Coalesce Research Group

APPROVED PROVIDER #782310

8th European Congress on

ADVANCED NANOTECHNOLOGY AND NANOMATERIALS

October 12-13, 2023 | London, UK

Exhibitor

DE GRUYTER

Coalesce Research Group
33 Market Point Dr,
Greenville, SC 29607, USA

Contact Us:

Phone: +1-718-543-9362
Whatsapp: +1-843-564-2296

Scientific Program

8th European Congress on
Advanced Nanotechnology and Nanomaterials

Day 1 October 12, 2023	
Meeting Hall: **Event 4&5**	
08:00 - 8.45	Registration
8.45 - 9.00	Introduction
Keynote Presentations	
9.00 - 9.40	Harmonic and Anharmonic Lattice Thermal Capacities of Molecular Wires and 0001-oriented Cylindrical ZnO Nano-Wires **Valeri Ligatchev,** Independent Researcher, Singapore
9.40 - 10.20	Effect of Magnetocrystalline Anisotropy to Enhance Self Heating Efficiency of Rare Earth Substitute Fe_3O_4 Nanoparticles for Magnetic Hyperthermia Application **Jyoti Prasad Borah,** NIT Nagaland, India
Exhibitor Presentation	
10:20 - 10:50	Introduction (Exhibitor) **Juliusz Skoryna,** De Gruyter, Poland
Group Photo 10:50 - 11.00	
Networks & Refreshments 11.00 - 11.15 @ Foyer	
Oral Presentations	
Chair	**Masahiko Hara,** Tokyo Institute of Technology, Japan
Co-Chair	**Alexandre D'Agostini Zottis,** Federal Institute of Santa Catarina, Brazil
Sessions	Advanced Materials and Applications | Life Sciences & Nanomedicine | Nanotech: In other fields | Nanotech for Energy and Environment | Nanotechnology and Nanomaterials | Biomedical Engineering and Nanobiotechnology | Nanocharacterization and Nanomanufacturing |
11.15 - 11.45	Characterisation of Vertical VO_2 Nano Switch **János Mizsei,** Budapest University of Technology and Economics, Hungary
11.45 - 12.15	The Influence of Gelatin type and Processing Conditions on Gelatin Nanoparticle Properties **Jos Olijve,** Rousselot BV, Netherlands
12.15 - 12.45	Mobilizing Phospholipids on Tumor Plasma Membrane *via* Nano-Particle Mediated Delivery Implicates Phosphatidylserine Externalization Blockade for Cancer Immunotherapy **Yi-Nan Gong,** Hillman Cancer Center, USA
12.45 - 13.15	Development and Evaluation of A High-flow-rate Cascade Impactor Equipped with Gelatin Filters for Collecting Ambient Particulate Matter **Constantinos Sioutas,** University of Southern California, USA
Lunch 13:15 - 14:00 @ Gallery	
14:00 - 14.30	Innovative Nanomaterials for The Removal of Nucleic Acids of Bacteria Conveying Antibiotic Resistance Genes from Water/Wastewater **Mike O. Ojemaye,** University of Fort Hare, South Africa

8th European Congress on
Advanced Nanotechnology and Nanomaterials

14.30 - 15.00	Ferritin Nanocage and Gold Nanorod Bioconjugate for Cancer Photothermal Therapy **Janhavi Devrukhkar,** Indian Institute of Technology Bombay, India
15.00 - 15.30	Use of Nanomedicine in the Treatment of Atherosclerosis **Ahsan Ali,** Kazakh Russian Medical University, Kazakhstan
15.30 - 16.00	A Mixed-Finite Element Method Based Formulation for the Static Bending Analysis of Eringen's Strain-Driven Euler-Bernoulli Nanobeams **Gaurab Kumar Khanra,** Indian Institute of Space Science and Technology, India
Networks & Refreshment 16:00 - 16:30 @ Foyer	
16.30 - 17.00	A Rapid Method for the Middle Uremic Toxin β2m Analysis *via* SMPS **Alice Chinghsuan Chang,** Industrial Technology Research Institute, Taiwan
17.00 - 17.30	Preclinical Evaluation of Novel Oxasmaragdyrin Dye Loaded Liposomes as Nir Triggered Theranostic Agent for Cancer Photothermal Therapy **Suditi Neekhra,** Indian Institute of Technology, India
17.30 - 18.00	Continuous Preparation of Size-Controlled $NiFe_2O_4$ Nanoparticles by Means of A Spinning Disk Reactor **Lorenzo Iezzi,** Sapienza University of Rome, Italy
Day 1 Concludes followed by Awards Ceremony	

Scientific Program

Friday
October 13, 2023

8th European Congress on
Advanced Nanotechnology and Nanomaterials

Day 2 October 13, 2023	
Meeting Hall: **Event 4&5**	
Keynote Presentations	
9:00 - 9:40	Bridging The Gap Between Emerging Technologies and AI Hardware! **Shady Agwa,** The University of Edinburgh, United Kingdom
9:40 - 10:20	Hedgehog Architectures of Hydrocarbon Surfactants to Form a Low Surface Energy Monolayer Comparable to Fluorocarbons **Masanobu Sagisaka,** Hirosaki University, Japan
Oral Presentations	
Chair	**Masahiko Hara,** Tokyo Institute of Technology, Japan
Co-Chair	**János Mizsei,** Budapest University of Technology and Economics, Hungary
Sessions	Nanomaterials and Nanoparticles | Computational Nanotechnology | Nanotechnology and Nanomaterials | Nanostructures And Nano films | Nanotech for Energy and Environment | Recent Development and Advanced Researches in Nanotechnology | Nanophotonics and Nano/Micro optics | Material Science and Nanomaterials | Nanomaterials and Nanoparticles | Industrial Nanotechnology
10:20 - 10:50	Novel Superparamagnetic Iron Oxide Nanoparticles Coated by Pheomelanin and Unsaturated Copolymer Applied to Biomedical Applications for Breast Cancer **Alexandre D'Agostini Zottis,** Federal Institute of Santa Catarina, Brazil
Networks & Refreshments 10:50 - 11:05 @ Foyer	
11:05 - 11:35	Nano-Spectroscopic Approaches to Chemical Evolution and Origin of Life **Masahiko Hara,** Tokyo Institute of Technology, Japan
11:35 - 12:05	Self-Assembled Organic Optical Waveguides **Amir Handelman,** Holon Institute of Technology, Israel
12:05 - 12: 35	Aptamer Target Chain Reaction (ATCR) for Smart Therapeutic Inhibitor Development **Hung-Wing Li,** The Chinese University of Hong Kong, Hong Kong
12:35 - 13:05	The Effects of Flame Retardant Materials on the Optimal Design of Rectangular Sandwich Plates Using the Firefly Optimization Algorithm **Saeed Kamarian,** Changwon National University, South Korea
Lunch 13:05 - 14:05 @ Gallery	
14:05 - 14.35	Crystallization of Nanostructured Explosive Mixtures into Core-Shell using Spray Flash Evaporation (SFE) and Mechanistic Study for Nanodiamonds Synthesis **Maxence VINCE,** French-German Research Institute of Saint-Louis, France
14.35 - 15.05	Nano-Reinforced Heating Element for De-icing Applications **Konstantina Zafeiropoulou,** University of Patras, Greece
15.05 - 15.35	Impacts of Morphological Nanomaterials' Parameters on *in vitro* Bioassays **Paulo Cesar De Morais,** Catholic University of Brasília, Brazil
15.35 - 16.05	Effect of Metal Magnetic Nanoparticles at Different Magnetization Characteristics on Enhanced Oil Recovery (EOR) **Farida Amrouche,** University of Lancaster, United Kingdom
Networks & Refreshments 16.05 - 16.30 @ Foyer	

8th European Congress on
Advanced Nanotechnology and Nanomaterials

Poster Presentations	
Poster Judge	**Alexandre D'Agostini Zottis,** Federal Institute of Santa Catarina, Brazil
PP-01	Encapsulation and Delivery of a Five-Step Biosynthesis Pathway in a Porous Metal-Organic Framework **Ainur Sharip,** King Abdullah University of Science and Technology, Saudi Arabia
PP-02	The Characterization of Hydrogel Contact Lens with Pyridine Group Materials **A-Young Sung,** Seon-Young Park and Hye-In Park, Daegu Catholic University, South Korea
PP-03	Stabilization of Water/Supercritical CO_2 Nanodispersions with Highly-Methylated Nonionic Amphiphiles and its Utilization for Nanoparticle Synthesis **Hiroto Iizuka,** Hirosaki University, Japan
PP-04	The Design of a Self-Discharging Filter: Nanotechnology Know-How in the Marine Industry **Nataliia Tiron-Vorobiova,** Danube Institute of National University, Ukraine
PP-05	Accelerated Adsorption and Surface Tension Reduction of Surfactant in Water by Heterogeneous Hydrophobic Chains Having Tms and T-Butyl Groups **Hinata Komiyama,** Hirosaki University, Japan
PP-06	Position-dependent Optical Absorption of A Hydrogenic-like System in Mesoscopic Coupled Quantum Dot-ring: Electric Field Effects **Nicolás Hernández,** Universidad Nacional de Colombia Sede Medellín, Colombia
PP-07	Optical Absorption Calculation of A D_0 System Confined in Semiconductor Quantum Camels **Ricardo Lopez-Doria,** Universidad Nacional de Colombia Sede Medellín, Colombia
PP-08	EGFR Targeted Cabazitaxel Loaded Loaded Lipid-based Nanocarrier: A New Intervention for The Management of The Breast Cancer **Charu Misra,** University of Bradford, United Kingdom
PP-09	Plasmonic Metasurfaces Fabricated by Nano-Imprinting Lithography and Their Optical Applications **Yung-Chun Lee,** National Cheng Kung University, Taiwan
PP-10	Designing and Characterization of Antibody and Fab Fragment Conjugated Niosomal Nanoparticles **Nilufer Cakir,** Sabanci University, Turkey
Video Presentation	
VP-01	Characterization of the Diameter of Aerodynamic Droplets Generated In Nebulizers Using the Image Processing Technique **Luciana Martins Pereira de Araújo,** Jorge Amado University, Brasil

Day 2 Concludes

Panel Discussion - Awards & Closing Ceremony followed by Vote of Thanks

8th European Congress on
Advanced Nanotechnology and Nanomaterials

Virtual Presentations	
Day 1 October 12, 2023	
11:00 - 11:10	Introduction
Oral Presentations	
11:10 - 11:40	Solid-State Hydrogen Storage Materials Based on Nanostructured Magnesium: Synthesis and Properties **Matoke Peter Mose,** National Taiwan University of Science and Technology, Taiwan
11:40 - 12:10	Synthesis and Characterization of Non-Toxic Organo- Modified Layered Double Hydroxide and Clay Nanoplatelet-Polyethyleneterepthalate Nanocomposites **Naveen Bunekar,** Chung Yuan Christian University, Taiwan
Keynote Presentation	
12:10 - 12:50	Shape Memory Effect and Thermomechanical Reactions in Shape Memory Alloys **Osman Adiguzel,** Firat University, Turkey
Oral Presentations	
12:50 - 13:20	Novel Green Synthesis of Propolis Pollen Nano-Emulsion and Evaluation of its Physicochemical Properties and Cytotoxicity **Dalia MA Elmasry,** Agricultural Research Center, Egypt
Lunch(13:20 - 13:50)	
13:50 - 14:20	Enhanced Anti-Inflammatory and Ulcerogenicity of Ibuprofen Microsphere Formulations using Irvingia Wombolu Fat (IRW) and Moringa Oil (MO) as Co-Lipids **Thaddeus Harrison Gugu,** University of Nigeria, Nigeria
14:20 - 14:50	Multifunctional Hydrogel-based Electrolytes for Thermoelectrochromic Devices **Valeria De Matteis,** University of Salento, Italy
14:50 - 15:20	Engineering Microporous Organic Nanospheres as A Drug Carrier **Shumaila Razzaque,** Institute of Physical Chemistry, Poland
15:20 - 15:50	Simulation of Lead-Free Perovskite MAGeI3 Solar Cell **Hasina Huq,** The University of Texas Rio Grande Valley, USA
Day 1 Concludes	

8th European Congress on
Advanced Nanotechnology and Nanomaterials

Day - 2 October 13, 2023 BST	
Oral Presentations	
11:00 - 11:30	Preparation and High-performance Electronic Devices of Black Phosphorus Nanoribbons **Changxin Chen,** Shanghai Jiao Tong University, China
11:30 - 12:00	Significant Impact of Green Synthesized Nanoparticles in Low-cost Electricity Generation and Antibacterial Applications **Bithi Paul,** American International University, Bangladesh
12:00 - 12:30	Magnetically Separable Nanocomposite Beads for Radionuclides Adsorption from Aqueous Solution **Manish Sharma,** Malaviya National Institute of Technology, India
12:30 - 13:00	Influence of Biofiber Reinforcement Materials on the Mechanical strength of the Hybrid Composite Materials **VV Venu Madhav,** V.R. Siddhartha Engineering College, India
13:00 - 13:30	Nano-Materials Challenges; for Industrial Applications **IK Battisha,** National Research Centre, Egypt
13:30 - 14:00	Dielectric Behaviour of Blended Mineral Oil with Vegetable Ester Containing TiO_2 Nanoparticles **Prabhat Kumar Maiti,** Regional Testing Laboratory, India
Poster Presentations	
14:00 - 14:15	Green Synthesis and Characterization of ZnO Nanoparticles by using Bryophyllum Pinnatum Leave Extract and Its Antibacterial Application **Monika Paul,** National University, Bangladesh
14:15 - 14:30	TXTL System for Fast Decode Synthetic Spidroins **Valquíria A. Michalczechen Lacerda,** Embrapa, Brazil
Day 2 Concludes	

Exhibitor

DE GRUYTER

De Gruyter

Materials sciences is a rapidly growing field in the De Gruyter portfolio, characterized by its focus on emerging topics and upcoming authors. This discipline is at the forefront of cutting-edge technologies that intersect with industry and features contributions from acclaimed scientists from around the world. Our portfolio contains a variety of books and journals, including the open-access journals: Nanophotonics (2021 IF: 7.9), Nanotechnology Reviews (2021 IF: 6.7), and Reviews on Advanced Materials Science (2021 IF: 5.0).

Day-1
Keynote Presentations

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

HARMONIC AND ANHARMONIC LATTICE THERMAL CAPACITIES OF MOLECULAR WIRES AND 0001-ORIENTED CYLINDRICAL ZnO NANO-WIRES

Valeri Ligatchev

Independent Researcher, Singapore

Abstract

Background: The low-temperature $C_p(T)$ function(s) of *linear macromolecules do not follow* the Debye's law, $C_p(T) \alpha T^3$. So-called 'Tarasov Equation(s)' allows one to obtain the basic equations for the thermal capacity of the 'layered' (2D) and 'chain' (1D) structures. However, even in this case, the (acoustic) phonon spectra of those 1D and 2D structure(s) are implicitly presumed to be quasicontinuous, and do not takes into consideration well-known spatial confinement effect.

Objective: Herein, acoustic phonon spectra and temperature-dependent *harmonic* and *anharmonic* fractions of *lattice thermal capacity* of Zinc Oxide (ZnO) nanowires (NWs) of 'cylindrical' morphology and *anisotropic* wurtzite atomic structure(s) are simulated realistically.

Methods: The *static* and *spatially confined* vibrational basis related closely to the Bessel functions of the first kind and of integer order(s) in a combination with so-called 'Christoffel Matrix' and 'Fock space' formalisms are implemented at simulations on the single-particle (fundamental) and manyparticle acoustic phonon spectra and temperature-dependent harmonic and anharmonic fractions of the lattice thermal capacity of 0001-oriented Zinc Oxide (ZnO) nanowires (NWs) with the 'cylindrical' morphology and essentially anisotropic wurtzite atomic structure(s).

Results: Obtained simulation results reveal significant effect of alteration(s) in the parameters of NW morphology (i.e., in NW radius – varying in the range from 2 nm to 7 nm – and in its length – varying in the range from 30 to 100 nm) on features of their single-particle and many-particle vibrational spectra, and temperature dependencies of harmonic and anharmonic fractions of the lattice thermal capacity of those 0001-oriented crystalline ZnO NWs in the temperature range from 1K to 1000 K.

Conclusion: Static basis set related to the Bessel functions in a combination with 'Christoffel Matrix' and 'Fock space' formalisms are used at realistic simulations on fundamental and many-particle vibrational spectra of cylindrical ZnO NWs and temperature dependencies of their harmonic and anharmonic lattice thermal capacity.

Biography

Valeri Ligatchev was born in Russia in 1959. He had obtained his MS, PhD and Doctor of Science (equivalent of Habilitation) degrees in Moscow Power Engineering Institute (MPEI, Russia) in years 1982, 1988 and 1998, respectively. In MPEI he worked as a researcher (senior researcher) and lecturer from 1988 till 1999. Since 1999 he is working (till 2014) and living in Singapore: in Nanyang Technological University, (1999 – 2005), NanoScience Innovation Pte. Ltd. (2005 – 2006), and Institute of High Performance Computing, A*STAR, (2006 – 2014). He became an author (co-author) of 82 referred journal articles, 106 conference abstracts and proceeding articles as well as of 7 books and book chapters. He is a member of The Electrochemical Society since 2007. His name had been included in 2011 Edition of Marquis Who's Who in the World.

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

EFFECT OF MAGNETOCRYSTALLINE ANISOTROPY TO ENHANCE SELF HEATING EFFICIENCY OF RARE EARTH SUBSTITUTE Fe_3O_4 NANOPARTICLES FOR MAGNETIC HYPERTHERMIA APPLICATION

Jyoti Prasad Borah

NIT Nagaland, India

Abstract

Hyperthermia is one of the cancer therapy which is considered to be an artificial way of increasing the body tissue temperature by delivering heat obtained from external sources to remotely destroy cancerous cells or prevent their further growth. The relevant physics in Ferrite-Based Magnetic nanoparticles and their response to the heat generation validates the efficacy for the approach. In single-domain superparamagnetic nanoparticles the magnetic anisotropy play an important role in modulating the energy barrier and hence heat dissipation by the magnetic nanoparticles. However, the role of magnetic anisotropy in controlling self-heating efficiency is a topic of debate. The debate surrounding the role of magnetic anisotropy in self-heating efficiency stems from the complex interplay of various factors involved in the heat generation process. Among the ferrites, inverse spinel Fe_3O_4 is a suitable candidate as a heating source due to its high biocompatibility and suitable magnetic properties. The low heating efficiency of Fe_3O_4 nanoparticles is a critical issue that limits the nanoparticles used in magnetic hyperthermia applications. It is well known that the presence of unique f-block properties of rare earth elements in the Fe_3O_4 system significantly impact the magnetic anisotropy as well as the relaxation mechanism. In this work Eu and Tb substitute Fe_3O_4 nanoparticle were prepared via the chemical coprecipitation method. The incorporated rare earth in the Fe_3O_4 system was further confirmed by XRD, FTIR, TEM, and XPS characterization. The tuned saturation magnetization with reduced coercivity and retentivity can be specified from VSM studies. We have examined the Self heating efficiency of the doped magnetite system by using induction heating set up. The results indicated that the magnetic anisotropy positively influence self heating efficiency. It is also found that the relationship between magnetic anisotropy and self-heating efficiency can depend on various factors, such as the specific material composition, particle size, dipolar interaction.

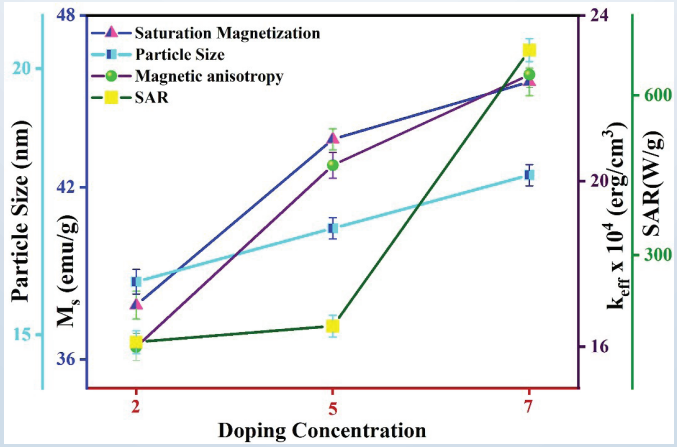


Figure 1: Variation of particle size, saturation magnetization, magnetic anisotropy, and SAR with different Eu doping concentrations.

Biography

Jyoti Prasad Borah is presently an Associate Professor in the Department of Physics, National Institute of Technology Nagaland, India. He has completed his PhD from Gauhati University, Assam, India. He has over 80 Publications. Dr. Jyoti Prasad Borah has completed Four external funded research project and two project is ongoing. His research interest lies in Metal ferrite based nanoparticles and nanocomposite for Magnetic hyperthermia application, Rare earth free materials for Permanent magnet application Dilute Magnetic Semiconductor (Oxide Semiconductor) and carbon nanotube and ferrite nanoparticles for photocatalytic and biomedical application.

Day-1
Oral Presentations

CHARACTERISATION OF VERTICAL VO_2 NANO SWITCH

János Mizsei, AL-abassi Salam, Zoltán Tafferner, and Péter Neumann

Budapest University of Technology and Economics, Hungary

Abstract

Background: Nowadays, widely researched materials are Mott insulators or metal-insulator transition (MIT). Those materials show unconventional electrical insulating behaviour and often exhibit interesting phase transitions with the drastic change in their electrical and magnetic properties under various stimuli, where the MIT materials undergo a first-order phase transition resulting in the change of the material's crystal symmetry. Several potential applications exist today for these materials, such as memories, optical sensors, or neural networks.

Vanadium dioxide (VO_2) is an example of MIT material showing a phase change at 68°C. The MIT effect results in a change of optical properties and an extremely high change of resistivity 3-4 orders of magnitude. Potential VO_2 devices applications are thermal sensors, thermal-optical and thermalelectrical devices, and MEMS applications. VO_2 resistors have thyristor-like characteristics due to a selfheating effect and/or high internal electric field. This structure can be considered an electro-thermal micro/nanodevice.

Objective: The aim of the present work is to show that vertically aligned VO_2-based devices can be used as a thermal-electrical circuit-based logic circuit and a thermal hotspot source for biasing alone or together. These two basic functions can be merged into one application, a prominent building block for complex logical functions or artificial neuron cells.

Methods: The thermal hotspot and the logical function were prepared from the same VO_2 layer with a combination of lateral and vertical device structures. The electrical measurements were compared by electro-thermal multiphysics simulation.

Results: The present study will show that the MIT-based logical function could change up to 3 orders of resistivity between two phases at 68°C, reversible. Based on the switching speed, the thermal time constant can be determined. The simulation result shows that the thermal behaviours of the designed structure are equal to the measured data.

Conclusion: The analysed structure shows a favourable result for more complex function development, and the theoretical tool allows optimised structure development.

Biography

János Mizsei was born in Jaszladany, Hungary, in 1952. He received his diploma in electrical engineering (1976),Dr. Techn. degree (1979), PhD (1995) from the Technical University of Budapest, the "candidate for techn. Science" (1987) and the "doctor of science" degree (2003) from the Hungarian Academy of Sciences. He has worked at the Department of Electron Devices of the Technical University of Budapest since 1977, at that time as professor emeritus. He had a sabbatical year at the Enterprise for Microelectronics, Budapest. His main subjects of interest are semiconductor technology (investigation and education), electron devices, including solar cells, surface physics of semiconductors and semiconductor gas sensors.

THE INFLUENCE OF GELATIN TYPE AND PROCESSING CONDITIONS ON GELATIN NANOPARTICLE PROPERTIES

Jos Olijve[1], Negar Hassani Besheli[2] and Sander Leeuwenburgh[2]

[1]*Rousselot BV, Belgium*
[2]*Radboud UMC, The Netherlands*

Abstract

Introduction: Gelatin-based nanoparticles (GNP) are increasingly used for drug delivery due to its biocompatibility, and versatility in terms of biochemical functionalization (1). The physico-chemical properties of gelatin particles such as size, surface charge and morphology are critical factors influencing their behavior in the final application. Therefor fundamental understanding of the effect of gelatin properties and nanoparticle processing parameters on surface properties is important. We studied the effect of gelatin type A vs. B, molecular weight, in combination with processing parameters to produce gelatin nanoparticles with tunable physico-chemical properties.

Methods: Gelatin type A and B from Rousselot was used to produce nanoparticles by a 2-step desolvation method. Acetone and glutaraldehyde (GA) were used as non-solvent and crosslinking agent. A TNBS assay was performed to quantify the number of free amine groups of crosslinked and non-crosslinked gelatins. Processing parameters variation including: addition rate of acetone, crosslinking amount, gelatin type (type A vs. B). The properties of the nanoparticles were characterized in terms of size, size distribution, surface charge using zeta-potential analysis and morphology by dynamic light scattering (DLS), scanning electron microscopy (SEM).

Results: The DLS and SEM analysis results indicate that the GNP size decreased for both type A and B gelatin with increasing non-solvent injection rate, resulting in monodisperse particles. We observed a strong influence of gelatin molecular weight on GNP size and homogeneity. An increase in molecular weight gave smaller GNP. Type A gelatin particles are smaller compared to type B. Likely due to the higher average molecular weight. Increase in crosslinker amount gave a decrease in surface charge, swelling properties and as result smaller particle size.

Conclusion: Gelatin nanoparticles for drug delivery with narrow size distribution and different size and surface charge were prepared by tuning gelatin molecular weight, type of gelatin and processing parameters, such as non-solvent addition speed, crosslinking amount.

Biography

Jos Olijve has a background in Biochemistry and Molecular Genetics and spent over 25 years as a Senior Engineer working on gelatin technologies before joining Rousselot's Scientific Development team in 2012. Jos has published 15 patent applications and authored/co-authored 12 scientific papers.

MOBILIZING PHOSPHOLIPIDS ON TUMOR PLASMA MEMBRANE VIA NANO-PARTICLE MEDIATED DELIVERY IMPLICATES PHOSPHATIDYLSERINE EXTERNALIZATION BLOCKADE FOR CANCER IMMUNOTHERAPY

Yi-Nan Gong[1,2]

[1]*UPMC Hillman Cancer Center, USA*
[2]*University of Pittsburgh School of Medicine, USA*

Abstract

Background: In "healthy" tumor cells, phosphatidylserine (PS) is predominately localized in the inner plasma membrane leaflet. During apoptosis, PS relocates to the outer leaflet. The exposed PS contributed to establish an immune suppressive tumor microenvironment, featuring M2 polarized tumor-associated macrophages (TAMs) and fewer tumor-antigen-specific T cells. The PS receptor TIM-3 is responsible for PS recognition.

Objective: To reverse the PS externalization in tumor microenvironments to boost anti-tumor immunity.

Methods: We targeted the PS scramblase Xkr-8 to block the apoptotic PS externalization by CRISPR-mediated KO, lentivirus-delivered shRNA as well as nano-particle-delivered siRNA. And we examined the anti-tumor efficacy.

Results: Silencing Xkr8 in vivo by either short hairpin RNA (shRNA) or small interfering RNA (siRNA) to achieve a PS externalization blockade provides robust therapeutic anti-tumor efficiency. Especially, co-delivery nanoparticles with Xkr8 siRNA and the chemo drugs intravenously increased anti-tumor immune response, featuring accumulated apoptotic tumor cells produce and release cyclic GAMP (cGAMP) to immune cells to activate the STING pathway, leading to TAM M1 polarization, suppressed interleukin (IL)-10 secretion, and natural killer (NK) cell cytotoxicity. Similarly synergetic anti-tumor effects were also observed when combine Xkr8 targeting with checkpoint blockade.

Conclusion: We provided novel therapeutic strategies (PS externalization blockade) and an anti-cancer target (Xkr8 silencing) to overcome the PS-mediated immune suppression in tumor microenvironments.

Biography

Yi-Nan Gong received his Ph.D. training at the National Institute of Biological Science, Beijing, under the mentorship of Dr. Feng Shao. Then he moved to St. Jude. Children's Research Hospital for postdoc training with the mentor Dr. Douglas Green. After that, he established my lab in Nov. 2018 at the University of Pittsburgh and UPMC. My research aims to understand the basic cell death programs and re-program cell death for immune therapeutic applications, using nano-particle mediated technologies. He is a 2021 NIH Director's New Innovator Award Recipient.

DEVELOPMENT AND EVALUATION OF A HIGH-FLOW-RATE CASCADE IMPACTOR EQUIPPED WITH GELATIN FILTERS FOR COLLECTING AMBIENT PARTICULATE MATTER

Constantinos Sioutas[1], Mohammad Aldekheel[1,2], Vahid Jalali Farahani[1], Ramin Tohidi[1] and Abdulmalik Altuwayjiri[3]

[1]University of Southern California, USA
[2]Kuwait University, Kuwait
[3]Majmaah University, Saudi Arabia

Abstract

This study aimed to develop and evaluate a high-volume multi-stage gelatin cascade impactor (GCI) capable of operating at a 100 lpm air flow rate and utilizing water-soluble gelatin substrates for the collection of particles in the coarse, accumulation, and ultrafine size ranges. The GCI consists of two impaction stages and a filter holder, with cut-point diameters of 0.20 μm and 2.5 μm. The impactor was designed for various applications, including in-vitro and in-vivo exposure studies, by enabling the extraction of water-insoluble particles into liquid suspensions. The performance of the GCI was assessed using artificially generated aerosols in the lab to determine the critical cut-point diameter of each impaction stage. In addition, the performance was evaluated in the field by comparing the results with a personal cascade impactor sampler (PCIS). The results of this work showed that the experimentally determined cut-point diameters, from the collection efficiency curves, agreed with theoretical predictions. Furthermore, the comparison between the GCI and PCIS revealed a strong agreement in particle mass concentrations, with data variability of less than 5%. The GCI also showed a higher capability in collecting PM-toxic constituents than the PCIS, with the reactive oxygen species (ROS) and dithiothreitol consumption (DTT) activities of the $PM_{2.5}$ collected using the GCI being more than twice the redox activity of particles collected with the PCIS. The development of the GCI offers a significant technological advancement in aerosol sampling due to its ability to efficiently collect multi-sized toxic PM constituents and its use of water-soluble filters, allowing for 100% particle extraction efficiency for inhalation and toxicity studies.

Biography

Constantions Sioutas has completed his PhD in Environmental Science and Engineering at Harvard University and currently holds the position of Fred Champion Professor in the Department of Civil & Environmental Engineering at the University of Southern California (USC).

INNOVATIVE NANOMATERIALS FOR THE REMOVAL OF NUCLEIC ACIDS OF BACTERIA CONVEYING ANTIBIOTIC RESISTANCE GENES FROM WATER/WASTEWATER

Mike O Ojemaye and Anthony I Okoh

SAMRC Microbial Water Quality Monitoring Center, University of Fort Hare, South Africa

Abstract

Water is a vital component of life and plays an essential role in human and animal lives, and because of these essential roles of water to life, access to quality water and quantity becomes imperative. Unfortunately, the aquatic environment, especially the freshwater milieu has become targets of extensive pollution due anthropogenic activities including discharge of inadequately treated wastewaters from municipal and hospital sources. Subsequently, water/wastewater systems have become established as reservoirs of antimicrobial resistance determinants in the environment. Sadly, municipal wastewater treatment systems are not designed to remove antimicrobial resistance determinants before discharge of their treated effluents into the receiving watershed, and consequently posing a health risk to communities downstream the treatment plants using the contaminated water. This challenge therefore suggests the need for the development of methods/materials for the elimination of antibiotic resistance genes (ARGs) in wastewater effluents before their discharge into the environment and consequently preventing the possibility of transfer of these genes to susceptible organisms. The continuous presence of ARGs in aquatic environments and the ability of microbes to take up and transmit these genes through horizontal gene transfer (HGT) is a major factor that promotes the emergence and development of antibiotic resistance. In this study, we synthesized nanomaterials for the removal of nucleic acids conveying antimicrobial resistance genes from water/wastewaters as a solution to curbing the menace of dissemination of antimicrobial resistance in the environment.

Biography

Mike O. Ojemaye holds a PhD, MSc and BSc degrees in Chemistry. He is presently a Lecturer and Researcher at University of Fort Hare, South Africa for 6 years now. His research interest is in the area of Environmental Chemistry with specialization in water/wastewater treatment and remediation as well as environmental contaminants monitoring. He is a widely published early career scientist and has presented several papers at national and international conferences as reflected in his google scholar profile (https://scholar.google.com/citations?user=dAamB4UAAAAJ&hl=en). He has supervised postgraduate students at Master and PhD levels. He is a recipient of the highly competitive South Africa Medical Research Council Extramural Postdoctoral Grant 2023, South Africa National Research Foundation Post-Doctoral Grant (2021-2022), H3D Symposium Travel Scholarship (2022), University of Mauritius/Volkswagen Stifung, Germany participation grant for workshop on computational chemistry (2019) and South Africa Medical Research Council study support (2015-2017). He also served as Laboratory Scientist for 5 years in two different manufacturing companies. He is a member of the Water Institute of South Africa, South African Chemical Institute, South African Catalysis Society and American Chemical Society.

FERRITIN NANOCAGE AND GOLD NANOROD BIOCONJUGATE FOR CANCER PHOTOTHERMAL THERAPY

Janhavi Devrukhkar, Sierin Lim and Rohit Srivastava

Indian Institute of Technology Bombay, India and Nanyang Technological University, Singapore

Abstract

Background: Photothermal therapy (PTT) has gained tremendous interest as a mode of minimally invasive localized cancer therapy, thus avoiding the need for surgery, and preventing the side effects of chemotherapy. Gold nanorods have emerged as excellent candidates as photothermal agents due to their distinctive surface plasmon resonance and contrast ability. However, application of gold nanorods in nanomedicine is limited due to their toxic CTAB surfactant coating. Attempts to replace the problematic CTAB layer have been partially successful due to incomplete removal and loss of nanoparticle stability. Ferritin nanocages are preferred for biomedical applications due to their unique structure and non-toxic nature.

Objective: To synthesize biocompatible Ferritin and Gold nanorod nanocomposite and evaluate its potential as theranostic agent for photo triggered cancer therapy.

Methods: Modified Ferritin nanocages bearing cystine residues on the outer surface to facilitate gold-sulphur interaction were produced by well-established fermentation techniques in *E coli.* They were conjugated to Gold nanorods by ligand exchange method by Au-S bonding to facilitate CTAB removal. Photothermal transduction efficiency and Cancer cell death by photho thermal therapy was studied using a 808 nm diode laser.

Results: The Ferritin coated nanorods show improved biocompatibility in normal cell line and enhanced cellular uptake in breast cancer cell line while retaining the photothermal transduction efficiency of gold nanorods. The *in vitro* studies reveal that synthesized nanoparticles are cytocompatible, haemocompatible and possess excellent photothermal transduction potential. The particles show high cellular uptake and cell death due to photothermal effect on breast cancer cells even at low laser power and low material concentration. As gold has a high atomic number, the particles showed good contrast in Computed tomography (CT) imaging.

Conclusion: Ferritin and Gold nanorod nanocomposite was synthesized and characterized. Functionalization with Ferritin cages improved biocompatibility, enhanced cellular uptake and NIR light induced cell death in breast cancer cell line.

Biography

Janhavi obtained a Masters degree in Life sciences from Mumbai University, India and was interested in the field of Cancer biology and therapy. She understood the fundamentals of Cancer during a research internship at the Advanced Centre for Treatment Research and Education in Cancer, Navi Mumbai. She joined the Indian Institute of Technology Bombay, Mumbai to conduct application based research where she was introduced to Cancer nanomedicine and worked on developing lipid, silica and gold based nanostructures for Cancer Theranostics as a Junior Research fellow in the department of Biosciences and Bioengineering. Janhavi is currently developing biocompatible NIR responsive gold and protein based nanocomposites for application in Photothermal therapy for breast cancer treatment as a joint Ph.D. degree candidate with Nanyang Technological University, Singapore and IIT Bombay.

USE OF NANOMEDICINE IN THE TREATMENT OF ATHEROSCLEROSIS

Ahsan Ali and Mansharipova AT

Kazakh Russian Medical University, Kazakhstan

Abstract

Background: Endotheliotoxic hyperlipidemia provide impaired eNOS-derived NO production, excessive free-radicals, adhesive molecules generation, vascular lipid accumulation, atherosclerosis development and progression. NO replacement by NO donors could restore NO deficits. HDLs have anti-atherogenic properties and are carriers of excessive cellular cholesterol through reverse cholesterol transport (RCT) pathway. Lipoprotein enrichment by anionic phosphatidylinositol (PI) increases the negative surface potential of lipoproteins and stimulate RCT. PI stimulates rapid flux and clearance of plasma cholesterol by increased hepatic uptake.

Objective: Regression of atherosclerosis stimulating RCT with experimental combination of NO donor encapsulated in PI nanocapsules (AlphaX1).

Methods: 30 rabbits fed with 2% cholesterol-enriched diet for 6 months. After 6 months, subdivided into 3 groups. Gr.1,10 animals without treatment. Gr.2, treated with AlphaX1 for 10 days, Gr.3, treated for 20 days. 5 rabbits-control. Animals sacrificed after 10 and 20 days of treatment. Part of abdominal aorta was snap frozen in cryostat for Oil Red O staining, part exposed for morphology and electron microscopy.

Results: Morphology/electron microscopy (x100-x27000): Gr.1–numerous vacuoles with neutral lipids and foam cells under endothelium, proliferation of solitary smooth muscle cells containing lipid vacuoles; Gr.2–moderate deposition of lipid vacuoles and foam cells in sub-endothelium, restoration of endothelium. Gr.3–express reduction of vacuoles with neutral lipids and foam cells, restoration of elastic fibers, regeneration of endothelium.

Conclusion: Data provide evidence that AlphaX1 provide regeneration of endothelial cells, restoration of elastic fibers (probably due to regulation of fibulin5 by PI3K/Akt), anti-inflammatory effect, clearance of foam cells from neutral lipids and regression of atherosclerosis. AlphaX1 provide antiatherogenic properties of NO and PI, probably by reduction in cytokines production, decrease in adhesion molecules expression, monocyte–endothelium adhesion inhibition, increased cholesterol efflux and clearance from plasma via hepatic uptake. AlphaX1 has the potential to be a new therapeutic agent for prophylaxis as well as for the treatment of hyperlipidemia and atherosclerosis.

Biography

Ahsan Ali is a medical doctor with a PhD degree in Cardiology. He has progressive experience in clinical and educational environments. He has many achievements in scientific research, starting from designing the research project, implementation and completion. He has been making novel achievements in the scientific research with a passion to improve the health and well-being. Worked on the nano capsular drug delivery system and developed nano capsular transdermal Insulin and first transdermal medicine for therapeutically regression of atherosclerosis and regeneration of endothelium. In 2007 he won the young scientist award. Fields of interests are Drug delivery, Atherosclerosis, apoptosis, restoration and regeneration of endothelium. He is author of 37 scientific papers in reputed journals and has 5 patents.

A MIXED-FINITE ELEMENT METHOD BASED FORMULATION FOR THE STATIC BENDING ANALYSIS OF ERINGEN'S STRAIN-DRIVEN EULER-BERNOULLI NANOBEAMS

Gaurab Kumar Khanra, IR Praveen Krishna and Raveendranath P

Indian Institute of Space Science and Technology, India

Abstract

The present work applies the Mixed Finite Element Method (MFEM) for the static bending analysis of nanobeams modelled after Euler-Bernoulli beam kinematics. Eringen's strain-driven, differential nonlocal constitutive model forms the basis of the proposed formulations. Nanobeams in various configurations subjected to point and uniformly distributed loads are inspected. Results for the fundamental quantities (deflections, slopes/section-rotations) and derived quantities (bending moments, shear forces) computed are compared with that of the traditionally used Finite Element Method (FEM). The efficacy of MFEM over FEM is thereby pointed out by the ability of the former to capture the size effects consistently, irrespective of the type of load applied and the nanobeam boundary conditions.

Background: Engineering cutting-edge MEMS/NEMS devices require a whole new branch of continuum theories which are, in essence, "size dependent," unlike the classical theories, which govern the macro-level structures. This is so because in such low dimensional systems, which form the basic structural building blocks of MEMS/NEMS devices, "size effects" as quantified by the "length scale parameter" become an important material property. These "size effects" result from inter-atomic or inter-molecular forces of attraction, such as the van der Waals and Langevin forces which are prominent in such a realm of low dimensions.

Several size-dependent continuum theories exist, such as strain gradient theory, couple stress theory, modified couple stress theory, Eringen's nonlocal elasticity theory, multi-scale models, etc. Our research is based on Eringen's nonlocal elasticity theory. Eringen first proposed this theory in the 1970s in its original integral form. The proposed constitutive model led to integro-differential equations that were challenging to handle. Therefore, an equivalent Eringen's differential nonlocal model was arrived at after a series of transformations on the original integral model. Since then, several research activities in this area of nonlocal elasticity have been carried out based on Eringen's differential nonlocal model from 2003 to 2016. However, pitfalls linked to this model were revealed by the famous "cantilever beam paradox" problem, wherein the deflections for a cantilevered nanobeam subjected to a point load at its tip became utterly devoid of the "length scale parameter." Therefore, the analytical solutions for elastostatic problems didn't make any physical sense. Researchers have used numerical methods such as FEM to analyze the nanobeam bending behavior. Eventually, it became evident that FEM produces inaccurate results due to it's inability to capture the size effects when a point load is applied to the nanobeam. It was also observed that for a statically indeterminate nanobeam in a clamped-clamped configuration and subjected to a uniformly distributed load, FEM fails to account for the size effects in the numerical solution for nanobeam deflections. The need for developing an efficient numerical technique to address the issues mentioned above was thus felt.

Objective: To present a Mixed Finite Element Method based formulation for Eringen's strain-driven Euler Bernoulli elastic nanobeams and demonstrate the superiority of MFEM over FEM through relevant case studies.

Methods: Weighted residual integrals are used to derive the weak form of the governing nonlocal moment-curvature and equilibrium equations. Considering the bending moment and the transverse displacement as the field variables approximated by the linear Lagrange interpolation functions, nanobeams in statically determinate and indeterminate nanobeam configurations are studied. Comparisons of the MFEM results for the fundamental and derived quantities are made with the numerical solutions based on FEM contributed.

Results: For the static nanobeam bending problems, a Mixed Finite Element Method based formulation is proposed for Euler-Bernoulli nanobeams. Flaws associated with the ability of FEM solutions available in the literature to capture the size effects thoroughly are exposed.

Conclusion: Using FEM for modelling nanobeams leads to inaccurate results due to it's inability to capture size effects, especially when the nanobeam is point loaded. This issue is resolved by adopting the proposed MFEM.

Biography

Gaurab Kumar Khanra is currently pursuing his Ph.D. and is affiliated with the department of Aerospace Engineering at IIST. He has been involved in active research in nonlocal elasticity for the past six years. He is interested in developing analytical, semi-analytical, and numerical solutions to address unresolved issues while modelling low-dimensional structure's static and dynamic behaviour.

A RAPID METHOD FOR THE MIDDLE UREMIC TOXIN β2M ANALYSIS VIA SMPS

Alice Chinghsuan Chang, Bin Hsu and Kung-Hung Liu

Industrial Technology Research Institute, Taiwan

Abstract

Background: β2-microglobulin (β2M) is a uremic toxin with molecular size ~11.8 kDa and is associated with frailty and mortality in hemodialysis patients. The β2M concentration in blood is measured using immunology-based methods such as enzyme-linked immunosorbent array (ELISA) in clinical practice while the drawbacks of the methods, which can be labor-intensive and costly, restrict the detection frequency of β2M.

Objective: To develop a rapid and lower-cost method, which is so-called SMPS, for β2M analysis and to evaluate the correlation between the proposed method and ELISA.

Methods: 16 spent dialysates were collected from the hemodialysis patients. The commercial human β2M was used for the database establishment in the proposed method – the scanning mobility particle sizer (SMPS). SMPS was connected to electrospray and was coupled with condensation particle counter (CPC) were for recognize β2M signal and quantify β2M concentration. The clinical method ELISA was also used for β2M analysis. The correlation between SMPS and ELISA data was calculated.

Results: The commercial human β2M was measured by SMPS and was characterized with a representative signal at 3.85 nm. β2M of the spent dialysate samples were characterized with the number concentration ranging from 3.06×10^{6} to 2.87×10^{8} counts/L, and were measured by ELISA in a range of 0.005–0.555 mg/L. The correlation of SMPS and ELISA were calculated as 0.915.

Conclusion: β2M data presents a high correlation between the proposed SMPS and the conventional ELISA. Our findings suggest that SMPS may be a promising approach for real-time monitoring and quantification of β2M clearance during hemodialysis in the near future.

Biography

Alice Chinghsuan Chang has her expertise in development and application of nano-metrology. Her achievements include the characterization of viscoelastic property of substrate for the study of mechanobiology (Chang & Nakanishi, 2021) and the measurement of non-volatile substances in solution for the impurity analysis in semiconductor (Chang & Lin, 2022). She currently focuses on the application of nano-techniques in clinical study – the quantification of middle uremic toxins, which are with the size in nanoscale and can be measured by the method such as SMPS. This approach suggests a promising role of nanotechnology in clinical application.

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

PRECLINICAL EVALUATION OF NOVEL OXASMARAGDYRIN DYE LOADED LIPOSOMES AS NIR TRIGGERED THERANOSTIC AGENT FOR CANCER PHOTOTHERMAL THERAPY

Suditi Neekhra[1], Chetna Patnaik[2], Laxman Kandala[1], B. Pradeep K. Reddy[1], Bharti Yadav[1], Ravikanth Mangalampalli[1], Abhijit De[2] and Rohit Srivastava[1]

[1]IIT Bombay, India

[2]Advanced Centre for Treatment, Research and Education in Cancer (ACTREC) TATA Hospital, India

Abstract

Background: Photothermal therapy (PTT) has gained significant interest with Near Infraredbased non-invasive imaging and has come up as a promising area lately to provide real-time imaging along with thermal ablation for cancer tumours. Materials that can act as both the tracker and the photosensitive agent, can serve the dual purpose for cancer theranostics. Using fluorescent dyes conjugated or encapsulated with nanomaterials for anti-cancer therapy is currently a hot topic for cancer theranostic research. They are proving to be more promising for image-guided therapies and hyperthermia-based clinical applications.

Objective: The primary objective of this work was to design a nanoformulation encapsulating highly hydrophobic dye in lipid assemblies. Further objectives include Physical characterization, *in vitro* and *in vivo* analysis for evaluating the potential of the nanoformulation.

Methods: This lipid-based nanoformulation is prepared by the thin film hydration method followed by size reduction using homogenization. It was characterized by electron microscopy, UV-Vis spectroscopy and DLS. Further, *in vitro* assays like biocompatibility and genotoxicity were conducted using mammalian cell lines, while hemocompatibility and immunotoxicity were performed using RBCs and PBMCs isolated from human blood. For *in vivo* analysis, tumour-induced immunocompromised mice were included for studying acute toxicity and photothermal efficacy.

Results: The synthesis, optimization, characterization, *in vitro* and *in vivo* evaluation were performed for liposomes loaded with novel organic Oxasmaragdyrin dye nanoformulation. The *in vitro* analysis has shown high biocompatibility and hemocompatibility with insignificant immunotoxicity and genotoxicity. The high photothermal conversion and transduction efficiency that is sufficient in killing cancer cells by thermal ablation are shown by the nanoformulation. Thereafter, we studied the acute toxicity and photothermal efficacy of the prepared nanoformulation on immunocompromised mice. The primary tumour was completely ablated without any relapse over a month that was monitored regularly by imaging the mice.

Conclusion: These findings give an edge to using this photothermal therapy as a combinational therapy with conventional chemotherapy, surgery, and radiation therapies. Furthermore, these results have opened doors to exploring the efficacy in higher animal models, doing real-time 3D imaging as well as pilot-scale production.

Biography

Suditi Neekhra has a keen interest in research and development towards improving the healthcare system. She is trained personnel in Cryo-SEM imaging for 3 years and has been a part of the Biologics GMP facility designing team in her department at IIT Bombay. She is a diligent team worker and has collaborated with multiple professors within the Institute and outside as well. Providing affordable healthcare facilities is a major challenge for developing countries and that has been the basis of all her research activities. She has worked on several projects that can aid towards economic designs and sustainable use of resources for maximum benefit to society.

CONTINUOUS PREPARATION OF SIZE-CONTROLLED $NiFe_2O_4$ NANOPARTICLES BY MEANS OF A SPINNING DISK REACTOR

Lorenzo Iezzi, M Stoller and F Stellacci

Sapienza University of Rome, Italy

Abstract

Background: In the last decades interest for photocatalytic degradation of organic pollutants in wastewater and groundwater by means of the use of semiconductor compounds increased much, becoming one of the most promising green chemistry technologies available to tackle water decontamination. In particular transition-metal ferrite nanoparticles exhibit high photocatalytic activity and unique magnetic and electric properties, making the material suitable for wastewater treatment and allowing the recovery and reuse of the nanoparticles with ease and without significant loss of their efficiency.

Objective: In this work, a Spinning disk reactor (SDR) was used to continuously produce Nickel Ferrite Nanoparticles of controllable size with a reduced energy consumption and productivity rates interesting to industrial purpose. In addition, the photocatalytic activity of the resulting product was also investigated in the degradation of the organic dye methylene blue

Methods: Nickel ferrite nanoparticles were produced by co-precipitation method at room temperature by means of a SDR and the final product was compared with those produced by using a conventional Stirred Tank Reactor (STR), in terms of crystallinity, particle size and distribution. The effect of the disk velocity on the particles size distribution was also investigated.

Results: Spinning disk reactor (SDR) was validated as a possible alternative equipment capable to continuously produce ferrite nanoparticles characterized by a narrower size distribution and higher purity compared to those produced by STR, with significant higher yields and lower energy consumption. The degradation of the Methylene Blue was found to be higher under UV-Visible light irradiation than Visible light irradiation alone.

Biography

Lorenzo Iezzi is a PhD student from the Department of Chemical, Materials and Environmental Engineering with experience in scaling-up the process of producing nanomaterials with photocatalytic properties that can be used in the removal of emerging pollutants from wastewater.

Day-2
Keynote Presentations

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

BRIDGING THE GAP BETWEEN EMERGING TECHNOLOGIES AND AI HARDWARE!

Shady Agwa and Themis Prodromakis

Centre for Electronics Frontiers, Institute for Integrated Micro and Nano Systems, The University of Edinburgh, United Kingdom

Abstract

Background: Moore's law is coming to an end soon due to the physical limits of the technology scaling; Meanwhile the technology space has been dominated by the Artificial Intelligence (AI) revolution. The AI applications, which are data-centric oriented, have introduced new challenges to the conventional Von Neumann architectures which are not originally designed to handle these data-intensive applications. The AI hardware design has to deal with the current technology's bottlenecks by exploring new emerging technologies and architectures for unconventional computing domains. Bridging the gap between the emerging technologies' capabilities and the AI hardware's requirements became an urgent need to cope with the ever-increasing AI performance demands.

Objective: To spotlight the AI hardware bottlenecks and to investigate the potential benefits of integrating both emerging technologies (like RRAMs) and architectures.

Methods: Conventional architectures, like GPUs and CPUs, are widely used to run the different AI applications. However, the performance and energy analysis shows a low efficiency in comparison to the human brain. The Deep Neural Networks (DNNs), which are at the core of the AI applications, are inspired by the human brain. Thus, the AI hardware should follow the same analogy to be able to handle the DNNs efficiently.

Results: There are three major bottlenecks that challenge the current AI hardware design; First, the memory wall which includes data-transmission from one die to another. Second, the Von-Neumann bottleneck which includes data-movement even within the same die from the memory unit to the processing unit. Third, the data representation and its computing domain which includes the computation complexity of the Vector-Matrix and Matrix-Matrix Multiplication required by DNNs.

Conclusion: Bridging the gap between the emerging devices' capabilities (like RRAMs) and the AI hardware's demands can lead to the next generation of the AI hardware. The brain-inspired AI hardware should leverage the high-density promise of the emerging devices to build digital in-memory computing architectures for unconventional computing domains (like stochastic/bitstream computing).

Biography

Shady Agwa is a research fellow at the University of Edinburgh, an IEEE member and IEEE CAS Society member. He got his PhD in Electronics Engineering from The American University in Cairo (AUC, Egypt) in 2018. In 2019, Dr. Agwa joined the Computer Systems Laboratory at Cornell University (USA) as a Postdoctoral Associate. In 2021, he joined the Centre for Electronics Frontiers at the University of Southampton (UK) as a senior research fellow and then as a research fellow at the University of Edinburgh (UK) in 2022. Dr. Agwa's research spans the Computer Architecture and VLSI design including: AI hardware design, In-Memory Computing, Stochastic Computing and Unconventional Computing, Emerging Technologies (RRAMs), Analog Content-Addressable Memory and Beyond Von-Neumann Architectures.

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

HEDGEHOG ARCHITECTURES OF HYDROCARBON SURFACTANTS TO FORM A LOW SURFACE ENERGY MONOLAYER COMPARABLE TO FLUOROCARBONS

Masanobu Sagisaka, H Komiyama, N Kovalchuk, M Simmons, A Mohamed, T Dirmanin, F Guittard and J Eastoe

Graduate School of Science and Technology, Hirosaki university, Japan

Abstract

Background: Low surface energy (LSE) surfactants have been used in a wide variety of applications such as coatings and inks, floor waxes, firefighting foams and so on. In general, the development and optimization of LSE materials has attracted much attention, and a wide variety of useful materials can be obtained by fluorinating surfaces. Unfortunately, fluorocarbons (FCs) have significant environmental risks, and recent studies highlight the persistence and bioaccumulation hazards of FCs.

Objective: To explore even more effective and efficient non-fluorinated surfactants, this study examined relationships between surfactant structure and aqueous solution properties. Of particular interest are links between γCMC, the effective hydrophobic-tail layer density (ρ_{layer}) and total number of carbon and silicon atoms in the hydrophobic tails (N_{C+Si}).

Methods: Surfactants bearing highly-methylated alkyl tails (so-called "hedgehog" groups) were found to reduce the limiting surface tension at the aqueous critical micelle concentration (CMC) to γ_{CMC} ~24 mN m^{-1}, which is considerably lower than for common n-alkyl tail surfactants (30-40 mN m^{-1}). This study synthesized various hedgehog surfactants [**Figure 1**] and measured surface tension of aqueous surfactant solutions with Wilhelmy plate method.

Results: Interestingly, γ_{CMC} is seen to depend on ρ_{layer} rather than N_{C+Si}, and ρ_{layer} ~0.64 g cm^{-3} appears to be an optimal surface layer density for promoting low γCMC. For a surfactant bearing trimethylsilyl (TMS) chain tips, exchanging the surfactant counterions from Na^+ to Mg^{2+} reduced γCMC from 23.8 mN m^{-1} to 21.5 mN m^{-1}, which is very low for a hydrocarbon surfactant, and comparable to typical fluorinated surfactants.

Conclusion: A new measure of the ability of different surfactants to lower surface tension is proposed, which is helpful for targeting low surface energy (tension) non-fluorinated surfactants. In terms of both γ_{CMC} and CMC TMS-terminal tips are shown to be key groups for promoting hydrophobicity and/or low surface tensions.

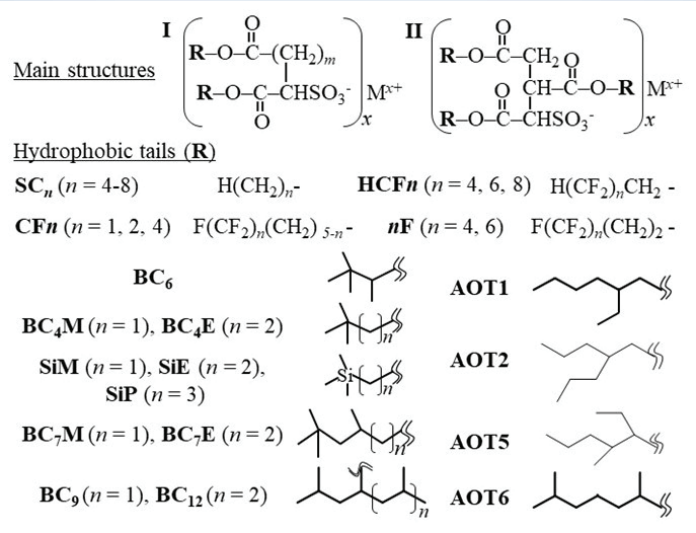


Figure 1: Structures of surfactants having hydrophobic tails R and counterions M^{x+}.

Biography

Masanobu Sagisaka received his PhD degree from Tokyo University of Science in 2003. After working at National Institute of Advanced Industrial Science and Technology (AIST) under a JSPS research fellowship for young scientists, he joined Hirosaki University as an Assistant Professor in 2004, and was promoted to Associate Professor in 2014, and Full Professor in 2022.

Day-2
Oral Presentations

NOVEL SUPERPARAMAGNETIC IRON OXIDE NANOPARTICLES COATED BY PHEOMELANIN AND UNSATURATED COPOLYMER APPLIED TO BIOMEDICAL APPLICATIONS FOR BREAST CANCER

Alexandre D'Agostini Zottis

Federal Institute of Santa Catarina, Brazil

Abstract

Background: Superparamagnetic iron oxide nanoparticles (SPIONs) have their use approved for the diagnosis/treatment of malignant tumors and can be metabolized by the organism. In this context, our research group are dealing with the investigation on SPIONs coated by novel biomaterials that might be used as potential negative contrast agents (CAs) and drug-delivery for treatment on breast cancer.

Objective: To present a novel kind of SPIONs coated by pheomelanin (SPION@pheo) applied as a negative T_2 contrast enhancement in MRI and an unsaturated copolymer poly(globalide-cocaprolactone) (PGlCL) modified with cysteine (SPION@PGlCLCys) which can be applied in targeted drug delivery, diagnosis of breast cancer, or even in theragnostic.

Methods: The synthesis of the SPION@pheo and SPION@PGlCLCys were carried out according to the co-precipitation approach with modifications.

Results: SPION@pheo showed up a greater transverse relaxivity r_2 (218 $mM^{-1}s^{-1}$) than longitudinal relaxivity r_1 (1.6 $mM^{-1}s^{-1}$), where the negative T_2 contrast enhancement (R_2 = 136) for MRI is featured. And concerning to the conjugation of the drug methotrexate on SPION@PGlCLCys, the enzymatic release assay at lysosomal pH showed that protease cleaves approximately ~38% of the amide bonds within 24 h, and ~45% in 72 h.

Conclusion: It can be concluded that this novel class of SPIONs using pheomelanin has significant potential as a high-performance agent for negative T_2 contrast for breast cancer investigation using MRI as a non-invasive diagnosis tool. On the other hand, the results obtained using the PGlCLCys can be seen as the first step for the development of a promising nanoplatform that can be easily modified and improved for future applications in less aggressive cancer treatments, allying targeting of tumor cells, controlled drug delivery, hyperthermia, and eventually diagnosis (theranostics).

Biography

Alexandre is a Physicist and has his expertise in Nanochemistry including methods of synthesis of SPIONs and studies of development of research of new biomaterials as coating in differents approach at aqueous medium involving co-precipitation, thermal decomposition, solvothermal and hydrothermal.

NANO-SPECTROSCOPIC APPROACHES TO CHEMICAL EVOLUTION AND ORIGIN OF LIFE

Masahiko Hara[1-3]

[1]*Tokyo Institute of Technology, Japan*
[2]*RWTH Aachen University, Germany*
[3]*Kumamoto University, Japan*

Abstract

Background: The origin of life, though it remains a mystery, is believed to have been chemical reactions at mineral surfaces on the earth during the Hadean period. Although there have been many proposals and preliminary experiments on this topic, no definitive origin has been reported yet because of a lack of nanoscopic studies.

Objective: We present the first material surface observations intended to elucidate the origin of life at the molecular level.

Methods: Observations were made using a combination of novel techniques, specifically, Raman spectroscopy imaging and single-molecule force studies by atomic force microscopy (AFM).

Results: Pyrite (FeS_2) is known to be one of the most common minerals that can provide condensation and reaction surfaces for chemical evolution. However, this mineral has mostly been studied from a crystallographic viewpoint or in bulk systems, and such investigations cannot fully resolve the exact mechanisms of the specific interactions that occur on this mineral. Moreover, no direct experimental evidence has been reported regarding pyrite initiating chemical evolution at the nano-scale when it is used as a reaction surface. In this study, the quantitative force analysis performed by using AFM, in which the residue of a single amino acid was mounted on AFM tips, enabled us to locate the reaction sites and to study the interaction forces between the amino acid and the pyrite surface.

Conclusion: Our Raman spectroscopy and AFM results revealed for the first time that defective areas, with the molecular composition FeS_{2-x}, increase the adsorption probabilities of amino acid residues in chemical reactions on the surface of pyrite.

Biography

Masahiko Hara was born in Tokyo, Japan. He received Doctor of Engineering in 1988 from Tokyo Tech. In 1985, he became Research Scientist at RIKEN, and has served as PIs of international projects including RIKEN-HYU Collaboration Research Center in Seoul, Korea. In 2003, he became Professor at Tokyo Tech and worked for Earth-Life Science Institute. He is currently Senior Fellow at RWTH Aachen University, Tokyo Tech Research Fellow, and Visiting Researcher at University of the Arts London. He has been engaged in nanotechnology and self-assembly in materials science for many years, pioneering new perspectives and interdisciplinary research transcending different fields.

SELF-ASSEMBLED ORGANIC OPTICAL WAVEGUIDES

Amir Handelman

Faculty of Electrical Engineering, Holon Institute of Technology, Israel

Abstract

Background: In recent years, organic materials have been used in many photonic applications (light source, optical modulators, etc.) thanks to their superior properties such as chemical versatility, biocompatibility, and broad spectral tunability.

Objective: To investigate the optical properties of the polar amino acid L-Histidine (His) and to construct optical waveguide from self-assembled His microstructure.

Methods: The optical properties of L-Histidine are investigated by methods like spectrophotometer, Spectrofluorometer, FTIR and Raman Spectroscopy. A custom optical setup was built in order to examine the waveguiding capabilities of His microstructures and measure their polarization response. The theory of Generalized Jones Matrix for biaxial crystals was used to estimate the linear birefringence of His microplate.

Results: Passive waveguiding capability is demonstrated in His microstructures. The linear birefringence of Histidine is estimated. Visible fluorescence in heated Histidine microplates is shown. Application of optical switching using Histidine microplates is shown.

Conclusion: His microstructures can be used as a self-assembled organic optical waveguide. The findings reported here may pave the way for utilization of self-assembled amino acids microstructures in biosensors and interconnects in many bio-photonic applications.

Biography

Amir Handelman received his BSc, MSc and PhD degrees in Electrical Engineering in 2008, 2011 and 2014, respectively, all from Tel-Aviv University, Israel. In 2014, Amir joined the faculty of Electrical Engineering in Holon Institute of Technology (HIT) as a tenure-track faculty member and established there the Applied Optics and Machine Vision Lab. In addition to his academic background, Amir has over 10 years' experience in computer vision and optics, which he gained during his works in several Hi-Tech companies. He's research interests are optic sensors, organic photonics, nonlinear optics, free-space optical communication, waveguide structures, AIphotonics, medical instruments, computer vision and machine learning and optical materials.

APTAMER TARGET CHAIN REACTION (ATCR) FOR SMART THERAPEUTIC INHIBITOR DEVELOPMENT

Hung-Wing Li, Ka-Wang Wong, Zefeng Wang and Dinggeng He

The Chinese University of Hong Kong, Hong Kong

Abstract

Background: Maintaining the physiological concentrations of biomolecules is a key to human health. Traditional drugs rely on dosages to inhibit overexpressed pathological targets. However, misdosing of drugs can cause severe side effects. A study has identified that 42% of adverse drug events (ADEs) leading to patient hospitalization was due to misdosing. Over bleeding is a major side effect in patients undergoing anticoagulant treatment for excessive clotting disorders, such as thrombosis and atrial fibrillation. Particularly, intracranial hemorrhage (ICH) can risk an individual with a mortality rate of 65%.

Objective: To develop a smart DNA-based anticoagulant with high efficacy but no side effect.

Methods: We first developed an aptamer target chain reaction (ATCR), which relies on a bivalent aptamer (HDTB-2) engineered with a sufficiently short spacer to continuously bind the target molecules, subsequently forming an aptamer target chain (ATC). ATCR is a universal, size-tunable, highly controllable, isothermal, self-assembly, and enzyme-free method for biomaterial formation. Through selecting aptamers with appropriate binding affinities, HDTB-2 inhibits target molecules only at the upregulated level and keeps it free at a healthy level to minimize the side effects due to misdosing.

Results: The design is applied as a smart anticoagulant, which exhibited stronger protection against misdosing and inhibition effects than commercial anticoagulants. The efficacy and exceptional side effect management capability were further validated by a series of in-vitro and in-vivo experiments.

Conclusion: To the best of our knowledge, this is the first report of a universal, non-covalently linked nucleic acid-biomolecule chain self-assembly method and a drug development technology that equips active pharmaceutical ingredients (API) with self-regulatory capability for smart management of the side effects.

Biography

Hung-Wing Li group focuses on the development of new (nano)-materials and tools that couples with highly sensitive laser-based detection techniques for advancing biomedical imaging, particularly in areas of: (i) imaging the biomarkers for early disease diagnosis; (ii) single cell and single extracellular vesicles imaging; and (iii) high resolution imaging therapeutics. The success of this aim certainly brings a new vista and new scientific knowledge as well as high impact on the development of detection tool, medical diagnosis and novel drugs for cancers and neurodegenerative related diseases.

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

THE EFFECTS OF FLAME RETARDANT MATERIALS ON THE OPTIMAL DESIGN OF RECTANGULAR SANDWICH PLATES USING THE FIREFLY OPTIMIZATION ALGORITHM

Saeed Kamarian and Jung-il Song

Changwon National University, South Korea

Abstract

The present work examines the effects of flame retardant (FR) additives on the optimal design of rectangular sandwich plates under compressive loads. The structure is made of flax fabric (FF)/vinyl ester (VE) composite face sheets and VE honeycomb core with three FR additives, including ammonium polyphosphate (APP), halloysite nanotube (HNT), and magnesium hydroxide (MH). The optimal FR combinations for the face sheets and core are considered as [6% 3% 3%] and [1% 0.5% 0%], respectively, based on previous research by the authors. Having the compressive properties of the materials used in the face sheets and core, the optimal design of the sandwich structure is investigated for minimum weight. The optimization variables include the face sheet thickness, core thickness, honeycomb cell size, and honeycomb cell wall thickness. Additionally, different failure modes such as face sheet dimpling, face sheet wrinkling, core shear instability, face sheet failure, and the fundamental natural frequency are considered as design constraints. Among these constraints, the fundamental natural frequencies are obtained based on first-order shear deformation theory (FSDT) using the generalized differential quadrature (GDQ) method, while the other constraints are approximated using available closed-form relationships. A biologically-inspired meta-heuristic algorithm called firefly algorithm (FA) that solves optimization problems without using gradient-based information on the objective functions and the constraints is implemented. The effects of FR additives on the optimum geometry parameters are studied for different length to width ratios, boundary conditions, and compressive load amplitudes. It is found that by choosing proper combinations of APP, HNT, and MH, both flammability and weight of the sandwich structure decrease.

Background: With the growing global awareness and concerns regarding environmental pollutants, as well as the excessive production of nonrenewable petroleum-based products, there has been a significant increase in attention towards the utilization of natural fiber-reinforced composites (NFRCs). However, despite the exceptional properties of flax fibers, their application in composite structures can pose challenges, particularly due to their low flame resistance. To address this issue, Kandare et al. conducted a study on the fire retardancy of eco-friendly sandwich components consisting of balsa core and flax reinforced epoxy face sheets. Prabhakaran et al. extensively examined the thermal conductivity, thermal expansion, flammability, and thermal stability of environmentally-friendly cork/flax/epoxy sandwich structures. Manobala et al. compared the thermomechanical behavior of four types of sandwich panels derived from a combination of flax-reinforced face sheets, glassreinforced face sheets, coir cores, and polyurethane cores.

Honeycomb sandwich structures have gained widespread applications in various industries such as aerospace, automotive, railway, marine, and civil due to their high efficiency. Consequently, numerous studies have focused on optimizing the physical, mechanical, and thermal properties of honeycomb structures for different purposes such as weight reduction, deflection control, impact resistance en-

hancement, and sound transmission loss improvement.

Objective: The objective of this study is to investigate the synergistic effects of APP, HNT, and MH additives on the optimal design of rectangular sandwich panels. The panels consist of FF/VE composite face sheets and VE honeycomb cores. The focus is on weight minimization of FR honeycomb sandwich plates under compressive loads using FA, considering various failure modes such as face sheet dimpling, face sheet wrinkling, core shear instability, face sheet failure, and the fundamental natural frequency.

Methods: To address the optimization problem, FA as a powerful metaheuristic optimization algorithm is employed. The natural frequencies of the structure are determined based on FSDT using GDQ method. Other constraints are predicted using available closed-form relationships.

Results: The optimal designs for sandwich plates under different boundary conditions and compressive loads ranging from 50 to 500 N are obtained. Depending on the applied compressive load and the required natural frequency, the use of FR additives may result in a significant decrease in the weight of the structure.

Conclusion: Optimal combinations of FR additives can enhance both the compressive modulus and strength of FF/VE composite face sheets and VE honeycomb core. FA proves to be a powerful metaheuristic optimization algorithm capable of accurately predicting optimum solutions for engineering optimization problems, particularly for weight minimization of honeycomb sandwich plates. It also significantly reduces the CPU time and computational costs during the optimization process. By utilizing appropriate amounts of APP, HNT, and MH additives, it is possible to design sandwich panels with improved flame resistance and reduced weight.

Biography

Saeed Kamarian obtained his doctoral degree in mechanical engineering with a specialization in solid mechanics. In 2019, he joined the Center of Advanced Materials Research (CAMR) at Changwon National University (CWNU) as a research professor, and continued his research in various areas.

CRYSTALLIZATION OF NANOSTRUCTURED EXPLOSIVE MIXTURES INTO CORE-SHELL USING SPRAY FLASH EVAPORATION (SFE) AND MECHANISTIC STUDY FOR NANODIAMONDS SYNTHESIS

Maxence Vince, Denis Spitzer and Guillaume Thomas

Nanomatériaux pour les Systèmes Sous Sollicitations Extrêmes (NS3E), UMR 3208 ISL/CNRS/UNISTRA, French-German Research Institute of Saint-Louis, France

Abstract

Research on the synthesis of nanodiamonds by detonation of hexolite (RDX/TNT) began in the USSR in the 1960s and later developed in other countries. The unique properties of nanodiamonds, such as biocompatibility, thermal conductivity, surface chemistry, and hardness, make them a sought-after material for numerous applications, such as medicine, sensors, and optical imaging. Studies have shown that the use of nanoscale explosives allows for the production of smaller nanodiamonds than with microscale explosives. Moreover, it has also been demonstrated that a core-shell structuring of hexolite leads to finer nanodiamonds. This is precisely what the SFE process, patented by NS3E, allows for.

The objective of this work is to shape nanostructured RDX@TNT mixtures into core-shell particles using the Spray Flash Evaporation (SFE) process. The mechanistic study aims at a better understanding and fine control of the crystallization process to ultimately synthesize nanodiamonds by detonation. SFE is a continuous crystallization process consisting of injecting a pressurized and overheated solution through a hollow nozzle into a vacuum chamber. For this case, RDX and TNT are dissolved in acetone. When flash conditions are reached, an ultra-fast evaporation of the droplets induces the crystallization of sub-micrometer particles. In parallel, in-situ measurements of droplet sizes and velocities at different positions in the reaction chamber are ensured by Particle Dynamic Particle Analysis (PDPA) using Dantec Dynamics Flow Explorer. The solvent temperature, injection pressure, solute concentration, and pump suction capacity have been investigated. The droplet size can be directly correlated to crystal size. Smaller droplet sizes and faster evaporation rates have led to smaller crystal sizes.

Biography

Maxence Vince since joining the French-German Research Institute of Saint-Louis (ISL) as a PhD Student, Maxence has been involved with studies related to the Spray Flash Evaporation Process, and more particularly to its mechanism comprehension. He was formed to analyze nanostructured explosive by AFM-TERS and he is currently preparing a study on the nanodiamonds synthesis by detonation. Prior to this, he completed a master's degree in advanced materials chemistry in Bordeaux, France.

NANO-REINFORCED HEATING ELEMENT FOR DE-ICING APPLICATIONS

Konstantina Zafeiropoulou, Christina Kostagiannakopoulou, Iakovos Delasoudas, George Sotiriadis, Stavros Tsantzalis and Vassilis Kostopoulos

University of Patras, Greece

Abstract

Background: During cold and cloudy conditions, the formation of ice on aerodynamic surfaces can result in reduced efficiency or even loss of flight control. The accumulation of snow and ice on aircraft wings cause their surface roughness or shape modification resulting in the disruption of the smooth air flow which can lead in severe degradation in lift and loss of aircraft control. So far, the embedded systems used towards this direction are generally bulky, heavy, and too costly. During the last years, composite materials are rising as a good candidate for replacing the above protection systems, made from conventional aircraft materials, due to their higher values of specific properties and multifunctional possibilities.

Objective: The design of nano-modified thin films with high electrical and thermal conductivity to be used as heating layers in advanced aircraft de-icing systems. Considering that such multifunctional layers can be an integral part of aeronautical panels, an additional second key purpose of this study was the development of electrically and thermally conductive nano-reinforced Carbon Fiber Reinforced Polymers (CFRPs).

Methods: Hybrid material concepts combining the advantages of Graphene NanoPlatelets (GNPs) and Carbon NanoTubes (CNTs) were developed. These were used to produce flexible nano-modified films thus contributing to advancement of multifunctional composites. Surface resistance of the films was measured using a high precision digital multimeter. To characterize the electro-thermal performance of the materials using the Joule Heating method, all measurements were conducted using a direct current setup. The distribution of the temperature was monitored using an IR thermal camera system.

Results: The findings reveal that the electrical conductivity of the nano-modified film exceeded 1500 S/m. Furthermore, the temperature rise of the CFRP's outer layer was sufficient for de-icing.

Conclusion: Incorporating the conductive film into the CFRP structure led to the development of an efficient electrothermal component with de-icing functionality.

Biography

Konstantina Zafeiropoulou is a PhD Candidate at the Applied Mechanics Laboratory, University of Patras, Greece. Her research activities lie in the area of nano-modified multi-functional composite materials, and specifically in the doping of polymers and fiber reinforced polymers with graphene nano-species for developing structural composites with improved damage tolerance and multi-functionality potential (thermal and electrical properties). This research is based on a project GBMinAIRS (Graphene Based composite Materials in AIRframe Structures). The selection of the appropriate nanofillers to be incorporated in the proposed structure has emerged after a lot of research and experimental characterization.

IMPACTS OF MORPHOLOGICAL NANOMATERIALS' PARAMETERS ON IN VITRO BIOASSAYS

Paulo Cesar De Morais

Catholic University of Brasília, Brazil

Abstract

This presentation will be focused on exploring mathematical models which are suitable to describe cargo-delivery using nanomaterials (NMs) while assessing information from in vitro assays. Presently, less than about 0.5% of the accumulated world's reports involving in vitro assays include a mathematical model, but this fraction is growing up steeply worldwide in recent years, signaling the recent trend in handling the biological data and the key role played by the extracted nanocytotoxicity parameters. The main stream driving the start of a mathematical model for in vitro assays is the Hill equation, herein described as Hill-inspired approaches, characterized by its newly interpreted Hill coefficient among other parameters. In this case, the morphological parameters of the NMs are included into the original Hill coefficient, which is interpreted as the number of ligand sites in the NM's surface which are available for binding to available receptors in the cell membrane. In this line, NMs' morphological characteristics, such as shape, typical mean size, and size dispersity should be properly included into the mathematical model via distribution functions. All these aspects will be introduced and comprehensively discussed in the present talk. The implications of the introduced nanocytotoxicity parameters will be also emphasized.

Biography

Paulo C. DE MORAIS, PhD, was full Professor of Physics at the University of Brasilia (UnB) – Brazil up to 2013, Appointed as UnB's Emeritus Professor (2014), Appointed as Guest Professor of Huazhong University of Science and Technology – China (2011), Visiting Professor at Huazhong University of Science and Technology (HUST) – China (2012-2015), Appointed as Distinguished Professor at Anhui University (AHU) – China (2016-2019), Appointed as Full Professor at Catholic University of Brasília (UCB) – Brazil (2018), Appointed as CNPq-1A Research Fellowship since 2010, 2007 Master Research Prize from UnB, 2008-member of the European ERA NET Nanoscience Committee, Member of the IEEE-Magnetic Society Technical Committee, Senior Member of the IEEE Society, 2012 China's 1000 Foreign Expert Recipient, and 2012 Academic Excellence Award from Brazilian Professor's Union. He held two-years (1987-1988) post-doc position with Bell Communications Research – New Jersey, USA and received his Doctoral degree in Solid State Physics (1986) from the Federal University of Minas Gerais – Brazil. He graduated in both Chemistry (1976) and Physics (1977) at UnB. Professor Morais is member of the Brazilian Physical Society and the Institute of Electrical and Electronics Engineers – IEEE. He has served as referee for more than 50 technical journals, takes part of the Editorial Board of more than 15 technical journals and has conducted research on nanomaterials for over 40 years. He has delivered more than 150 Invited Talks all over the World. He is known for his research in preparation, characterization and applications of nanosized materials (magnetic fluid, magnetoliposome, magnetic nanoemulsion, magnetic nanocapsule, magnetic nanofilm, magnetic nanocomposite, nanosized semiconductors, polymeric dots, carbon dots, and graphene quantum dots). With nearly 500 published papers in peer reviewed journals and 15 patents, he has appeared in recent World ranking of top 1% scientists, such as 2020-Stanford and 2022-Research.com.

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

EFFECT OF METAL MAGNETIC NANOPARTICLES AT DIFFERENT MAGNETIZATION CHARACTERISTICS ON ENHANCED OIL RECOVERY (EOR)

Farida Amrouche[1], Martin J Blunt[2], Stefan Iglauer[3], Farid Aiouache[1] and Basu Saha[1]

[1]*University of Lancaster, United Kingdom*
[2]*Imperial College London, United Kingdom*
[3]*Edith Cowan University, Australia*

Abstract

Background: Nanoparticles (NPs) are a diverse class of materials that comprise particulate substances of dimension typically less than 100 nm. Pure metal precursors are used, leading to special optoelectrical properties because of their well-known LSPR (localised surface plasmon resonance) features.

Objective: The work examines the efficiency of metal NPs under a magnetic field on oil production.

Methods: A range of NPs precursors, including iron oxide, Fe_2O_3 (0.02 wt%, and alumina, Al_2O_3 (0.1 wt%) were added and followed by the introduction of a magnetic field (MF) of 6,000 G strength. The NPs were mixed in deionized water (DW) and then subjected to the MF when they were introduced in a chalk sample.

Results: The selected NPs performed better when they were mixed in the DW by increasing oil recovery by 22.1% for Fe_2O_3 NPs, and 14.7 % for Al_2O_3. After adding an MF, the oil recovery increased by 2.9% for the Fe_2O_3 NPs and no increase was witnessed for the Al_2O_3 NPs.

Conclusions: The result of this work validates that Fe_2O_3 NPs, as superparamagnetic NPs, promote an interaction with an MF which helps in improving the mixing of the suspension, hence the better penetration into pore space and alteration of the physiochemical properties (contact angle, surface charge/zeta value, surface tension, and pH). However, Al_2O_3 NPs, as non-magnetic NPs, did not alter the oil recovery in the presence of the MF.

Biography

Farida Amrouche is a Senior Research Associate at Department of Engineering, University of Lancaster, United Kingdom. She had PhD in Chemical Engineering.

Day-2
Poster Presentations

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

ENCAPSULATION AND DELIVERY OF A FIVE-STEP BIOSYNTHESIS PATHWAY IN A POROUS METAL-ORGANIC FRAMEWORK

Ainur Sharip, Somayah Qutub, Raik Grunberg, Niveen Khashab and Stefan Arold

King Abdullah University of Science and Technology (KAUST), Saudi Arabia

Abstract

Background: Enzymes are essential tools for the "green" industry, research, and diagnostics, and are increasingly being considered for therapeutic applications. Many natural bioactive compounds require synthesis pathways consisting of three or more enzymes. However, the inherent low stability and lack of reusability of these biomolecules limit their application range. It has been observed that the immobilization of enzymes on solid supports or their encapsulation within structured materials can facilitate enzyme reuse and enhance their stability under harsh conditions.

Objective: To encapsulate a complete violacein biosynthesis pathway within Metal-organic frameworks(MOFs).

Methods: The Violacein biosynthesis pathway composes of five enzymes VioA, B, C, D, and E that together convert L-tryptophan to Violacein. These five enzymes of the violacein pathway are recombinantly expressed and purified from *E.Coli*. Violacein enzymatic reaction is performed by incubating these enzymes with substrate and cofactors, produced Violacein is quantified by HPLC-MS instrument. Enzymes were infiltrated within hierarchically etched MIL-101 (eMIL) metal-organic framework by incubation overnight under mild stirring. Upon successful encapsulation, the performance of the MOF-packaged violacein pathway is tested. Specifically, we looked at the thermostability, storage and re-usability of the enzymes-MOFcomposite.

Results: Here we demonstrate that the complete violacein biosynthesis pathway can be infiltrated into an eMIL. The resulting nanoreactors robustly produce violacein under a range of conditions and show high reusability. Moreover, the MIL-101 association permits the lyophilisation and long-term storage of the violacein production pathway. Moreover, we demonstrate the delivery of the complete multi-protein system into mammalian cells where it produces the violacein natural product from cell-provided substrates and cofactors. The eMIL pathway shows increased cytotoxicity within cancer cells compared to non-cancer cells, presumably due to the increased availability of the NADPH cofactor.

Conclusion: Our work demonstrates that eMIL can immobilize, stabilize, and deliver non-standard proteins of different sizes, surface charges, biological functions, and multimeric states. This paves the way for the design of "smart" stimuli-responsive multi-enzyme nanoreactors for biotechnological and medical applications.

Biography

Ainur Sharip is a PhD student at King Abdullah University of Science and Technology (KAUST), Saudi Arabia. She is originally from Kazakhstan, where She got my bachelor's degree in Biological Science at Nazarbayev University, Astana. She received Master's Degree in Bioscience from KAUST in 2018. During my Master's studies, She worked on the osteogenic differentiation of stem cells into bone cells using magnetic nanowires. Throughout my PhD studies, She explored several possibilities for the spatial immobilization of multi-enzyme pathways. Overall, Ainur Sharip interested in developing a technology platform for the rapid biosynthesis of high-value natural products using molecular, synthetic and structural biology techniques.

THE CHARACTERIZATION OF HYDROGEL CONTACT LENS WITH PYRIDINE GROUP MATERIALS

A-Young Sung, Seon-Young Park and Hae-In Park

Daegu Catholic University, South Korea

Abstract

Currently, as the proportion of users of hydrogel contact lenses increase, many ophthalmic diseases caused by infection of contact lenses are occurring. In this study, changes in the characteristics of contact lenses manufactured by adding various pyridine series characterized by antibacterial and UV protection functions to hydrogel and silicon hydrogel materials, respectively, were examined. Hydrogel contact lenses were manufactured using 2-Hydroxyethyl methacrylate [HEMA] and Ethylene glycol dimethacrylate [EGDMA], 2,2' -Azobis(2-methylpropionitrile) [AIBN] at 100°C, and silicone hydrogel contact lenses were manufactured using SIDAAA2 [SID], Ethylene glycol dimethacrylate [EGDMA], 2,2 ' -Azobis(2-methylpropionitrile) [AIBN], N,N-Dimethylacrylamide [DMA] at 130°C. As pyridine-based monomers, 2-Pyridinol 1-oxide, 3-Hydroxypyridine N-oxide, and 4-Pyridylcarbinol N-oxide were used, respectively.In the case of pyridine series was added to the hydrogel material, there was no significant change in physical properties such as refractive index and water content regardless of the type of pyridine. In the case of pyridine series was added to the silicon hydrogel material, the refractive index and UV protection were improved compared to the hydrogel material regardless of the type of pyridine. In particular, the lens with 3-Hydroxypyridine N-oxide had the highest refractive index and showed excellent UV blocking effects in the UV-A area. In addition, the materials, all series with pyridine showed antibacterial properties.The pyridine series used in this study improved the function of contact lenses, and can be used as a high refractive index contact lenses material with antibacterial and UV protection when added to silicon hydrogel materials.

Biography

Ayoung Seong is Professor at Department. of Optometry & Vision Science, Daegu Catholic University., 38430 South Korea. Ayoung Seong area of interest includes Photochemistry, ophthalmic optical equipment.

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

STABILIZATION OF WATER/SUPERCRITICAL CO_2 NANODISPERSIONS WITH HIGHLY-METHYLATED NONIONIC AMPHIPHILES AND ITS UTILIZATION FOR NANOPARTICLE SYNTHESIS

Hiroto Iizuka, Yudai Nitta, Julian Eastoe and Masanobu Sagisaka

Graduate School of Science and Technology, Hirosaki University, Japan

Abstract

Background: Supercritical CO_2 ($scCO_2$) has a variety of advantages for use as a solvent such as non-toxicity, non-flammability, inexpensiveness, and readily accessible critical point. However, it is a poor solvent for polar substances and this disadvantage limited its application. To overcome the limitation, a supercritical CO_2 solution having aqueous nanodroplets with surfactant reverse micelles, namely water-in-supercritical CO_2 nanodispersion, has attracted much attention. Since the nanodispersion can dissolve not only nonpolar materials but also polar ones, it can be applicable to a wide range of technologies such as nanomaterial synthesis.

Objective: This study aimed at developing CO_2-philic nonionic amphiphiles able to stabilize W/CO_2 nanodispersions (W/C-NDs) with a high water content. Synthesis of inorganic nanoparticles was also tested in the nanodispersions.

Methods: To develop amphiphiles soluble in $scCO_2$, trimethylsilyl (TMS) units as a CO_2-philic group were employed for the amphiphiles hydrophobic group. Formation of the W/C-NDs was confirmed by visual observation, FT-IR and SANS measurements. Ag nanoparticles were synthesized by mixing two W/C-NDs containing 8 mM silver nitrate and 32 mM citric acid solutions at 45°C, 350 bar, and amphiphile concentration of 80 mM. The resulting Ag particles were collected with water [**Figure 1**].

Results: W/C-NDs were successfully prepared with the amphiphiles with TMS groups. Using these W/C-NDs, silver particles were prepared and confirmed to have diameters of several tens of nm by SEM observation [**Figure 2**]. UV-visible absorption spectra and DLS measurement showed absorption with a peak top at 428 nm, and mean diameter of ~69 nm, respectively.

Conclusion: Formation of silver NPs synthesized in the W/CO_2 NDs. It implies that W/C-NDs can play a role as a nanoreactor without environmental-burden and any side effects in use of surfactant.

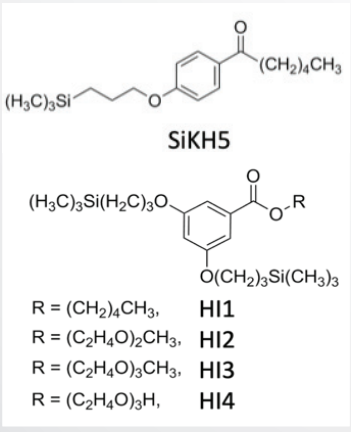


Figure 1: Structure of Amphiphiles.

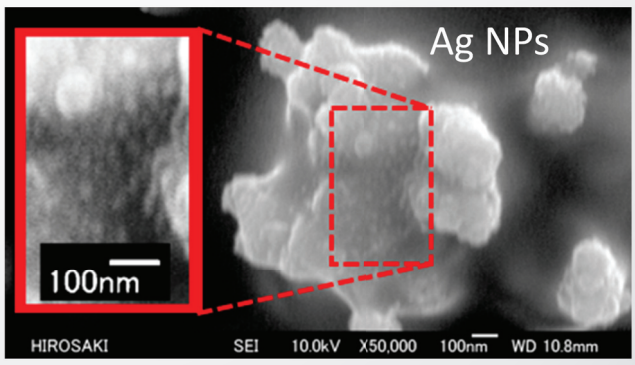


Figure 2: SEM image of Ag NPs prepared using W/C-NDs.

Biography

Hiroto Iizuka received a Bachelor of Engineering degree from Faculty of Science and Technology, Hirosaki University, Japan in March 2022. He is now a master course student of 2nd grade at Graduate School of Science and Technology, Hirosaki University, and has been studying W/C-NDs and its application under Prof. Masanobu Sagisaka. He has developed nonionic amphiphiles having TMS groups able to stabilize W/C-NDs and succeeded nanoparticle synthesis using it. He won poster presentation award at the conference of Japan Research Institute of Material Technology in December 2021, and student award at 2nd World Congress on Oleo Science, WCOS2022 in September 2022.

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

THE DESIGN OF A SELF-DISCHARGING FILTER: NANOTECHNOLOGY KNOW-HOW IN THE MARINE INDUSTRY

Nataliia Tiron-Vorobiova and Tanzer Satir

Danube Institute of National University "Odessa Maritime Academy", Ukraine

Abstract

Background: Great interest in our time is paid to the ballast water (BW) treatment system. Indeed, in the process of de-calibrating the vessel, the water from the tanks flows through the filters and is subjected to UV (ultraviolet) treatment only that does not comply with the BW under section D-2 (the Standard determining the quality of sea BW, i.e., the maximum number of viable organisms, which can be contained in BW) adopted in 2017 according to the IMO (International Maritime Organization) Convention. It must be admitted that the increased requirements for the cleaning of spent products lead to a rise in the cost of sea and river waterages, and the freight rate of a tonne of cargo is sharply increased. In this regard, today, the challenge is to improve the quality of treatment and reduce its cost.

Objective: This abstract proposes the consideration of key aspects of the nanotechnological approach to the design and technical solution of the BW management system, based on the DI NU 'OMA'.

Methods: The conditions for the implementation of the method of disinfection and purification of BW were found experimentally. The problem is solved by two inventions connected by an inventive concept. In the first invention, the task is solved by a method of disinfecting and cleaning BW, providing for the introduction of an oxidizing agent into it and subsequent treatment with ultraviolet radiation. In the second invention, the task is solved by the installation for disinfection and purification of BW, containing a ballast tank-tank connected to each other by technological pipelines for mixing the spent substance with an oxidizing agent, a device for processing the spent substance with ultraviolet light, and a fine filter, in which, unlike the prototype, it additionally contains a reagent dispenser, a coarse filter, a ballast pump, and a high-frequency electrohydraulic-shock block.

Results: Electrohydraulic shock leads to the destruction of invasions and pathogenic strains. A self-discharging filter with nanocarbon inserts allows screening of solid elements and microorganisms in isolated BW. The advantage of a self-discharging filter is that it provides a high level of destruction of invasions to the BW cleaning plant. Why is the design of a self-discharging filter for cleaning the BW optimal?

Conclusion: The answer is quite simple: increasing the size of filtering elements, we increase the throughput of the processed BW. Moreover, according to the research and development of nanotechnology, they are on the rise in pursuit of the original and useful things, and at the time when the take-off of factory production takes place, very little is being done to guarantee the safety to the society and the environment.

Biography

Nataliia Tiron-Vorobiova is a PhD in Technical Sciences, Docent of the Department of Management in the Transport Industry Nataliia Tiron-Vorobiova is a professional biotechnologist (former junior researcher in Problem Research Laboratory at the ONAFT, Odessa, Ukraine). At this stage of her scientific activity, she is actively interested in the issues of ecological aspects of conservation of the marine biocenosis despite its constant neutralization. Directly actively engaged in research work assigned to the Department of MTI and the Department of Ship's power plants and systems. Together with representatives of scientific DI NU "OMA" she began a large-scale scientific work on the disinfection / purification of the ballast water of marine vessels, including the effluent of regional enterprises - with the further introduction into production created on the basis of the Institute of BWTS (ballast water management system) in accordance with international the requirements of the quality standard D-2 IMO Convention at the national level of the state.

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

ACCELERATED ADSORPTION AND SURFACE TENSION REDUCTION OF SURFACTANT IN WATER BY HETEROGENEOUS HYDROPHOBIC CHAINS HAVING TMS AND T-BUTYL GROUPS

Hinata Komiyama, Yukio Hasegawa, Nina Kovalchuk, Mark Simmons, Julian Eastoe and Masanobu Sagisaka

Graduate School of Science and Technology, Hirosaki University, Japan

Abstract

Background: Fluorocarbon (FC) surfactants have various excellent properties like surface tension reducing abilities and repellencies for water and oil, and been used in many chemical industries so far. However, those are expensive and adverse effects on human body and environment.

Objective: This study aimed to develop low surface energy hydrocarbon (HC) surfactants inexpensive, safe, and able to replace FC surfactants.

Methods: Di-chain surfactants with low surface energy trimethylsilyl (TMS) or tert-butyl groups at the ends of hydrophobic chains were synthesized [**Figure 1**]. Static and dynamic surface tension measurements of aqueous surfactant solutions were conducted at 25°C, and provided critical micelle concentration (CMC), surface tension value at CMC (γ_{CMC}), minimum effective molecular are (A_{min}), and characteristic time τ (time required to reach a value halfway between the surface tension of pure water and the equilibrium surface tension).

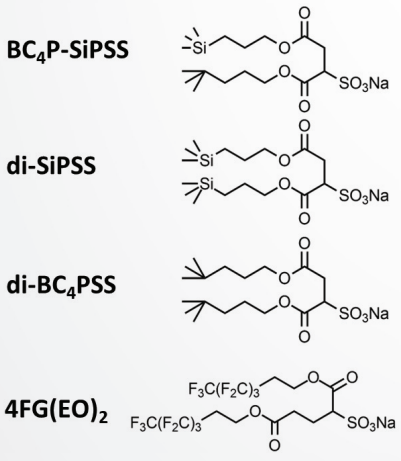


Figure 1: Structures of surfactants.

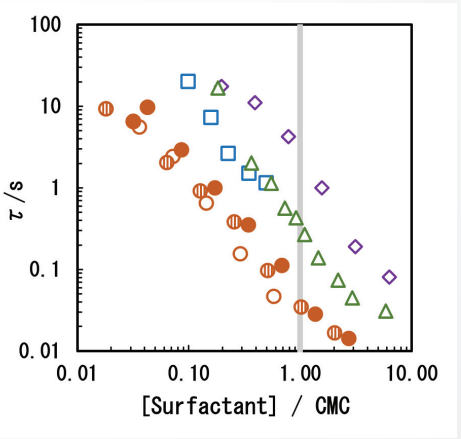


Figure 2: Relationship between surfactant concentration per each CMC and characteristic time τ of aqueous solution at 25°C.

Results: Figure 2 shows the relationship between surfactant concentration per each CMC and characteristic time τ. The hybrid-chain surfactant BC_4P-SiPSS having TMS- and t-butyl terminated chains was found to have a high CMC value like those of corresponding double-chain surfactants (di-BC_4PSS and di-SiPSS). However, the characteristic time τ, in other words, surface tension reduction rate, of BC_4P-SiPSS was 10 times faster than those of double-chain surfactants. Exchanging Na counterion to divalent ones (Mg or Ca) did not affect very fast τ of BC_4P-SiPSS at same [surfactant]/CMC values. These results sug-

gest that adsorption rate of surfactant is accelerated by the hybrid chain structure with keeping a good solubility in water, and the effect remains even after replacing counterion.

Conclusion: The asymmetric hydrophobic chains having TMS and t-butyl groups is a key structure to accelerate adsorption and surface tension reduction of surfactant in water.

Biography

Hinata Komiyama received a Bachelor of Engineering degree from Faculty of Science and Technology, Hirosaki University, Japan in March 2022. She is now a master course student of 2nd grade at Graduate School of Science and Technology, Hirosaki University, and has been studying fluorine-free low surface energy surfactants under Prof. Masanobu Sagisaka. She won poster presentation award at the conference of Japan Research Institute of Material Technology in December 2021, and Best Poster Presentation Award at The 95th JSCM Anniversary Conference in October 2022.

POSITION-DEPENDENT OPTICAL ABSORPTION OF A HYDROGENIC-LIKE SYSTEM IN MESOSCOPIC COUPLED QUANTUM DOT-RING: ELECTRIC FIELD EFFECTS

Nicolás Hernández[1], R López[1], YA Suaza[2] and MR Fulla[1]

[1]*Universidad Nacional de Colombia Sede Medellín, Colombia*
[2]*Centro de Investigación CIENTIC, Institución Universitaria Pascual Bravo, Medellín – Colombia*

Abstract

Background: The droplet epitaxy (DE) growth technique has enabled the fabrication of quantum dots (QDs) with exotic geometries, which are of great interest for technological purposes. One is the coupled quantum dot-ring (CQDR) consisting of a QD surrounded by a quantum ring (QR). Its geometrical complexity and the possibility of confining few-particle systems raise the possibility of tuning its electro-optical properties. This versatility positions it as an interesting nanostructure for novel developments in optoelectronics.

Objective: Explore the effect of the impurity position on the optical absorption spectrum of a hydrogen-like system confined in a CQDR in the presence of an electric field

Methods: A height profile to emulate a realistic CQDR grown by the DE technique is proposed. Subsequently, using the effective mass approximation and the envelope function, the Hamiltonian of the system is formulated. This is solved with the framework of the adiabatic approximation, which reduces the three-dimensional Schrödinger equation to a two-dimensional eigenvalue problem. This simplified problem is numerically solved via the finite element method. Finally, with the eigenvalues and eigenfunctions, and using the compact density matrix formalism, the linear, nonlinear, and total optical absorption is calculated for transitions.

Results: The hydrogenic-like system exhibits an interesting optical absorption spectrum when the impurity is confined inside the QD. A red and blueshift are observed depending on the impurity position. Finally, the stark quantum confinement effect is observed if the electric field is perpendicularly applied to the impurity's vector position. Without the electric field, the system presents zero absorption. However, it becomes optically active if the electric field is applied.

Conclusion: The optical absorption spectrum is highly tunable in the infra-red range (4-20 meV), with the impurity position and the electric field. Higher optical activity is found when the impurity is located inside the QD. Also, when the applied electric field is perpendicular to the impurity's vector position, a modulated absorption by the electric field is found, which can be useful in optoelectronic devices.

Biography

Nicolás Hernández is currently a Ph.D. candidate in Science – Physics, at the Universidad Nacional de Colombia, Sede Medellín. With a great research interest in the study of the electronic and optical properties of semiconductor quantum dots, he has published several papers in international journals. He also works as a lead data scientist. Other research interest includes machine learning in low dimensional physics, Equilibrium statistical mechanics, Wigner functions applied to chaos theory, and open systems.

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

OPTICAL ABSORPTION CALCULATION OF A D_0 SYSTEM CONFINED IN SEMICONDUCTOR QUANTUM CAMELS

Ricardo A López-Doria[1], N Hernández[1], IE Rivera[2] and MR Fulla[1]

[1]*Escuela de Física, Universidad Nacional de Colombia Sede Medellín, Colombia*

[2]*Centro de Investigación CIENTIC, Institución Universitaria Pascual Bravo, Medellín – Colombia*

Abstract

Background: The new advances in the growth mechanisms of semiconductor heterojunctions have led to the fabrication of diverse and novel nanostructures with varied sizes and morphologies. For instance, Quantum Camels (QCs) are interesting semiconductor-based structures with a particular geometry that, to our knowledge, have been unnoticed and never theoretically studied by the scientific community. QCs can confine charge carriers in the three spatial dimensions, leading to quantized energy levels and a density of states similar to the actual atoms. This fact reveals potential applications for the QCs in fields like optoelectronics or quantum information systems.

Objective: Calculate the optical absorption of a D_0 system consisting of a shallow donor impurity that releases a conduction band electron into the nanostructure, confined in a realistic QC under external fields.

Methods: The interaction with a monochromatic light wave is modeled by solving in a perturbative scheme the Liouville-Von Neumann master equation for a two-level system with the inclusion of a phenomenological operator. For that purpose, the eigenstates of the system are first calculated under the effective mass and envelope function approximations, considering the presence of external electric, magnetic, temperature, and hydrostatic pressure fields. A realistic three-dimensional geometry is modeled by a proposed analytic function for the height profile of the QC, which is based on the experimental AFM images. The finite element method is used to solve the system' Hamiltonian.

Results: The energy eigenvalues are analyzed and discussed as a function of geometrical parameters and external probes. The linear, non-linear, and total absorption coefficients are plotted as a function of the incident photon energy for different values of the external fields.

Conclusion: The QC's geometry parameters and external fields are proven to affect the energy eigenvalues significantly and, consequentially, the absorption's peak position. Furthermore, the external probes affect the magnitude of the total absorption spectra maxima.

Biography

Ricardo A Lopez-Doria Ph. D. candidate from the National University of Colombia – Medellín campus. Throughout grad and undergrad studies, He have been focused on studying the fundamental properties of few-particle systems confined in semiconductor nanostructures such as quantum dots. He has published several papers in international journals. I'm interested in applying analytic and numerical methods to solve the Schrodinger equation. Currently, He works as a consultant for Wolfram Research as a physics application developer.

EGFR TARGETED CABAZITAXEL LOADED LIPID-BASED NANOCARRIER: A NEW INTERVENTION FOR THE MANAGEMENT OF THE BREAST CANCER

Charu Misra[1,2] and Muhammad Wahajuddin[1]

[1]Institute of Cancer Therapeutics, School of Pharmacy and Medical Sciences, University of Bradford, United Kingdom

[2]School of Chemical Sciences and Pharmacy, Central University of Rajasthan, India

Abstract

Introduction: Cabazitaxel (CBZ), a novel second-generation drug has been effectively used in the management of prostate cancer. Owing tremendous properties, researchers are now highly interested in exploring its potential for breast cancer treatment. Recent studies indicate that CBZ exhibits higher potency than Docetaxel, making it a compelling candidate for breast cancer therapy. However, CBZ faces several challenges, including low solubility, hypersensitivity, poor drug permeation, rapid plasma clearance, and fluid retention. To address these challenges and unlock CBZ's potential in breast cancer treatment, we developed EGFRtargeted chitosan-coated solid lipid nanoparticles as a delivery system for CBZ

Method: Solid lipid nanoparticles were prepared using the microemulsification method. The formulation was characterized using DLS studies and TEM. The prepared formulation was further tested against various cancer cell lines. Pharmcokinetics, biodistruction and invitro ananlysis was also carried out.

Result: The analysis of the developed nanoconjugate showed a conjugated efficacy of 78.7 ± 0.14% and drug loading of 69.6 ± 0.23%. Particle size and zeta potential was found to be 210 nm and -26 mV, repectively. Notably, the formulated nanoformulation demonstrated a higher drug release rate in pH 5.6 phosphate-buffered saline (PBS), with approximately 89.15% released in 48 hours, compared to 31.50% released in pH 7.4 PBS. *In vitro* cell viability studies on MCF-7 cells demonstrated the enhanced cytotoxic nature of the developed nanoconjugate compared to the plain drug. Moreover, hemolysis studies revealed the blood-compatible nature of the nanoconjugate, indicating its safety for intravenous administration. Pharmacokinetic studies showed that the developed system offered higher bioavailability and decreased drug clearance from the system compared to the plain drug. Furthermore, antitumor studies demonstrated the enhanced efficacy of the developed system, in line with the results obtained from the in vitro studies.

Conclusion: EGFR targeted chitosan-coated solid lipid nanoparticles loaded with CBZ show great promise as a potential therapeutic approach for breast cancer.

Biography

Charu Misra Ph.D scholar from University of Bradford. She has specialized skill in the field of nanotechnology-based drug delivery systems and drug conjugates tailored for the treatment of breast cancer. Her research is centered around the development of innovative nanoformulations, with the primary objective of augmenting both safety and effectiveness of anticancer agents. A significant aspects of her work involves investigating the potential of solid lipids with focus on comprehending their impact of pharmokinetics, pharmacodynamics and overall safety profiles. Her work was recognized and funded by Commonwealth Scholarship Commission. Researcher has contributed significantly to the scientific community through rang of publications.

PLASMONIC METASURFACES FABRICATED BY NANO-IMPRINTING LITHOGRAPHY AND THEIR OPTICAL APPLICATIONS

Bo-Wei Hua and Yung-Chun Lee

National Cheng Kung University, Taiwan

Abstract

Background: Metasurfaces, which stem from metamaterials, have shown great potential for advanced optic and optoelectronic applications in emerging high-tech devices. However, the feature sizes of nano-structures are typically around 100 nm or less, making them challenging to manufacture.

Objective: Nano-imprinting lithography (NIL) is a powerful tool for mass-producing nanostructures with the benefits of large patterning areas, high throughput, and low cost. A new type of NIL system and imprinting methods were developed to meet the requirements for fabricating metasurfaces.

Methods: Efforts have been focused on improving the NIL system and its processes to meet the required high aspect ratio on the fabricated metallic nano-structures. It also involves design, simulation, and optical measurement on the optical performance of the proposed metasurfaces.

Results: The targeted metasurface is a tri-layered plasmonic system composed of two orthogonally oriented metallic nano-wire gratings sandwiching a layer of metallic nano-antennas, with two dielectric layers made of spin-on-glass in between the three layers of metallic nano-structures. Three different designs were proposed in this tri-layered plasmonic metasurface with function as half-wave plates, optical beam refractors, and metalenses..

Conclusion: We developed an innovative nano-imprinting method which can successfully fabricate plasmonic metasurfaces which demonstrate good optical performance as being designed.

Biography

Yung-Chun Lee received the Ph.D. degree in Theoretical and Applied Mechanics from Northwestern University, USA, in 1994. From 1994 to 1996, he was a post-doctoral researcher at the Department of Engineering and Applied Physics, Cornel University, USA. After working in industry for one year, he joined the Mechanical Engineering Department, National Cheng Kung University, Tainan, Taiwan, in 1997 and is now a distinguished professor at the same institute. He was awarded twice (2017, 2020) the Outstanding Research Award from the Ministry of Science and Technology (MOST), Taiwan.

DESIGNING AND CHARACTERIZATION OF ANTIBODY AND FAB FRAGMENT CONJUGATED NIOSOMAL NANOPARTICLES

Nilufer Cakir, Capan Yilmaz, Karabicak Dilan, Akgun Sibel and Mustafaoglu Nur

Sabanci University, Turkey

Abstract

Background: Glioblastoma multiforme (GBM) is a highly aggressive brain tumor with a poor prognosis. The current treatment options have limited efficacy due to the blood-brain barrier (BBB) and tumor heterogeneity. Targeted cancer therapy, such as monoclonal antibodies, has emerged as a promising approach for the treatment of GBM. However, the limited interaction between the tumor and the administered dose is a major limitation of this therapy.

Objective: To overcome these limitations, we have developed antibody-conjugated (α-Nio) or Fab fragment conjugated (Fab-Nio) niosomal nanoparticles (α-Nio) as a targeted drug delivery system for GBM treatment.

Methods: In this study, we aimed to conjugate Bevacizumab, a mAb that targets vascular endothelial growth factor (VEGF), to niosomal nanocarriers using two different conjugation strategies, UV-NBS and EDC/NHS. Niosomes were chosen as they are more stable and bioavailable than liposomes. The physicochemical properties of the niosomes were characterized, and the antigen-binding efficacy of the conjugated Bevacizumab candidates was tested via in vitro analyses. UV-NBS and EDC/NHS conjugation strategies were used to achieve site-specific and randomized conjugation of antibodies onto niosomal nanoshuttles, respectively.

The performances of biosimilar Bevacizumab and Bevacizumab antigen binding fragments were compared in healthy (HUVEC) and cancer (U-87) cell lines. The UV-NBS conjugation strategy involved using tryptamine as the conjugation agent to achieve site-specific conjugation of antibodies onto niosomal nanoshuttles without affecting antigen-binding efficacy. The EDC/NHS conjugation strategy involved the random conjugation of antibodies onto palmitic acid-loaded niosomal nanoshuttles. The physicochemical properties of the niosomes were controlled and set to certain ranges, and the conjugated Bevacizumab biosimilar performance equivalence was verified with the original Bevacizumab to confirm the obtained efficacyresults.

Results: The α-Nio and Fab-Nio formulations were tested with various in vitro testing, and the obtained results demonstrated that some UV-NBS Fab conjugated niosomes were highly effective than the original and biosimilar product in U-87 cell lines, with the highest dosage of 0.015 mg. Interestingly, Fab-nio formulations demonstrated advanced efficacy even though they were using EDC/NHS chemistry which results with random conjugation of antibodies on nanoparticle surfaces.

Conclusion: The study's two conjugation strategies of Bevacizumab to niosomal carriers provided a wide aspect of physicochemical characterization for niosomes. The obtained results demonstrated the potential of using α-Nio and Fab-Nio as a targeted drug delivery system for GBM treatment. Further studies are needed to evaluate the stability and clearance performance of the conjugated α-Nio nanocarriers *in vivo*.

Biography

Mustafaoglu academic journey was started by Notre Dame University for the Ph.D. degree and marked by a commitment to excellence and innovation at Wyss Institute, Harvard University as a postdoctoral fellow. Currently, Assistant Professor Nur Mustafaoglu is a distinguished academic and researcher in the fields of Molecular Biology, Genetics, and Bioengineering at Sabanci University. With a passion for nanobiotechnology, antibodies, immobilized antibodies, nanoparticles, organ-on-a-chip models, and BBB-specific drug delivery strategies, she has made significant contributions to the academic era. As an educator, Dr. Mustafaoglu has enriched the learning experiences of countless students. Through her engaging teaching methods and mentorship, she has positively influenced her students' academic and professional growth.

Day-2
Video Presentation

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

CHARACTERIZATION OF THE DIAMETER OF AERODYNAMIC DROPLETS GENERATED IN NEBULIZERS USING THE IMAGE PROCESSING TECHNIQUE

Luciana Martins Pereira de Araújo[1] and Walter Duarte de Araújo Filho[2]

[1]*Jorge Amado University (UNIJORGE), Brazil*
[2]*State University of Bahia, Brazil*

Abstract

Currently, most acute respiratory diseases, such as asthma and cystic fibrosis, are treated systemically. The use of nebulizers is increasingly used due to the ease with which they deliver the drug through an aerosol suspension, causing the drug to act locally in the respiratory tract, providing greater absorption efficiency. This study aims to characterize droplet diameters by bands of "breathable particles" generated in nebulizers, using image processing. In the nebulization procedure, the images of the dispersed aerodynamic droplets were captured using the ILD technique and then processed. Histograms of droplet diameter distribution were prepared, emphasizing the range with diameters between 1.0 and 5.0 µm, where the greatest absorption occurs. The results attested that each nebulizer has its own characteristic of delivering aerodynamic suspension in the nebulizing process. In this study, the ILD represents a viable alternative for the characterization of dispersed aero droplets, as it is low cost compared to other known techniques such as Laser Diffraction, Phase Doppler Anemometry (PDA) among others.

Biography

Luciana Martins Pereira de Araújo is a Professional with more than 20 years of experience in higher education, degree in Physics from the Federal University of Viçosa (UFV), specialization in physics teaching, master's degree in science from the Electrical Engineering and Industrial Informatics program - CPGEI from the Federal Technological University of Paraná (UTFPR), sub-area of Biomedical Engineering. He has a doctorate in science from UTFPR, with an emphasis on Biomedical Engineering, working mainly in education, public health, biomarkers, fluorescence, diagnosis, nanotechnology and applied physics. Currently, He is working as a Professor at Jorge Amado University Center.

Virtual Day-1
Keynote Presentation

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

SHAPE MEMORY EFFECT AND THERMOMECHANICAL REACTIONS IN SHAPE MEMORY ALLOYS

Osman Adiguzel

Firat University, Turkey

Abstract

Shape memory alloys take place in a class of advanced smart materials by giving stimulus response to changes in the external conditions. These alloys are adaptive structural materials and exhibit a peculiar property called shape memory effect, with the recoverability of two shapes at different conditions. Shape memory effect is initiated with thermomechanical treatments on cooling and deformation and performed thermally on heating and cooling, with which shape of the material cycles between original and deformed shapes in reversible way. Therefore, this behavior can be called thermal memory or thermoelasticity. Deformation in low temperature condition is plastic deformation, with which strain energy is stored in the materials and released on heating by recovering the original shape. This phenomenon is governed by the thermomechanical and thermoresponsive transformations, thermal and stress induced martensitic transformations. Thermal induced martensitic transformations occur on cooling with cooperative movement of atoms in <110 > -type directions on a {110} - type plane of austenite matrix, by means of lattice invariant shear, along with lattice twinning reaction and ordered parent phase structures turn into the twinned martensite structures. The twinned structures turn into detwinned martensite structures by means of stress induced martensitic transformations with deformation. These alloys exhibit another property, called superelasticity, which is performed by mechanically stressing and releasing at a constant temperature at the parent phase region, and material recovers the original shape upon releasing, by exhibiting elastic material behavior. Superelasticity is performed in non-linear way, unlike normal elastic materials behavior, loading and releasing paths are different, and cycling loop refers to the energy dissipation. Superelasticity is also result of stress induced martensitic transformation, and the ordered parent phase structures turn into the detwinned martensite structures by stressing. However, lattice twinning and detwinning reactions play important role in martensitic transformations.

Copper based alloys exhibit this property in metastable beta-phase region. Lattice twinning and lattice invariant shear is not uniform in these alloys and cause the formation of complex layered structures. The layered structures can be described by different unit cells as 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice. The unit cell and periodicity are completed through 18 layers in direction z, in case of 18R martensitic structure in ternary copper-based shape memory alloys.

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

Biography

Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post- doctoral research scientist in 1986-1987, and studied were focused on shape memory effect in shape memory alloys. His academic life started following graduation by attending an assistant to Dicle University in January 1975. He became professor in 1996 at Firat University in Turkey, and retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He supervised 5 PhD- theses and 3 M. Sc- theses and published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international level with contribution. He served the program chair or conference chair/co-chair in some of these activities. Also, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Additionally, he joined over 120 online conferences in the same way in pandemic period of 2020-2022. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder.

Virtual Day-1
Oral Presentations

SOLID-STATE HYDROGEN STORAGE MATERIALS BASED ON NANOSTRUCTURED MAGNESIUM: SYNTHESIS AND PROPERTIES

Matoke Peter Mose

National Taiwan University of Science and Technology, Taiwan

Abstract

One of the ultimate solutions to carbon neutral energy is a hydrogen economy. A future hydrogen production method could be based on renewable energy sources, such as wind and solar power. Hydrogen storage is a basic need to be able to use this technology. This is because hydrogen as an energy carrier is in a gaseous state at ambient conditions, with a low energy density. The search for a hydrogen storage technology that is cost-effective and has high energy efficiency is therefore crucial. Since magnesium is abundant in the Earth's crust, its high hydrogen storage capacity (7.7 wt% for MgH_2) and affordable cost ($2-3/kg), magnesium-containing materials have high prospects for hydrogen storage. In recent decades, magnesium-containing materials have been investigated for on-board vehicle applications. The kinetics and thermodynamics of magnesium-containing materials are unsuitable for on-board development. In recent decades, interest in nanostructured materials has increased. The nanometre scale brings with it a host of new physical and chemical properties for materials. Many nanoprocessing techniques have been developed for the production of Mg materials at the nanoscale to improve sorption kinetics or change thermodynamics. By using high-energy ball milling (HEBM), we have synthesised Mg-based hydrogen storage materials that are nanostructured. Results indicate that HEBM produces different morphologies and microstructures, both of which affect size reduction. It is possible that size reduction could affect the thermodynamics and kinetics of sorption in Mg-based hydrogen storage materials.

Biography

Matoke Peter Mose completed his Master's degree at the National Taiwan University of Science and Technology, Taiwan. He is currently working as a PhD student at the same institution. He has published two papers in reputed journals and is keen to explore further opportunities in the nano and micro composite materials laboratory of the Department of Mechanical Engineering.

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

SYNTHESIS AND CHARACTERIZATION OF NON-TOXIC ORGANO-MODIFIED LAYERED DOUBLE HYDROXIDE AND CLAY NANOPLATELET-POLYETHYLENETEREPTHALATE NANOCOMPOSITES

Naveen Bunekar, Tsung-Yuan Tsai

Chung Yuan Christian University, USA

Abstract

Introduction: High gas barrier, transparent and non-toxic with recycling capable polymer nanocomposites are in increasing demand due to the need to develop easier recyclable food packaging technologies. Herein, we report a green synthesis and modification process used for layered double hydroxide (LDH) nanoplatelets and natural clay fillers. The effect of both the modifier on different nanoplates (nonpolar and polar) on the formation of uniform dispersed LDH and clay nanoplatelets was systematically studied. Modified LDH and clay nanosheet - polyethylene terephthalate (PET) composites synthesized by Insitu polymerization method. The gas barrier performance and optical properties of the modified LDH and Clay nanosheet- PET films were evaluated. We found that the PET composites retained excellent optical responses and exhibited a high gas barrier. This represents an gas barrier improvement factor (BIF) PET composites films of 3.

Background: In the past 20 years, organic-inorganic nanocomposites have been recognized as most promising materials that exhibit a variety of unique properties because of the synergies of the inorganic and organic components. LDHs are used here to develop catalysts without using any heavy metals. Poly(ethylene terephthalate), more commonly known as PET, is an indispensable material due to its excellent physical and chemical properties. It is an important material in the textile industry, and in food packaging where it has noticeably become the choice for beverage containers. The escalating production of PET today is, however, still leading to a global concern over the treatment of PET waste products and their destructive impact to the environment. PET does not create a direct hazard to the environment, but due to its substantial fraction by volume in the wastes stream and because it is a non-degradable material in normal conditions, it is seen as a noxious material.

Objective: PET-LDH or clay nanocomposites synthesized by insitu polymerization method without heavy metal catalyst, with increase polymer composites properties.

Methods: Experimentally, 34.65 g of 0.135 mol $Mg(NO_3)_2 \cdot 6H_2O$ and 25.38 g of 0.067 mol $Al(NO_3)_3.9H_2O$ were dissolved in 240 ml of deionized water to form a clear solution; the pH of the resulting solution was then maintained at 10 by adding 21.6 g of 0.54 mol 30 ml NaOH solution. This solution was rapidly agitated at room temperature for 2 min and then placed in a high-pressure autoclave to react at 100°C for 24 h to form LDH precipitation. The obtained precipitation were collected by centrifugation and washing with deionized water, followed by freeze-drying. The synthesized samples are designated as MgAl LDH-100°C. Synthesized LDHs and commercial MgAl LDH were calcined at 550°C for 24 h to produce magnesium–aluminum layered double oxide (LDO). After LDO is reconstructed and modified with DMSI both synthesized and commercial LDHs, dimethyl sulphoniatic acid salt (DMSI) (at 1.5 times the AEC of the magnesium–aluminum layered double hydroxide) was used as a modifier and dissolved in 50 ml of water to form a modifier aqueous solution. 10 g of magnesium–aluminum layered double oxide

was then slowly added to the modifier aqueous solution, which was then placed in a high-pressure autoclave to react at 100°C overnight with agitation to form MgAl LDH-DMSI precipitation. The precipitation was collected by centrifugation and then washed with deionized water, followed by freeze-drying.

Results: Synthesized LDHS and modified LDHs materials confirmed by XRD, SEM and FTIR analysis. From XRD the d-spacing of LDHs and modified LDHs has been increased it means that modifier is intercalated into the layers. further, it was confirmed by SEM and FTIR analysis. Insitu synthesized polymer-compsoites, particles dispersion, thermal stabilities, transmission and gas barrier evaluated by XRD, TGA, UV and GPA. The Thermal stability, and gas barrier properties has been improved. T% reattained as pure polymer, however with increase the concentration of nanoparticles the haziness increased T% decreased.

Conclusion: Here, we successfully report the *in-situ* polymerization of PET/LDH-DMSI and PET/CL120-PAHS nanocomposites using modified MgAl-LDH as a catalyst. The mechanism for the formation of PET/MgAl LDH-DMSI nanocomposites by the driving force concept is proposed. Furthermore, the physio-chemical properties have been investigated.

Biography

Naveen Bunekar is the CTO of BERKM Inc and postdoctoral fellow at Chung Yuan Christian University., before being named CTO in September 2021, Naveen worked as a senior researcher and was responsible for new business development including finding the new products and make research on it make cost effective products for BenQ materials corporation. Furthermore, he served as research adviser for Climb Co China based American company. Prior to joining Chung Yuan Christian University as PhD, Naveen was collaboration projects with various companies like as Mitsubishi chemicals, and DIC corporation, etc. During this time, he had been working and published over 28+ publications in (papers, reviews, patents and book chapters) reputed international journals. Also, presented his work in various national and international conference platforms. Also serving as a reviewer for several international journals like American Chemical Society (ACS) omega, Irian polymer journal and Polymer-Plastics Technology and Materials. Review editor for Frontiers in Environmental Chemistry (sorption technologies) and Frontier materials (Polymeric and composites materials). In addition, Dr. Naveen has serving as technical program committees and reviewer for the World Academy of Science, Engineering and Technology (WASET). His present research focus on nanomaterials polymer composites, recycle polymer for various industrial applications.

NOVEL GREEN SYNTHESIS OF PROPOLIS POLLEN NANO-EMULSION AND EVALUATION OF ITS PHYSICOCHEMICAL PROPERTIES AND CYTOTOXICITY

Dalia M. A. Elmasry[1] and Dina M. El-Shaarawy[2]

[1]Agricultural Research Center, Egypt
[2]Animal Health Research Institute,Agricultural Research Center, Egypt

Abstract

Background: Apitherapeutic products, such as propolis and bee pollen, are highly valued by practitioners of natural medicine due to their potential therapeutic and nutritional benefits. The green chemistry approach to the synthesis of nanoparticles provides a number of benefits, such as the scalability of the process, the possibility of economic viability, and the provision of a risk-free method for producing nanoparticles.

Objective: A unique kinetically stable colloidal dispersion with a size range of 10-100 nm may be created by replacing the aqueous phase with a non-aqueous polar phase that contains a modest quantity of oxygen. This process results in an anhydrous nanoemulsion.

Methods: With technological method preparation of nanoemulsion contain alcoholic extract of propolis and pollen creative as new nanoemulsion product for therapeutic characterized with physicochemical properties and its cytotoxicity

Results: The 20% propolis pollen nanoemulsion preparation results that TEM revealed that droplets size of 10.03± 0.7 nm with no aggregation, size homogeneity and spherical nature. The nanoemulsion, , viscosity, polydispersity index (PDI) and were, 0.8872, and 0.468 , respectively. After 72 h incubation, the results of viability % with different concentrations ranging (0.01, 0.1, 1,10, 100 ug/ml) were 102.94 ± 0.63 , 95.28 ± 2.79 , 93.16 ± 0.64 , 92.16 ± 0.51 , 1.31 ± 0.199 . Therefore IC50: > 23.19 ug/ml. LC–MS/MS analysis of nanoemulsion revealed common presence of phenolic compounds such as curcumadiol (11.5%), Methyl oleate (27.11%), Phenolic acids (3.39%), 10,12-Pentacosadiynoic acid (3.95%), Eupatorin (1.93%) and Quinindoline (1.57%).

Conclusion: The innovated nanoemulsion have bioactive phenolics and flavonoids compounds that have antimicrobial agent due to unique properties

Biography

Dalia is Associated prof., have experienced nanomaterials synthesis and application with a demonstrated history of working in the nanomaterials Research and synthesis unit, AHRI institute and active participation trainer in "Nanotechnology Application in Veterinary Field, since 2012. She developed this nanomaterial synthesis after years of research, evaluation and administration in the field and in researcher institutions.

Dalia is PI of STFA project of innovation grant 2021.Dalia is Skilled in chemical safety and security training program, Biosafety Laboratory and Quality Management. Also , visitor Researcher at the Nanobioelectronics & Biosensors Group, Catalan Institute of Nanoscience and Nanotechnology (ICN2), (Barcelona), Spain. Dalia is one of Judges for STEM school from 2016 till known in Egypt Dokki, Giza. Dalia had TOT- Certificate, 2012.she have many publication in nanotechnology research.

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

ENHANCED ANTI-INFLAMMATORY AND ULCEROGENICITY OF IBUPROFEN MICROSPHERE FORMULATIONS USING IRVINGIA WOMBOLU FAT (IRW) AND MORINGA OIL (MO) AS CO-LIPIDS

Thaddeus Harrison Gugu

University of Nigeria, Nigeria

Abstract

Ibuprofen is a member of the propionic acid class of nonsteroidal anti-inflammatory drugs (NSAIDs) with anti-inflammatory, analgesic, and antipyretic activities used to relieve a variety of pains. The objective of this study was to formulate, characterize and evaluate the in vitro and in vivo properties of ibuprofen formulated as solid lipid microspheres (SLMs) for enhanced delivery. The mixtures of Irvingia wombolu fat (IRW) and moringa oil (MO) each with Phospholipon® 90G (PL90G) at the ratio of 2:1 w/w were prepared by fusion, characterized and used to prepare SLMs. The SLMS were thereafter evaluated using the following parameters: particle size and morphology, stability, and encapsulation efficiency EE (%). In vitro release was carried out in phosphate buffer (pH 7.4). The ibuprofen-based SLMs were also evaluated for anti-inflammatory and anti-ulcer effects using animal models. The pH showed a significant increase after two months of formulation with a maximum value of 6.4 while the EE obtained were 95.6, 89.4 and 61.6 % for SLMs formulated with lipid matrix of Phospholipon® 90G (1% and 2%), and MO (1%) respectively. The in vitro release showed maximum release of 87.8 and 98.97 % of the two different lipid-based formulations while the anti-inflammatory effect was up to 89.90 % after 5 h of inducing inflammation. The SLMs did not show any lesion thus conferring gastroprotection on the formulations. The SLMs exhibited good anti-inflammatory properties with gastroprotective action.

Biography

Thaddeus Harrison Gugu is a laboratory Scientist and Pharmacist by training and a university lecturer by profession at University of Nigeria specialized on Pharmaceutical Microbiology and Biotechnology. Currently, my research is centered on microbial-based drug discovery and delivery for cancer and other tropical diseases. Expert in antimicrobial evaluations, Cell culture, Molecular biology and Drug delivery.

MULTIFUNCTIONAL HYDROGEL-BASED ELECTROLYTES FOR THERMOELECTROCHROMIC DEVICES

Valeria De Matteis[1], Alessandro Cannavale[2], Stefania Liuzzi[2], Ubaldo Ayr[2], Umberto Berardi[2] and Rosaria Rinaldi[1]

[1]*University of Salento, Italy*
[2]*University of Bari, Italy*

Abstract

In this study, we introduced a novel thermoelectrochromic device that incorporates a hydrogel-based electrolyte derived from cellulose, specifically hydroxypropyl cellulose (HPC). This electrolyte exhibits both thermochromic properties and efficient ion conduction under ambient conditions. Leveraging these characteristics, we developed an electrochromic layer comprising PEDOT:PSS to create a multifunctional device. This device capitalizes on the thermochromic properties of HCP, which becomes apparent when the critical temperature of 43°C is reached, resulting in a 37% increase in reflectance at 420 nm. Additionally, the device demonstrates significant transmittance modulation (52% at 650 nm) when a low external bias of 2.5 V is applied. Notably, this represents the first instance of a smart window design that combines HPC and PEDOT:PSS within a single device, showcasing a fully organic system suitable for diverse applications, ranging from construction to transportation.

Biography

Valeria De Matteis got her PhD in Biomolecular Nanotechnologies in 2014 at the Italian Institute of Technology (CBN-IIT). Since 2019, she is assistant professor at Department of Mathematics and Physics "Ennio De Giorgi" of University of Salento, Lecce (Italy) funded by "PON AIM-Attraction and International Mobility". From February to September 2020, she was visiting researcher at the Institute for Bioengineering of Catalonia (IBEC)-Barcelona (Spain). Her current research focuses on the synthesis of inorganic nanomaterials following their toxicological profile in vitro with a biophysical approach. In addition, she focused on the green routes to obtain plasmonic nanomaterials investigating their role on the inflammatory response and thermal treatment of cancer cell models. She is also engaged in teaching and training of undergraduates and graduate students at University of Salento (Italy).

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

ENGINEERING MICROPOROUS ORGANIC NANOSPHERES AS A DRUG CARRIER

Shumaila Razzaque

Institute of Physical Chemistry, Poland

Abstract

Porous organic polymers have gained enormous attention ascribed to their ease of synthesis, stability, wide applications and characteristic tunable porosities. Their high surface area and interconnected pores endows them with the promising potential as a storage chamber and aids in controlled release as desired. The microporosity is a key factor in maintaining the controlled and sustained release of the therapeutics. Additionally, the charming feature is ease of functionalization, enabling the application in biological system. Based on the properties of porous material, herein we had fabricated the hypercrosslinked polymer nanospheres by employing the Friedel crafts chemistry. The obtained structure was modified with the biological ligand (ssDNA) to enhance its bio-compatibility and water dispersion. In general, the Friedel crafts reaction is very fast and results in the random growth of the polymer network. In order to overcome this issue, the synthetic conditions were controlled by tuning the temperature and addition of monomers via dropwise method. Thus, the hypercrosslinked polymer obtained have a regular spherical nanospheres with a particle size distribution ca 240-280 nm. The obtained polymeric nanospheres have a positive potential as chemotherapeutic carrier and it's on demand release.

Background: Triple negative breast cancer is one of the leading types of cancer in women worldwide. The cure of this immortal disease is the extensive application of chemotherapeutic drugs which have more negative impact then cure. Therefore, the carriers are the dire need to maintain the controlled, sustained and targeted release of medicine at cancer site.

Objective: Targeted carrier for the chemotherapeutics.

Methods: The pores were tuned by the selection of crosslinking agent to obtain the microporous polymer nanospheres of desirable pore sizes. The model chemotherapeutic drug, was used to elucidate the characteristic properties of designed material in sustained release. Moreover, the biocompatibility of the designed microporous nanospheres could be increased via the functionalization of surface with the biological ligand such as ssDNA.

Results: The nanospheres obtained have the pores in the range of micro and mesopores. The pore size is quite good to encapsulate the Epirubicin. The fabricated nanospheres were tested in-vitro to see the release profile and anticipate its application.

Conclusion: The designed nanospheres have the small size, high surface area, rich surface chemistry and biocompatibility. These hypercrosslinked nanospheres can easily encapsulate the large amount of epirubicin and allows its targeted release.

Biography

Shumaila Razzaque is Assistant Professor at Institute of Physical Chemistry, PAN, since 2022. She received her PhD in 2017 from the Huazhong University of Science and Technology. She further her postdoctoral research in UK-Nano Energy Materials Research Centre (2018-2021). Her main research interests are development of polymeric materials, microporous polymers, nanocomposites and fabrication of metal nanoparticles for the adsorption, catalysis and drug carrier perspective.

SIMULATION OF LEAD-FREE PEROVSKITE MAGeI3 SOLAR CELL

Hasina Huq, Leonel Ibarra III and Shamik Datta

The University of Texas Rio Grande Valley, USA

Abstract

Perovskite materials has been highly attracted in recent years due to its photovoltaic properties and its promising application in many optoelectronic devices such as solar cells, light-emitting diodes, lasers, and many others. It has been reported that perovskite solar cells have reached a power conversation efficiency of up to 25%, which is similar to the widely used silicon based solar cells. Many of these perovskite solar cells have been manufactured using simple additive deposition techniques that can potentially cut cost in future large scale solar cells manufacturing. Although they have shown great potential in becoming the main material for next generation solar cell, there is many things still to be researched and many obstacles to overcome. A main concern is that perovskite solar cells have not shown the same durability and stability as silicon based solar cells. A method to solve this issue is to explore and test many of these perovskite materials with different configuration. We simulated an organic perovskite material, Methyl-ammonium germanium iodide (MAGeI3), in a p-i-n solar cell configuration using simulator SCAPS 1-D. Hole Transport Material Nickel Oxide (NiO) is used in every configuration and metal oxide materials Zinc oxide (ZnO), Titanium dioxide (TiO_2), and Tin dioxide (SnO_2) were alternately used for electron transport material. Thickness of perovskite MAGeI3 was varied from 0.1um to 1.2um and data Voc, current density, fill factor, and efficiency were collected and plotted. Results indicate that these configurations can obtain an efficiency of approximately 23% with configuration NiO, MAGeI3, and TiO having the most promising simulation results. Although these are only simulation results, the testing of these configurations can lead to an advancement in the understanding of perovskite solar cells.

Biography

Hasina F. Huq is Professor at The University of Texas Rio Grande Valley. Huq received her B.Sc. in Electrical Engineering from Bangladesh University of Engineering and Technology (BUET) and M.S. degree in Electrical Engineering from the Virginia Polytechnic Institute and State University (Virginia Tech). Dr. Huq got her Ph.D. in Electrical Engineering from the University of Tennessee, Knoxville. Her teaching and research interests include electronics, wide-bandgap semiconductor devices, biosensors, high temperature electronics and VLSI integrated circuits (IC) design. Her research work in these areas has been published widely in peer-reviewed journals as well as in conference proceedings.

DIELECTRIC BEHAVIOUR OF BLENDED MINERAL OIL WITH VEGETABLE ESTER CONTAINING TiO_2 NANOPARTICLES

Prabhat Kumar Maiti

Regional Testing Laboratory, India

Abstract

A transformer is an essential piece of an electric power network. Reliable and consistent operation of transformers largely rests on their insulating materials, which consist of paper and insulating liquid. Mineral oil is an extensively exploited dielectric liquid. However, their low biodegradability and projected scarcity elicited investigations into bio-esters as alternatives. Blended mineral oils with esters are emerging as improved liquid dielectrics. Nanofluids are also evolving as an impending substitute for traditionally used mineral oil. This work is proposed to investigate the applicability of blended mineral oils with vegetable esters and their TiO_2-based nanofluids. The oil specimens containing kraft paper and copper catalyst were also aged at elevated temperatures. The study includes various measurements such as AC breakdown voltage, volume resistivity, interfacial tension, viscosity, tan delta, pour point, etc. A significant improvement in ac breakdown was observed with certain blends, as evident from the Weibull probability distribution plot. The base fluids showed approximately the same pour point, whereas it was reduced significantly in blended nanofluids. In comparison to mineral oil, the interfacial tension in vegetable ester was significantly less. There was a very nominal reduction in interfacial tension for vegetable oil-based nanofluids, whereas it was noticeable in the case of nanofluids of mineral oil. The blended nanofluids exhibited approximately the same values of interfacial tension for all the studied ratios. UV-visible spectrophotometric analyses were conducted to estimate the extent of decay in the studied specimen. The experiment showed improved decay resistance in certain specific samples. Measurements of tan delta and resistivity indicated a relationship with the blending ratio of nanofluids. The study suggested the possibility of achieving a suitable ratio for better dielectric properties.

Introduction: The transformer is an electrical device that alters voltage and current without changing the frequency of the electric power. The major components of a transformer are the core, windings, and insulator. The insulator used in the transformer is classified as liquid and solid. During the operation of a transfonner, due to the core and copper loss, heat is generated. The liquid insulator used in transformers acts as a coolant to dissipate the heat generated inside the transformer and also works as an electrical insulator. Therefore, an efficient liquid insulator should have good cooling and insulating capacity. Mineral oil-based transformer oils have been used as liquid insulators for more than a century. However, using mineral oil has some disadvantages, including toxicity and fire risks. Eater oils with high bio-degradability, flash point, and high moisture tolerance are being considered as alternatives to mineral oil. Esters oil is mainly categoried into two varieties: synthetic ester (SE) and natural ester (NE). SES are / dyough esterification of carboxylic acids with desired carbon chains and alcohols. NES are a cifiQ)$6y of completely biodegradable liquid dielectrics that are manufactured from oils drawn

out from plants. These oils are soya beans, sunflower, palm, rapeseed, canola, rapeseed, and palm. NES are highly eco-friendly, and they undergo bio-degradation of about 97-99% in 21 days, as per the Coordinating European Council (CEC-L-33). They also release a much lower amount of toxic material than MOs.

Another significant benefit is the water solubility property. The water solubility of NE is 858 ppm at 20 0 C, which is 20 to 30 times higher than that of MO. So, it helps remove water from cellulosic materials. As a result, the life of solid insulation is extended. The water content of paper is about 0.1% to 1.0% in a new transformer. The amount of water in solid insulation increases with the service period, mainly as a byproduct of the degradation process of cellulose. Moisture content of solid insulation above 2% is considered wet and is prone to failure.

In order to mitigate the risk associated with MO-filled transformers, it becomes necessary to retrofill the existing transformers with NE. The quantity of MO that continues to exist in the transformer while retofilling could be anywhere between 5% and 20% of the liquid insulator's overall capacity throughout the removal procedure. The manufacturing criteria of the transformer control the amount of retained MO. Moreover, the MO retained in solid insulation may be released into liquid insulation during the post-retrofilling period. This process leads to a further change in the ratio of MO and NE in the liquid insulator. This process influences the physicochemical and electrical properties of liquids as well as solid insulators. Further, to improve viscosity, tan delta, specific resistance, oxidation stability, and compromised pricing, the study on MO and NE mixed oil is necessary. Due to these requirements, great attention is focused on studies of mixed MO and NE oils. It is reported to have improved dielectric properties when MO is mixed with 15% to 20% ester oil. In another study, it was established that a mixture of 15% vegetable oil and 85% MO served as excellent blending with respect to viscosity, resistivity, and charging current. The mixture of jatropha oilbased NE and MO has been reported to show higher AC and DC breakdown voltages compared to the individual oils. Exhaustive review articles published on studies of mixed MO with ester oil emphasized the relevance of these materials as alternative liquid dielectrics.

Nowadays, due to the development of nanotechnology in numerous applications, the impact of nanofillers is gaining major prominence in the improvement of dielectric materials.T. J. Lewis established the concept of nanodielectrics in 1994 with the objective of preparing solid insulators with the ability to tolerate high voltage. The initial focus of research was on producing solid nanocomposites, mainly polymer-based nanocomposites, for electrical insulation. The terminology of nanofluid (NF) was proposed by Choi in 1995 at Argonne National Laboratory, USA. The NF was prepared by dispersing metal power in a base fluid that exhibited superior thermal conductivity. The concept of liquid dielectrics was first introduced by Segal. The liquid dielectric, termed dielectric ferrofluid, was prepared by adding magnetic nanoparticles (NFs) to MO, which showed enhanced thermal performance and dielectric strength. Thereafter, numerous studies on NFs were reported by researchers in order to assess their thermal and dielectric properties. The NFs used to prepare liquid dielectrics are usually represented in three types, such as: 1. conductors (Fe_3O_4, Fe_2O_3, and SiC);2. semiconductors ($Ti0_2$, ZnO, CuO, and Cu_20); and 3. Insulators (AbO_3, SiO_2, and BN). Apart from these, a few other types of NPs are mentioned in the literature, such as metal, polymer, and lipid-based nanoparticles. Among the metal oxide NPs, Fe_30_4, TiO_2, AI_2O_3, and SiO_2 are widely studied. A larger amount of research has been published on the performance evaluation of MO-based NFs than that of NE-based NFs. The objectives of this investigation are to assess the capabilities of TiO_2 semiconducting NP in base fluids such as MO, NE, and MO-NE blended oils.

Biography

Prabhat Kumar Maiti is presently Joint Director and Unit Head, Central Power Research Institute (CPRI) Kolkata and CPRI Guwahati. He received the M.Sc. degree in Chemistry from IIT Kharagpur, M.Tech. degree in Corrosion Science and Engineering from IIT Bombay, and the Ph.D. degree in Boiler Corrosion Study from IIT Bombay. He has worked at the CPRI Bangalore for 10 years, 5 years at the CPRI Noida and 16 years at the CPRI Kolkata. He was the Project Leader for establishing CPRI Kolkata and CPRI Guwahati Laboratories. He has taken part in CPRI research projects on environmental assessment, coal and fly ash, and transformer oil as a group member sponsored by MoP (CPRI), MoE & F, ISRO, power plants, IOCL, and others. He has more than 30 years of experience and comprehensive technical knowledge in the testing and analysis of various materials, including water and air pollutants related to coal-fired thermal power plants, coal, fly ash, insulating oil, etc. At present, he is engaged in the condition monitoring activities of power transformers through the evaluation of liquid insulators. He has authored 29 technical papers.

Virtual Day-2
Oral Presentations

PREPARATION AND HIGH-PERFORMANCE ELECTRONIC DEVICES OF BLACK PHOSPHORUS NANORIBBONS

Changxin Chen

Shanghai Jiao Tong University, China

Abstract

The performance of diodes, which are the basic building blocks in integrated circuits, highly depends on the materials used. Black phosphorus (BP) and carbon nanomaterials with unique structures and excellent properties can form heterostructures with favorable band matching to fully utilize their respective advantages and thus achieve high diode performance. In this work, high-performance Schottky junction diodes based on a two-dimensional (2D) BP/single-walled carbon nanotube (SWCNT) film heterostructure and a BP nanoribbon (PNR) film/graphene heterostructure were investigated. The fabricated Schottky diode based on the heterostructure with the 10 nm-thick 2D BP stacked on the SWCNT film had a rectification ratio of 2978 and a low ideal factor of 1.5. The Schottky diode based on the heterostructure with the PNR film stacked on the graphene exhibited a high rectification ratio of 4455 and an ideal factor of 1.9. The high rectification ratios for both devices were attributed to the large Schottky barriers formed between the BP and carbon materials, thus leading to a small reverse current. We found that the thickness of the 2D BP in the 2D BP/SWCNT film Schottky diode and the stacking order of the heterostructure in the PNR film/graphene Schottky diode had a significant effect on the rectification ratio. Furthermore, the rectification ratio and breakdown voltage of the resulting PNR film/graphene Schottky diode were larger than those of the 2D BP/SWCNT film Schottky diode, which was attributed to the larger bandgap of the PNRs compared to the 2D BP.

Biography

Changxin Chen is a professor at Department of Micro/Nano Electronics in Shanghai Jiao Tong University. He got his Ph.D. degree in Microelectronics and Solid-State Electronics and his master degree in Material Science. His research is focused on nanoelectronics and nano-optoelectronics based on one- or two- dimensional materials. He had authored or co-authored more than 70 peer-reviewed articles.

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

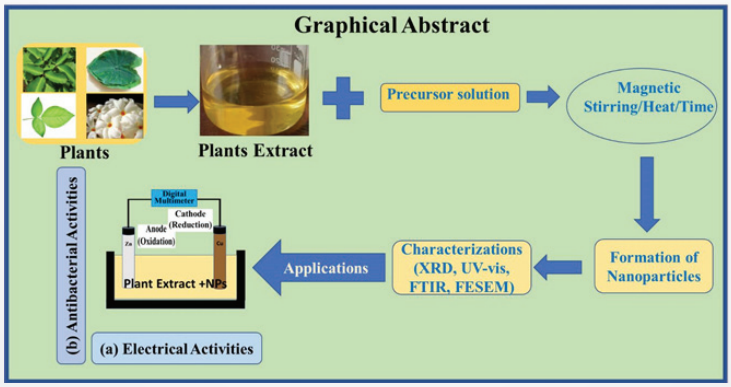
SIGNIFICANT IMPACT OF GREEN SYNTHESIZED NANOPARTICLES IN LOW-COST ELECTRICITY GENERATION AND ANTIBACTERIAL APPLICATIONS

Bithi Paul[1], Monika Paul[2] and KA Khan[3]

[1]*American International University-Bangladesh, Bangladesh*
[2]*National University, Bangladesh*
[3]*Jagannath University, Bangladesh*

Abstract

Green synthesis of nanoparticles (NPs), a unique approach to the synthesis of nanoparticles (NPs) by using plant extracts as reducing agents, establishes a sequence of wide varieties of nano-bio boundaries. The construction of these boundaries vehemently depends on the bio physicochemical reaction between the functional groups of plant extract and the precursor solutions of expected NPs. This study uses several plant extracts to synthesize the metal and semiconductor oxide nanoparticles (eg; Ag NPs, ZnO NPs, CuO NPs). The formation of green synthesized NPs has been probed by X-ray diffraction spectroscopy (XRD), UV-visible Spectroscopy, Fourier Transform Infrared (FT-IR) Spectra, Energy Dispersive X-ray (EDX) spectroscopy, Scanning Electron Microscopy (SEM). Moreover, an excellent bio-electrochemical cell has been developed by using the plant extract electrolyte solution and several electrical parameters like open circuit voltage, load voltage, short circuit current, load current, maximum power, internal resistance, capacity, voltage regulation, voltage efficiency, and energy efficiency have been investigated for this bioelectrochemical cell. The electrical performance has been significantly improved after using green synthesized NPs on cells. In addition, the antibacterial activities of NPs were examined, and the NPs revealed good antibacterial activities against some selective bacterial organs. This study can take the frontier forward for the integration of nanotechnology in medicinal and low-cost power production applications.



Biography

Bithi Paul is an Assistant Professor, Department of Physics, American International University-Bangladesh. Ms. Paul has completed her Master's degree in Materials Science from Missouri State University, USA. She has done her Bachelor's and M.Sc degree in Physics from Jagannath University, Dhaka Bangladesh. Her research interests are on the synthesis and characterization of metal and semiconductor oxide nanomaterials, analysis of the electrical and medicinal application of green synthesized NPs, and nanobio interaction between ZnO NPs and Glucose, DNA, and RNA bases.

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

MAGNETICALLY SEPARABLE NANOCOMPOSITE BEADS FOR RADIONUCLIDES ADSORPTION FROM AQUEOUS SOLUTION

Manish Sharma[1], Lalita Yadav[1], Priya Sharma[1], Vikash Chandra Janu[2] and Ragini Gupta[1]

[1]Malaviya National Institute of Technology, India

[2]Defence Research and Development Organization Jodhpur, India

Abstract

The fast-increasing development of nuclear power stimulates the exploration of low-cost and highly efficient materials to selectively remove of uranium (VI) and thorium(IV) from contaminated wastewater streams. The drinking of radionuclide-contaminated water can lead to irreversible damage to the entire living being. Therefore, the removal of radionuclides from water is a necessary requirement. Here in, we successfully developed a novel decorated magnetic nanocomposite beads adsorbent. The adsorption/desorption ability of the functionalized nano magnetite was studied. It is well known that magnetic separation provides important advantages such as being a rapid and efficient way for removing and recycling magnetic particles by applying an external magnetic field. The as-obtained nanomaterial composite was characterized using Fourier-transform infrared spectroscopy (FT-IR), Scanning electron microscopy (SEM) X-ray diffraction (XRD), Thermo Gravimetric Analysis (TGA), Transmission electron microscopy (TEM) The decorated magnetite composite shows extraordinary adsorption capacity and fast adsorption rates for the removal of uranium (VI) in aqueous solution. The influence of factors including the dosage of the composite used, pH of an aqueous solution, and temperature were investigated by UV visible spectroscopy and inductively coupled plasma mass spectrometry (ICP-MS). The thermodynamic parameters, including Gibbs free energy (ΔG°), standard enthalpy change (ΔH°) and standard entropy change (ΔS°) for the process, were calculated using the Langmuir constants.

Biography

Manish Sharma is a Senior Research Fellow at Malaviya National Institute of Technology Jaipur. He is completed M.tech from University of Rajasthan in 2017. Now, He is pursuing Ph.D from Malaviya National Institute of Technology Jaipur

Coalesce Research Group

8th European Congress on
Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

INFLUENCE OF BIOFIBER REINFORCEMENT MATERIALS ON THE MECHANICAL STRENGTH OF THE HYBRID COMPOSITE MATERIALS

VV Venu Madhav, Ch Sri Chaitanya, P Phani Prasanthi, AVSSKS Gupta and VV Spandana

V.R. Siddhartha Engineering College, India

Abstract

Background: The interest over the custom made materials with desired properties lead to the development and usage of the composite materials. The properties of the composite materials depend on their composition and its manufacturing process. Partial and fully biodegradable composite materials are of greater interest. The usage of natural and plant-based materials makes the composite materials biodegradable.

Objective: The present study investigates the effect of the weight fractions of the banana and pineapple fibres in the composite material on its tensile, flexural and impact strengths. To study the effects of the fibre, three materials were manufactured with 70 wt.% of epoxy matrix and 30 wt.% of fibres were used. In the fibres, first material has 50% each of banana and pineapple, while the second and third have 1/6th of banana and 1/6th of pineapple respectively.

Methods: The materials were manufactured using hand layup method. The fibres were cut and placed in one direction and epoxy was poured in to the mold. The mixture was allowed to cure for a day. Tensile test was conducted using Tensometer as per ASTM D3039-76. The impact and flexural tests were conducted as per ASTM D256 and ASTM D790 respectively

Results: Each experiment was conducted for 5 times and the mean results were reported. The tensile strength is higher for composite with larger pineapple concentration. The results are similar for all the three materials. The highest tensile strength is 31.56 MPa, Flexural Strength is 49.02 MPa, and Impact strength is 10.6 J/m

Conclusion: The addition of the banana and pineapple increased the mechanical strength of the composite material. When compared to the pineapple and the banana fibres, the pineapple fibres imparted maximum strength to the composite.

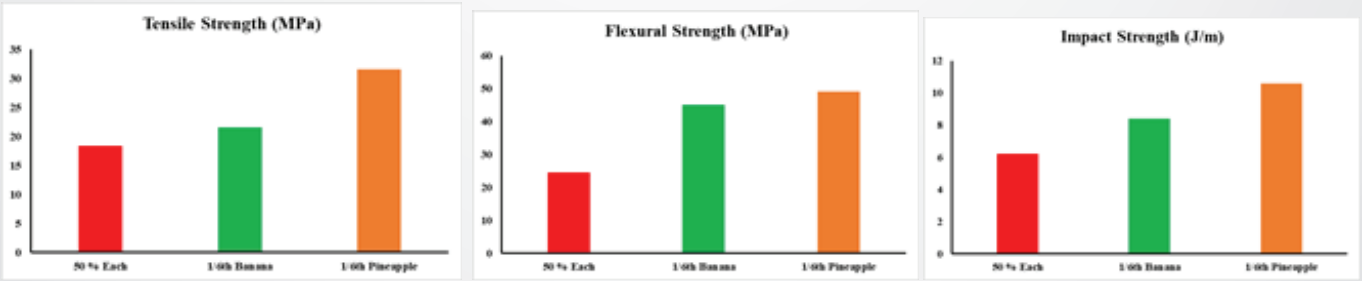


Figure 1: Tensile strength, Flexural Strength, Impact Strength of the Natural fibre composite material with 70% of matrix and 30% fibre ((a) 50% each fibre, (b) 1/6th Banana Fibre, (c) 1/6th Pineapple Fibre).

Biography

V. V. Venu Madhav is currently working as an Assistant Professor at Department of Mechanical Engineering, Velagapudi Ramakrishna Siddhartha Engineering College, Vijayawada, India. He did his PhD from Jawaharlal Nehru Technological University, Hyderabad. He has over 14 years of teaching experience and another 14 years in industry. He published more than 40 articles in international and national journals and conferences, 1 patent and 1 DRDO project. 23 Coursera certificates.

NANO-MATERIALS CHALLENGES; FOR INDUSTRIAL APPLICATIONS

Inas Kamal Battisha

National Research Centre (NRC), Egypt

Abstract

Advanced classes of nano-composites silica phosphate SiO_2- P_2O_5 –(Er^{3+}, Ho^{3+} & Ho^{3+}:Yb^{3+}) and – silica titania $SiTiO_2$ – (Ho^{3+}& Ho^{3+}:Yb^{3+}) planar waveguide and up-down shifting higher efficiency solar cell thin film layers system, both will be succefully prepared by sol gel technique, respectively. They can be used as amplification of optical signal at nearly about 1500 nm, for Erbium ions without converting it to electrical signal. Yb^{3+} ions were introduced as sensitizer for the Er^{3+} ions, (which is very important in telecommunication). Moreover, $SiTiO_2$ – (Ho^{3+}& Ho^{3+}:Yb^{3+}) thin films are an excellent choice for luminescent up-down-shifting layer on the front side of a crystalline Si solar cell to improve its performance. The prepared material structure will be characterized using XRD technique. The planar waveguide thin film thickness of both SiO_2- P_2O_5 –(Er^{3+}, Ho^{3+} & Ho^{3+}:Yb^{3+}) and $SiTiO_2$ - (Ho^{3+}& Ho^{3+}:Yb^{3+}) will be measured using the Field Emission Scanning Electron Microscope (FESEM) technique in which, it is expected to be in the range higher than 1.45 µm. However, silica phosphate and silica titania films have high optical transmission up to 98 % confirming good transparency samples. Thus, thickness increase up to 1.5 µm with high transparent films enabling the planar waveguide system to successfully deal with single mode transmission, used for industrial applications.

Biography

Inas Kamal Battisha is a Professor of Solid State Physics in Department of Solid State Physics at National Research Centre (NRC), Egypt .

Virtual Day-2
Poster Presentations

Coalesce Research Group

8th European Congress on

Advanced Nanotechnology and Nanomaterials

October 12-13, 2023 | Hyatt Place London Heathrow Airport, London, UK

GREEN SYNTHESIS AND CHARACTERIZATION OF ZNO NANOPARTICLES BY USING BRYOPHYLLUM PINNATUM LEAVE EXTRACT AND ITS ANTIBACTERIAL APPLICATION

Monika Paul[1], Bithi Paul[2] and Md Kamrul Alam Khan[3]

[1]*National University, Bangladesh*
[2]*American International University, Bangladesh*
[3]*Jagannath University, Bangladesh*

Abstract

In this study, Bryophyllum pinnatum (BPL) leaves extract has been used as the reducing agent to synthesize of Zinc Oxide (ZnO) nanoparticles (NPs) through a one-step, cost-effective approach. Characterization methods such as the XRD, UV-vis spectrophotometer, FTIR, and FESEM confirmed the successful formation of ZnO NPs with an average crystallite size of around 15 nm. The XRD spectra represents the peak positions of ZnO NPs which are matched with the characteristic of space group P63mc (zincite phase). The UV-visible spectra revealed the maximum absorption peak at 368 nm for the green synthesized ZnO NPs. The presence of many active functional groups in BPL extract such as flavonoids, proteins, alcohols, tannins, terpenoids are mainly acted as reducing agents during the reaction mechanism of the formation of ZnO NPs. The FESEM images of ZnO NPs confirm the average particle size of 45 nm. In addition, a unique bio-electrochemical cell was developed by using the pant extract electrolyte solution and the electrical parameters were monitored with the time duration. The green synthesized nanoparticles were used in the electrochemical cell to amplifying the electrical properties of cell. Moreover, the antibacterial activities of BPL extract-mediated NPs were investigated and ZnO nanoparticles were found as a potential candidate against bacterial infections. The results may open a new era of green synthesized nanoparticles in nanotechnology for power and medicinal applications.

Biography

Monika Paul completed her undergraduate degree in biology (Zoology) and a graduate degree in Fish and Fisheries from the National University, Bangladesh. At present, Ms. Paul is working as a senior science teacher at Professor Rowshan Ahmed School & College, Dhaka, Bangladesh. Monika is very interested in the multidisciplinary field to extend her academic and research expertise. She is continuing her research in nano-bio interactions, green synthesis of nanoparticles via bio-reducing agents, developing the bio-electrochemical cell for electricity generation, and so on.

TXTL SYSTEM FOR FAST DECODE SYNTHETIC SPIDROINS

Valquíria A Michalczechen-Lacerda, GMS Rosinha, LP Silva, EL Rech and DMC Bittencourt

National Institute of Science and Technology in Synthetic Biology, Brazil

Abstract

Background: Natural spider silk proteins have unique structural characteristics that make them ideal for the development of new biomaterials. However, those genes are long repetitive sequences encoding elastic, strength or flexible fibers. These proteins can be synthetically assembled and need to be evaluated before large –scale production.

Objective: To inspect TXTL system for fast decode predict synthetic spidroins.

Methods: Five spidroins from Parawixia bistriata (WO 2008/113145 A1) was constructed in our laboratory in pET28a. The cell free reaction (pTXTL-P70a-T7 rna HP Arbor Biosciences) was carried out in 1,5 mL tubes using 30 nM DNA plasmids in a volume of 12 µL at 27 °C for 48 h. A 2 µL aliquot of the total protein extract was analyzed qualitatively by SDS-PAGE, stained with Comassie blue, and spidroins were detected by Western blot. After purification with IMAC, the spidroins were desalinized, lyophilized and the material was morphologically characterized by SEM and AFM.

Results: All five spidroins, MaSp2 8× (29 kDa), MaSp2 16× (54 kDa), MaSp2 32× (105 kDa), MaSp1+2 4× (40 kDa), MaSp1+2 8× (77 kDa), were produced by cell free system and confirmed by western blot. SEM and MFA showed similar results, where proteins with lower mass (29 to 54 kDa) formed globular particles, which ranged from 163 to 880 nm. Those with high mass (77 to 105 kDa) tend to form fibrillary structures.

Conclusion: In this case, the TXTL system was a fast do decode in small-scale results and to predict the molecular and morphological characteristics of new biomaterials from spidroin assemblies. We believe steps are essential for an efficient choice in the production system and investment in large-scale production.

Biography

Valquíria A. Michalczechen Lacerda is brazilian born in Canada. She is a PhD Molecular biologist and has her expertise in build and research of new biomaterials from spidroins since biodiversity of Brazil. She's a postdoc currently searches for innovations for the sustainable production of spidroins (in vivo, in vitro and cell free systems) and collaborate with scientific research at Embrapa Cenargen and Embrapa Agroenergia, Brasília-DF, Brazil

INDEX

Ahsan Ali	22
Ainur Sharip	46
Alexandre D'Agostini Zottis	34
Alice Chinghsuan Chang	25
Amir Handelman	36
A-Young Sung	47
Bithi Paul	79
Changxin Chen	78
Charu Misra	55
Constantinos Sioutas	19
Dalia MA Elmasry	69
Farida Amrouche	43
Gaurab Kumar Khanra	23
Hasina Huq	73
Hinata Komiyama	51
Hiroto Iizuka	48
Hung-Wing Li	37
IK Battisha	83
Janhavi Devrukhkar	21
János Mizsei	16
Jos Olijve	17
Jyoti Prasad Borah	13
Konstantina Zafeiropoulou	41
Lorenzo Iezzi	28
Luciana Martins Pereira de Araújo	60
Manish Sharma	80
Masahiko Hara	35
Masanobu Sagisaka	31
Matoke Peter Mose	66
Maxence VINCE	40
Mike O. Ojemaye	20
Monika Paul	86
Nataliia Tiron-Vorobiova	50
Naveen Bunekar	67
Nicolás Hernández	53
Nilufer Cakir	57
Osman Adiguzel	62
Paulo Cesar De Morais	42
Prabhat Kumar Maiti	74
Ricardo Lopez-Doria	54
Saeed Kamarian	38
Shady Agwa	30
Shumaila Razzaque	72
Suditi Neekhra	26
Thaddeus Harrison Gugu	70
Valeri Ligatchev	12
Valeria De Matteis	71
Valquíria A. Michalczechen Lacerda	87
VV Venu Madhav	81
Yi-Nan Gong	18
Yung-Chun Lee	56

Note

Bookmark the Dates

9th European Congress on

ADVANCED NANOTECHNOLOGY AND NANOMATERIALS

June 24-25, 2024 | Amsterdam, Netherlands

Contact Us:

Cathy Allen | Program Manager

nanomaterials@crgconferences.org

Phone: +1-718-543-9362

WhatsApp: +1-843-564-2296