioned branch of knowledge, it is almost lacking. The present textbook deals with physical foundation of nanotechnologies. The book consists of three relatively independent parts. The first chapter is devoted to the plasma state of matter, its fundamental physical phenomena, their laws and regularities. The fundamental ideas related to physics micro- and a nanoworld of the condensed bodies are covered in the second chapter of the textbook. Finally, the third chapter discloses new theoretical and experimental methods for the investigations of multi-electron systems. The textbook is written basing on the materials, which have been selected from the reviews published in the "Advances in Physical Sciences" journal. The present textbook is intended for senior students, who are studied it the universities training engineers for industrial production and researchers for the institutes. The book can also be useful for the students of other specialties of the natural-science and technical profiles in universities, where there are training courses dealing with physical phenomena of nano- and microworld. The book will be of interest for teaching staff of the universities and for all who are fond of physics and its current state..

Raman Singh
Monash University, Australia

Biography

Professor Raman Singh's research expertise is in environment-assisted degradation and its mitigation by nanotechnology (e.g., graphene coating) and environment-assisted. His professional distinctions and recognitions include: Editor of a book on Cracking of Welds (CRC Press), Lead Editor of a book on Non-destructive Evaluation of Corrosion (Wiley), Editor-in-Chief of an Elsevier and two MDPI journals, leader/chairperson of a few international conferences and regular plenary/keynote lectures at international conferences, over 250 peer-reviewed international journal publications, 15 book chapters/books and over 100 reviewed conference publications, and several competitive research grants. He has supervised 50 PhD students.

GRAPHENE COATINGS: A DISRUPTIVE APPROACH TO REMARKABLE AND DURABLE CORROSION RESISTANCE OF METALS AND ALLOYS

Degradation of engineering metallic materials by aggressive/corrosive environment and its mitigation costs dearly (any developed economy loses 3-4% of GDP due to corrosion, which translates to ~$250b to annual loss USA). In spite of traditional approaches of corrosion mitigation (e.g., use of corrosion resistance alloys such as stainless steels and coatings), loss of infrastructure due to corrosion continues to be a vexing problem. So, it is technologically as well as commercially attractive to explore disruptive approaches for durable corrosion resistance.Graphene has triggered unprecedented research excitement for its exceptional characteristics. The most relevant properties of graphene as corrosion resistance barrier are its remarkable chemical inertness, impermeability and toughness, i.e., the requirements of an ideal surface barrier coating for corrosion resistance. However, the extent of corrosion resistance has been found to vary considerably in different studies. The author's group has demonstrated an ultra-thin graphene coating to improve corrosion resistance of copper by two orders of magnitude in an aggressive chloride solution (i.e., similar to sea-water). In contrast, other reports suggest the graphene coating to actually enhance corrosion rate of copper, particularly during extended exposures. Authors group has investigated the reasons for such contrast in corrosion resistance due to graphene coating as reported by different researchers. On the basis of the findings, author's group has succeeded in circumventing the challenges and demonstrated durable corrosion resistance as result of development of suitable graphene coating. The most recent results include optimization of CVD parameters (such as tilting of metal substrate) for graphene for durable corrosion resistance. The presentation will also assess the challenges in developing corrosion resistant graphene coating on most common engineering alloys, such as mild steel, and demonstrating circumvention of the challenges.

Thomas J Webster
Hebei University of Technology, China

Biography

Thomas J Webster's degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA). He has served as a professor at Purdue (2000-2005), Brown (2005-2012), and Northeastern (2012-2021; serving as Chemical Engineering Department Chair from 2012 - 2019) Universities and has formed over a dozen companies who have numerous FDA approved medical products currently improving human health. He is currently helping those companies and serves as an adjunct professor at Hebei University of Technology, Saveetha University, Vellore Institute of Technology, UFPI, and others.Dr. Webster has numerous awards including: 2020, World Top 2% Scientist by Citations (PLOS); 2020, SCOPUS Highly Cited Research (Top 1% Materials Science and Mixed Fields); 2021, Clarivate Top 0.1% Most Influential Researchers (Pharmacology and Toxicology); 2022, Best Materials Science Scientist by Citations (Research.com); and is a fellow of over 8 societies. Prof. Webster has over 1,350 publications to his credit with over 53,000 citations.

Human Nanomedicine: Nanomaterials in the Clinic

Nanomaterials have been widely tested in vitro and in small order animal studies for decades. Results have shown greater tissue growth, decreased bacteria growth, and inhibited inflammation. However, few studies exist examining human tissue response to nanomaterials. This presentation presents a cohort study of nano implants inserted into humans. In particular, one study includes the implantation of nanotextured spinal implants into over 14,000 patients over the past 5 years. Results demonstrated no cases of infections or other implant failures which is significantly better than statistics on conventional spinal implants which have up to 20% failure rates. This study will further explain that nano implants mimic the natural nano texture of bone itself and possess surface energy that can competitively increase the adsorption of proteins known to promote osteoblast (bone forming cells) functions, decrease bacteria functions, and limit inflammatory cell functions. As such, this presentation will cover the few human clinical studies on nano implants showing improved human health.

Nagy Habib
Imperial College London, UK

Biography

Dr. Nagy is Head of Surgery at the Hammersmith Campus of Imperial College London. Currently, he is driving the development of an saRNA drug which is being trialed in patients with liver cancer (OUTREACH study, ClinicalTrials.gov ID NCT02716012), a second trial in patients with solid tumours (TIMEPOINT study, ClinicalTrials.gov ID NCT 04105335) and OUTREACH2 study, which is a randomised phase II follow-on study in patient with viral HCC (ClinicalTrials.gov ID NCT 04710641). Previously, he was Pro-Rector for Commercial Affairs at Imperial College London. He was appointed to this position because of his experience attracting inward investment from industry and pharma, encouraging collaboration between the diverse departments at the university, and enabling commercialisation (spin out companies) via the Tech Transfer Office. He has published widely in gene therapy, stem cell therapy, oligonucleotides, surgery.

Small activating RNA: From concept to phase II clinical trials

Small activating RNAs (saRNA) are double stranded 21 nucleotide RNA that either target promoters or enhance genes leading to mRNA upregulation. saRNAs can be delivered with liposomes into the systemic circulation or subcutaneously by conjugation with aptamers or GalNAC. MTL-CEBPA is an investigative drug that resulted from the conjugation of saRNA CEBPA with NOV 340 lipsomes that targets tumour associated macrophages in order to alter favourably the tumour microenvironment. The relevance of the technology is that it can deliver transcription factors to the bone marrow CD34+ cells and that the effect lasts at least 6 weeks in vivo. MTL-CEBPA has been administered safely in over 130 patients with advanced cancer and improved clinical outcome in a sub-set of patients when co-administered with TKI or check point inhibitor. Clinical outcomes will also be presented.

José C Conesa
Institute of Catalysis and Petroleochemistry, Spain

Biography

JC Conesa entered the ICP staff in 1979; he was ICP Vicedirector, then ICP Director, being now ICP Ad Honorem Professor. He was first in Spain using SR techniques to study heterogeneous catalysis, and first in CSIC to use quantum calculations to understand them. He is expert in XPS and FTIR (including operando), EPR, UV-Vis-NIR. He has analyzed CeO2-supported metals and oxides, more recently for H2 production. He has kept furthermore continued interest in photocatalysis and photoactive solids. He belongs to the Steering Committee of AMPEA, a JP of the European EERA devoted to sustainable energy. His over 210 articles and book chapters have received more than 10100 citations, leading to a Hirsch index h=58.

Computing with hybrid DFT methods interfaces between semiconductors

Band offsets between semiconductors are crucial to determine the direction of electron transfer at their interfaces, which is important in particular for photocatalysis and photoelectrochemistry. Two methods are normally used to compute such offsets from first principles: alternating slabs put in contact, without empty spaces between them, and separate calculations of each material surface confronted with empty vacuum space. The first method has the risk of introducing distortions due to insufficient epitaxial match, which may lead to bandgap changes, and the second may neglect electron transfer at the interface, which may be important in systems having very different average electronegativities, and also implies a spill of electronic density into the vacuum space which will not be present in the real interfaces. In this work results will be compared using both approaches for different interfaces: anatase TiO2/ZnO (relevant for photocatalysis), and also a comparison of interfaces between CuGaS2 and either ZnS or CdS, possibly relevant for photovoltaic materials, will show the effects of significant epitaxial mismatch. The same comparison will also be made in the PbTe|TiO2 (rutile) and diamond/grey tin, and finally the system BiVO4/NiOOH (relevant for photoelectrochemistry) will be studied. The method will be based on using for the bulk phases hybrid DFT methods providing bandgap values coincident with the experimental ones, and transferring subsequently to the interfaces the distances between the band positions and the profile of the electrostatic potential as previously suggested (C. G. Van de Walle & R. M. Martin, Phys. Rev. B 1987, 35, 8154). In all cases it will be ensured that all interfaces are nonpolar according to Tasker's criterium (P.W. Tasker, J. Phys. C: Solid State Phys. 1979, 12, 4977). A critical analysis of any relevant differences found will be presented.

Scholars Frontiers in

NANOSCIENCE AND NANOTECHNOLOGY CONGRESS

SPEAKERS
Day 2

Mihaela D Leonida
Fairleigh Dickinson University, USA

Biography

Dr Mihaela Leonida received a MS and a Ph.D. in Chemical Engineering from the Polytechnic University in Bucharest, Romania and a Ph.D. in Bioorganic Chemistry from Wesleyan University in Middletown, CT, USA. At the present, she teaches biochemistry at Fairleigh Dickinson University in Teaneck, NJ, USA. Dr Leonida's research interests are in the field of redox enzyme stabilization and bionanomaterials with biological activity. She is the author of several books and over 70 papers published in science journals and conference proceedings.

Tannic Acid as Modulator of Nisin Release from Composites with Antibacterial Activity

Nisin, a bacteriocin, is a natural preservative used in the food industry. Among its shortcomings leakage in lipophilic environments is an important one. We encapsulated nisin in a marine biopolymer in order to improve is release profile. Composite materials were prepared using a mild, environmentally friendly procedure, ionotropic gelation of chitosan by sodium tripolyphosphate in the presence of nisin (N) at different concentrations. In two parallel sets of preparations, tannic acid (TA) was added at 10:1 and 5:1 N:TA, respectively. The obtained particles were characterized by FTIR, SEM, size, zeta potential, encapsulation efficiency, loading capacity, and ratio of residual free amino groups. The kinetics of nisin release from the particles was studied to assess the role of TA as a potential modulator thereof. Its presence resulted in enhanced release, higher at lower N:TA ratio. The kinetics of the release from water-based/oil-based creams, and simulated sebum is also reported. An additional benefit of our particles was that TA, a strong antioxidant, imparted antioxidant activity to the composites. Antimicrobial turbidimetric tests were performed against one gram-positive bacterium (Staphylococcus aureus) and two gram-negative bacteria (Escherichia coli and Pseudomonas aeruginosa), all relevant for the food, pharmaceutical, and cosmetic industries. All the composites showed synergistic effects against all the bacteria tested. The positive coaction was stronger against the gram-negative species. This is remarkable since nisin itself has not known activity against them.

M Mohsen
AMS Layout Design Engineer, Egypt

Biography

Eng. M Mohsen endeavors to apply her accumulated experience in the field of nano technology in the AMS, and bio-medical fields. She received the B.Sc. degree in electronics and communications engineering from the Faculty of Engineering, Cairo University, Giza, Egypt, in 2018. She received the M.Sc. degree with the Nano-Electronics Integrated System Center (NISC), Nile University, Cairo, in 2020. Currently, she is working as AMS layout engineer at SI-Vision company in Egypt since 2020.

Nanotechnology Usage Nowadays

Nowadays, non-destructive methods for testing biological tissues are becoming trendy and more significant in lots of cheap and fast monitoring health, and environmental applications. These techniques are endeavouring to present hand-held and cheap devices' for matching the growing market needs. Innovation in measurement techniques, signal processing algorithms, and circuit design is needed for achieving this goal.

The achievement in portable bio-devices is mainly driven by the continuous downscaling of CMOS as mainstream semiconductor technology till reaching FinFET, MBC FET, and Gate-All-around FET, enabling efficient improvements in terms of processing speed, memory capacity, integration density, and power consumption.Another aspect pushing the economic success of CMOS is the proceeding integration on a functional level, enabling further miniaturization and price reduction. Digital, memory, analog, and mixed-signal blocks, even the radio-frequency (RF) front-end are integrated into so-called systems on chip (SOC) or systems in package (SIP).

Especially in consumer electronics with high volume and high complexity, there is a strong trend for SOC integration and single-chip solutions. Semiconductor companies realized that in this business field SOC integration is an important differentiation factor and value adder. The use of the most recent CMOS technologies and smart design techniques is a prerequisite for further improvements in terms of functionality, area, and power consumption.

HamidrezaSiampour
University of Cambridge, UK

Biography

Dr HamidrezaSiampour is a Research Associate at the University of Cambridge working on diamond-based quantum nano-sensors. He received a PhD degree in Nano-optics from the University of Southern Denmark for his thesis "A Nanophotonic Platform for Quantum Optical Integrated Circuits". From Jun-2019 to Jan-2022, he was a postdoc at the University of Sheffield working on the development of a semiconductor nanophotonic platform for directional spin-photon coupling. As a Visiting Researcher at Ulm University (07/2018-09/2018), he investigated GeV centers in nanodiamonds coupled to plasmonic waveguides. Before that, he was working on the project of single-atom electronics at Shanghai Jiao Tong University (2013-2016) where he proposed and developed the idea of Si nanowire core-shell phototransistors based on two-photon-absorptionphenomena at telecom wavelengths. From 2009 to 2013 he was a Research Assistant at Isfahan University of Technology, where he developed a sequential quadratic programming algorithm for solving inverse scattering problems based on non-radiating current reconstruction.

Hybrid quantum photonics with nanodiamonds and plasmons

Hybrid quantum photonic platforms combining different photonic elements in a single functional unit have great potential to leverage the strengths of individual subunits while avoiding their respective limitations. The desired functionality of such a hybrid integration relies on strong light-matter interaction at the single-photon level, and requires nanometre-scale fabrication precision and potentially involves a material diversity that is incompatible with standard nanotechnological processes. In this talk, I will discuss our developments in realization of hybrid integrated quantum photonic circuits based on dielectric-loaded plasmonic waveguides, containing accurately positioned nanodiamonds (NDs) with colour centres. This includes a top-down fabrication technique that was developed for accurate and deterministic positioning of waveguide components to incorporate NDs containing a single (nitrogen, silicon or germanium) vacancy centre. Moreover, a chip-integrated cavity was demonstrated combining resonant and plasmonic enhancement to increase the spontaneous emission rate of single photons with up to 42-fold at the cavity resonance. We have also demonstrated on-chip remote excitation of single quantum emitters by the plasmonic modes in dielectric ridges atop colloidal silver crystals. Quantum emitters were produced by incorporating single germanium-vacancy (GeV) centres in NDs, providing bright, spectrally narrow and stable single-photon sources suitable for highly integrated circuits. Cryogenic characterization of GeV-NDs indicated symmetry-protected and bright zero-phonon optical transitions with up to 6-fold enhancement in energy splitting of their ground states as compared to that found for GeV centers in bulk diamonds (i.e. up to 870 GHz in highly strained NDs vs. 150 GHz in bulk).

Nooshin Kianvash Rad
University of North Carolina at Greensboro, USA

Biography

NooshinKianvashRad is a PhD student and graduate research assistance at Joint School of Nanoscience and Nanoengineering(JSNN) at the University of North Carolina Greensboro with over 10 years of post-graduate experience in Radiology Technology, in Public and Private Health Centre, and a strong background in Nano-medicine. Her research Interest includes diagnosis and treatment of Cancers, Drug Delivery, Cancer treatment by changing cell cycling.

Native Nanostructure Surface from the Wings of Tibicens spp. Cicada sensitized yeast to antifungal drugs

Candida albicans is an opportunistic fungal pathogen that affects immunocompromised patients and causes superficial to systemic infections. Under varied environment conditions, this pathogen exhibits a variety of reactions that result in the growth of a virulence factor, such as biofilm formation. The diagnosis of fungal infections is challenging due to the lack of sensitive and rapid diagnostic tools and the failure of antibiotic treatment, which leads to the persistence of infection. Factors such as immunosuppression after implantation, increased utilization of prosthetic devices, as well as catheters in combination with antibiotics, prolonged chemotherapy, and HIV infection, lead to enhanced mortality, and morbidity in immunocompromised patients caused by Candida albicans. These conditions often limit the ability to use antifungals due to their toxicity, impermeability, and side effects, leading to an increasing resistance of Candida albicans to current antifungal drugs. This existing resistance enhances the priority of developing new antifungal drugs or therapies. So, microbial rupture upon interaction with nanostructure surfaces has gained a lot of interest. Our lab showed that this interaction influences the major transcriptional changes resulting in a set of characteristic metabolic and physiological responses in Candida albicans, such as adhesion, ergosterol biosynthesis, and altered expression of DNA damage response genes. The ergosterol biosynthesis pathway is the target of several classes of antifungal drug. The interaction of between Candida albicans and the nanostructure surfaces resulted in the reduction of cellular ergosterol resulting in a sensitivity to antifungal drugs. These findings provide a potential molecular approach to designing efficient antimicrobial surfaces to control biofilm formation in immunocompromised patients and extend the use of current antifungal drug classes. The goal of our research is to identify the genetic response of the fungal pathogen, Candida albicans, to mechanical stimuli therapy and determine how such a response allows this pathogen to adapt, followed by forming a biofilm on different substrates.

A Guillermo Bracamonte
National University of Cordoba, Argentine

Biography

A Guillermo Bracamonte, PhD in Chemical Sci., holds an assistant professor position at UNC andresearch position at CONICET (Commission of Research in Science, Argentina). During his researchcareer, he held postdoctoral positions at COPL, Laval University (Quebec), and University of Victoria(British Columbia), Canada. He was research visitor at University of Regensburg, Germany (Bayern),Germany; and researcher at the NASA Astrobiology Institute, and University of Akron (Ohio) UnitedStates. Then, he began his own Research Group, in collaboration with other International Researchers,within Nanophotonics, Biophotonics and Nanomedicine.

Tuning high electromagnetic fields from the Nanoscale towards the far field for Nanophotonicsand Biophotonics applications: core-shell and hybrid Nanocomposites

The design and synthesis of subwavelength Silica nanoparticlesand hybrids Silica nanocomposites, and gold Core-shell nanoparticles for Enhanced Fluorescence based onMetal Enhanced Fluorescence (MEF). Thus, the tuning of Plasmonics was afforded to the development ofcontrolled Ultraluminescent properties. These Nanoparticles are of high interest for Nanotechnology,Biophotonics, and Nanomedicine applications. It was optimized Luminescent SiO2 NPs and Ultra-Luminescent Au@SiO2 based on MEF. The fluorophore was Rhodamine B (RhB), well known as emitterand photon counter. The MEF, it is an effect produced by the excitation of a strong electromagnetic fieldin the near field that have effect on the occupation of the excited state affecting as well the kineticconstants of fluorescent lifetime decays. In order to study the MEF phenomena it was tuned and assayedvariable gold cores sizes on the Luminescence of Au@SiO2-RhB nanoarchitecture. It was evaluated theMEF Enhancement Factors (MEFEF) by dissolving the gold cores. Analysis of single nanoparticles andnanocomposites in presence of Au@SiO2-RhB, MEFEF of 20-40 and 10 with 40 and 20 nm respectivelyby Laser Fluorescence Microscopy NanoImaging. These enhancements were accompanied with shorteningof Fluorescence Lifetime decays attributed to MEF phenomena. Core-shell nanoparticles with 40 nm coresshowed the strongest hot-Ultraluminescent-spots and higher Ultraluminescent bacteria surface coverage,while for 20 nm and 5 nm cores weaker intensities were measured compared to 40 nm. However, it wasdetermined higher Nano-resolution with intermedium intensities accompanied with enhanced detail ofBacteria Bioimaging, and Unicellular microorganisms with smaller core sizes. In this context, as well itshould be contemplated the Optical activity of Biostructures for Bioimaging applications.

Moreover it was discussed about the Bioconjugation of these Nanoparticles as well as theincorporation or chemical surface modifications with other types of organic molecular spacers for potentialNanophotonics applications as well.

Mirza Muhammad Faran Ashraf Baig
Hong Kong University of Science and Technology, Hong Kong

Biography

Mirza Muhammad Faran Ashraf Baig research work mainly focuses on the construction and function of DNA nanomachines, which are cutting edge and challenging topics. He designed and constructed unique DNA molecular tension probes using a short circular DNA nanotechnology technique and functionalized these probes with fluorophores, gold nanoparticles, small molecular drugs, and peptide ligands. He achieved nano-specific precision in organizing plasmonic nanoparticles on the nano DNA frameworks to achieve plasmon resonance effects. His work on the DNA nanomachines provided an efficient mechanism of fluorescence resonance energy transfer that realizes the bio-imaging, and detection of biological events, and functions of the biomolecules. Hehave been working on multi-layered hybrid magnetic nanoparticles for applications in nanomedicine from last two years.

Recent Advances of Magnetic Gold Hybrids and Nanocomposites, and Their Potential Biological Applications

Magnetic gold nanoparticles (mGNP) have become a great interest of research for nanomaterial scientists because of their significant magnetic and plasmonic properties applicable in biomedical applications. Various synthetic approaches and surface modification techniques have been used for mGNP including the most common being the coprecipitation, thermal decomposition, and microemulsion methods in addition to the Brust Schiffrin technique, which involves the reduction of metal precursors in a two-phase system (water and toluene) in the presence of alkanethiol. The hybrid magnetic–plasmonic nanoparticles based on iron core and gold shell are being considered as potential theranostic agents. In this critical review, in addition to future works, we have summarized recent developments for synthesis and surface modification of mGNP with their applications in modern biomedical science such as drug and gene delivery, bioimaging, biosensing, and neuro-regeneration, neuro-degenerative and arthritic disorders. I shall discuss the techniques and biological applications of mGNP majorly based on my own research

Emine Kaynar
Sivas Cumhuriyet University, Turkey

Biography

Emine Kaynar, after completing her undergraduate education in nanotechnology engineering, is doing her master's degree in the same department. She is actively working at the Nanophotonics Application and Research Center during master's degree education. While working at this center, she worked in projects named Growth and Characterization of AlN/Si Distributed Bragg Reflector, Numerical Investigation of Diffraction Patterns of Small-sized Apertures Using XUV Region to Visible Region Light Sources, and Determination of Structural and Optical Properties of InP/InGaAs Structure Grown at Different As Concentrations by Metal Organic Chemical Vapor Deposition Method. She wrote articles named Determination of Optical Properties of MOVPE-Growth InxGa1-xAs/InP Epitaxial Structures by Spectroscopic Ellipsometry, Sputtered AlN for Distributed Bragg Reflectors Operating in the SWIR Wavelengths and the effect of structure parameters and static electric field on the nonlinear optical properties of triple InGaAs/GaAs during the master's degree education.

Investigation on AlN/Si Distributed Bragg Reflector for VECSELs at Telecom Wavelengths

The use of semiconductor-based electronic and optoelectronic devices takes more and more in daily life. One of the semiconductor-based device research areas has been surface-emitting lasers. Vertical external cavity surface emitting lasers (VECSELs) have been extensively studied in the literature because they can be used in fiber optic networks and optical interconnects. The optically pumped VECSEL offers many potential advantages over a conventional in-plane laser. One of these advantages is the compatibility of VECSEL chips with low-cost substrate scale fabrication and testing methods. The near-infrared region was the focus of the first VECSEL studies. Since the first demonstration, 100 W continuous wave power and pulse width less than 96 fs at GHz level correspond to kW level peak powers in single mode lasing have been obtained at 1 μm wavelength by using GaAs-based VECSEL [1,2]. However, GaAs-based VECSEL performances could not be obtained in the rest of the electromagnetic spectrum. There are two main reasons for this: low thermal conductivity and refractive index difference of the used materials.Based on these studies, it is aimed to eliminate the problems of thermal conductivity and refractive index difference in this study. For this purpose, a new material system has been developed and 6 pairs of high thermal conductivity (kThSi=180 W/cm.K, kThAlN=300 W/cm.K) and high refractive index difference (nSi=3.6, nAlN=2.25) Si/AlN DBR structure has been grown on the Si substrate by using sputtering technique. Then, structural and optical characterization of AlN/Si DBR structure has been performed. Optical characterization of the DBR has shown a reflection of more than 99% for the 6-pair.

Rizwan Asif
Qarshi University Lahore, Pakistan

Biography

Dr Rizwan Asif is currently working as an assistant professor at Qarshi University in Lahore, Pakistan. Recently, he have completed my PhD in Microbiology. His area of Interest includes Phytochemical analysis of herbal drugs, Drug designing and evaluation their therapeutic effects, Evaluation of antimicrobial, antiviral and antifungal effects of herbal drugs, Comparative clinical study of different herbal formulation, Evaluations of Antioxidant, Antimicrobial, Antifungal, Anticancer and Immunomodulation activity of various indigenous medicinal plants, Study of Plants microbe interaction, Plant pathogens and plant defence mechanism, Fungal diseases of plants, Bacteriology, Molecular study of Pathogens.

Green Synthesis of Silver Nanoparticles (AgNPs), Structural Characterization, and their Antibacterial Potential

Background: In the field of nanotechnology, the metallic nanoparticles are of remarkable interest because of their unique electronic, magnetic, chemical, and mechanical properties. Purpose: In the present work, silver nanoparticles (AgNPs) were synthesized using bio-reduction method. Research Design: Silver nitrate was used as metallic precursor and the extract of Moringa oleifera leaves with different concentrations was used as reducing as well capping agent. The extract exhibited strong potential in rapid reduction of silver ions for the synthesis of silver nanoparticles. The synthesized silver nanoparticles were characterized by UV-visible spectroscopy, X-ray diffraction (XRD), and scanning electron microscopy (SEM) techniques. Results: The absorption SPR peaks appeared in the range of 415 to 439 nm. SEM analysis exhibited that particles were spherical in shape with size distribution range from 10 nm to 25 nm. The synthesized silver nanoparticles were pure crystalline in nature as confirmed by the XRD spectra with average crystallite size 7 nm. In vitro antibacterial activity of the prepared silver nanoparticles colloidal samples as well the extract was studied using different concentrations of AgNPs (C1 = 100 µg/ml, C2 = 50 µg/ml, C3 = 25 µg/ml) by well diffusion method against Gram negative Escherichia coli. The antibacterial performance was assessed by measuring the zone of inhibition (ZOI). Conclusions: The results suggested that AgNPs prepared by green approach can be considered as an alternative antibacterial agent.

Seiko Jose
Central Sheep and Wool Research Institute, India

Biography

Seiko Jose is a scientist, working at Central Sheep and Wool Research Institute, Avikanagar, Rajasthan, India. He is specialized in Textile Chemistry and having more than 17 years of experience in textiles. He is having seven years of experience in the cotton, silk, and linen processing industry. In the past ten years of his research, he has handled many natural fibres like, jute, pineapple leaf fibre, coconut fibre, flax, silk, wool, ramie, etc. He contributed to 48 research articles and 14 book chapters. His major research areas are extraction and characterization of natural fibre, utilization of agro residues, textile dyeing and finishing, eco-friendly textile processing, nano technology and fibre composites. His Google citations are more than 950. He published 3 books and another 3 books are in progress in the field of textiles, and composites with reputed publishers namely Wiley and Elsevier. He managed 10 industrial consultancy works in the national and international level. Currently is holding the position of Editor in 6 Journals.

Investigation of effect of nano kaolinite as a filler in the coarse wool - vinyl ester composite

In the reported work, wool fabric was coated with vinyl ester resin and subsequently composites were developed. To increase the mechanical properties of the composite, nano kaolinite was used as a filler. The effect of nano kaolinite in the physico- mechanical properties, surface morphology, moisture content, water contact angle, water diffusion and aging characteristics of the wool-vinyl ester resin composite was analyzed using various analytical methods. The inclusion of nano kaolinite significantly improved the tensile and impact strength of wool-vinyl ester resin composite. The SEM images depict a good adhesion between the wool fibre and the vinyl ester resin. The presence of nano kaolinite in the composite caused marginal reduction in the water contact angle and increase in the water diffusion properties. The FTIR spectra showed absence of chemical interaction between the nano kaolinite, wool fibre and vinyl ester resin. The thermal and UV aging properties of the wool- vinyl ester composites were improved with the addition of nano kaolinite, however the developed composites showed poor biodegradation.

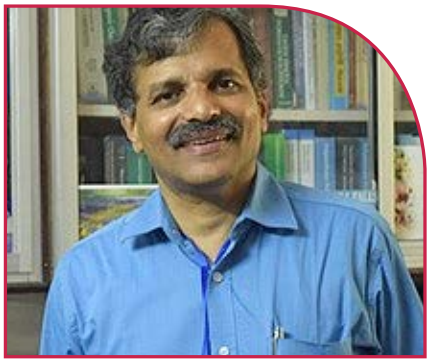
Vladimir V Egorov
Russian Academy of Sciences, Russia

Biography

Dr Vladimir Valentinovich Egorov has his expertise in theoretical molecular and chemical physics. Education: National Research Nuclear University MEPhI, Faculty of Theoretical and Experimental Physics (1966 – 1972), Moscow, USSR. He has completed his PhD from Theoretical Department of Institute of Chemical Physics, USSR Academy of Sciences (1981), and he has completed his Dr Phys & Math Sci degree from Institute of Physical Chemistry, Russian Academy of Sciences (2004). He is leading researcher at FSRC "Crystallography and Photonics", Russian Academy of Sciences, Moscow, Russia. Prof Egorov is working on the development of a fundamentally new physical theory quantum-classical mechanics and its applications in physics, chemistry, biology and biomedicine.

Quantum-Classical Mechanics: Principles, Applications, and Prospects

In quantum mechanics, the theory of quantum transitions is grounded on the convergence of a series of time-dependent perturbation theory. In nuclear and atomic physics, this series converges because the dynamics of quantum transitions are absent by definition. In molecular and chemical physics, the dynamics of "quantum" transitions, being determined by the joint motion of a light electron (or electrons) and very heavy nuclei, are present by definition, and this series becomes singular. An exception is the dynamic problem for stationary states in the Born-Oppenheimer adiabatic approximation, when the electronic subsystem turns out to be "off" from the general dynamic process and therefore is not dynamically full-fledged: it only forms an electric potential in which the nuclei oscillate. Removing the aforementioned singularity can be accomplished in two ways. The first method was consisted of introducing an additional postulate in the form of the Franck-Condon principle into molecular quantum mechanics, in which the adiabatic approximation is used. The second method was proposed by the author and consisted of damping the singular dynamics of the joint motion of an electron and nuclei in the transient state of molecular "quantum" transitions by introducing chaos. This chaos arises only during molecular quantum transitions and is called dozy chaos. Dozy chaos leads to the continuity of the energy spectrum in the molecular transient state, which is a sign of classical mechanics. Meanwhile, the initial and final states of the molecule obey quantum mechanics in the adiabatic approximation. Molecular quantum mechanics, which takes into account the chaotic dynamics of the transient state of molecular "quantum" transitions, can be called quantum-classical mechanics (QCM). The efficacy of the damping for the aforementioned singularity is shown by different QCM applications, in particular, by applications of the so-called Egorov resonance to optical spectra in polymethine dyes and J-aggregates both for single-photon and two-photon processes, which, in particular, are rationalizing experimental studies in the field of bioimaging and photodynamic therapy. Prospects for further developments in QCM and their applications to problems of cancer and viral infections are discussed.



Sabu Thomas
Mahatma Gandhi University, India

Biography

Sabu Thomas is currently the Vice-Chancellor of Mahatma Gandhi University, Kottayam, Kerala, India. He is a Professor at the International and Inter University Centre for Nanoscience and Nanotechnology and Full Professor of Polymer Science and Engineering at the School of Chemical Sciences of Mahatma Gandhi University, Kottayam, Kerala, India. His ground-breaking research has covered the areas of polymer science and engineering, polymer nanocomposites, elastomers, polymer blends, interpenetrating polymer networks, polymer membranes, green composites and nanocomposites, nanomedicine and green nanotechnology. Prof. Thomas has received several national and international awards in recognition for his work, and recently received Honoris Causa (DSc) from the University of South Brittany, Lorient, France, in recognition for his contributions to polymer science and engineering. Prof. Thomas has published over 1400 peer- reviewed research papers, reviews and book chapters. He has co-edited more than 160 books. Currently he is having an H index of 118.

Engineering at the Nanoscale: A Strategy for Developing High Performance Functional Materials from Agrowaste

Green chemistry started for the search of benign methods for the development of nanoparticles from nature and their use in the field of antibacterial, antioxidant, and antitumor applications. Bio wastes are eco-friendly starting materials to produce typical nanoparticles with well-defined chemical composition, size, and morphology. Cellulose, starch, chitin and chitosan are the most abundant biopolymers around the world. Cellulose nanoparticles (fibers, crystals and whiskers) can be extracted from agrowaste resources. Chitin is the second most abundant biopolymer after cellulose, it is a characteristic component of the cell walls of fungi, the exoskeletons of arthropods and nanoparticles of chitin (fibers, whiskers) can be extracted from shrimp and crab shells. Starch nano particles can be extracted from tapioca and potato wastes. These nanoparticles can be converted into smart and functional biomaterials by functionalization through chemical modifications due to presence of large amount of hydroxyl group on the surface. The preparation of these nanoparticles includes both series of chemical as well as mechanical treatments; crushing, grinding, alkali, bleaching and acid treatments. Since large quantities of bio wastes are produced annually, further utilization of cellulose, starch and chitins as functionalized materials is very much desired. The cellulose, starch and chitin nano particles are currently obtained as aqueous suspensions which are used as reinforcing additives for high performance environment-friendly biodegradable polymer materials. These nanocomposites are being used as biomedical composites for drug/gene delivery, nano scaffolds in tissue engineering and cosmetic orthodontics. The reinforcing effect of these nanoparticles results from the formation of a percolating network based on hydrogen bonding forces. The incorporation of these nano particles in several bio-based polymers have been discussed. The role of nano particle dispersion, distribution, interfacial adhesion and orientation on the properties of the ecofriendly bio nanocomposites have been carefully evaluated.

Forough Amiry
Islamic Azad University of Iran, Iran

Biography

Forough Amiry studied applied chemistry at Payame Nour university during 2010-2015 and graduated as MS in Medicinal chemistry from Islamic Azad University of Iran in 2021. She has published 2 research articles in SCI journals and has three more awaiting article to be published.

Smart polymeric nanocomposite based on protonated aluminosilicate, curcumin, and chitosan for mesalamine drug delivery as an anti-inflammatory nanocarrier

Due to the importance of the colon-specific disease, its treatment with reduced side effects has become fascinating over the last decades. The aim of this study was the synthesis of the nanocomposite based on the protonated aluminum-modified mesoporous silica nanoparticles (H/Al-MSN) and curcumin possesses mesalamine to develop its efficacy and eliminating side effects for enhancing permeability in intestinal tissues. Here, different amounts of mesalamine were loaded and studied under accurate analysis in order to evaluate release quality. The aluminosilicate nanoparticles are encapsulated by the combination of curcumin as an herbal product and also chitosan as a natural biopolymer with the advantages of non-toxicity, biocompatibility, biodegradability, and non-allergenic. The release of mesalamine from the nanocomposite was investigated in different pH included acidic, neutral, and alkaline media. The results showed that the release of mesalamine is dependent on acidity. A colonic drug delivery system was designed based on the release time and pH sensitivity. The drug release was studied at pH 5.5, 7, and 8 a different region of the gastrointestinal tract was simulated. The results showed that the trend of mesalamine release is higher at pH 8 with high efficacy performance of more than 90 percent at room temperature for about 90 h.

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Biography

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

Two innovative paradigms of film growth. Perfect Mg2Si films for light and heat conversion into electricity

We demonstrate the rational methods of investigation of various temperature-dependent processes on surface or interface. If the sample has a wedge-shaped temperature distribution on the surface (see graphical abstract), the processes can be studied in the whole T range simultaneously, in a single experiment. Thus, the number of experiments necessary for achieving the result can be radically reduced. The narrow band silicide Mg2Si attracts attention of researchers because it has great perspectives for applications in solar cells and thermoelectric elements, consists of ecologic, abundant and rather cheap components. However, the UHV synthesis of Mg2Si films on Si surface is problematic: at low T magnesium does not intermix with Si but at high temperatures (HT) the deposited Mg re-evaporates fast without formation of the film. Basing on the analysis of the deposition kinetics and Mg-Si convex hull, we explain how and why Mg2Si can be grown on Si at HT, using the method of ultra-fast (pulsed) deposition. As an example, demonstrating advantages of our methods, we demonstrate that for the deposition rate of ~ 10000 nm per second the Mg2Si film can be successfully formed, but only on the sample area where T < 484 °C. The silicide growth process takes ~0.3 s.; in some extent it is similar to the self-propagating high-T synthesis. The mean residence time of a Mg atom on Si(111) at 480 °C is estimated as ~ 10-6 s. The films obtained by ultra-fast (pulse-type) deposition at T ≈ 400 °C have the best to date crystal quality and electrophysical parameters. The approaches used in our experiments can be suitable for investigations of many T-dependent processes (deposition kinetics, diffusion kinetics, interface reactions, phase transitions etc.) and T-dependent properties in different systems.

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