SCI SYNOPSIS

Joint Event

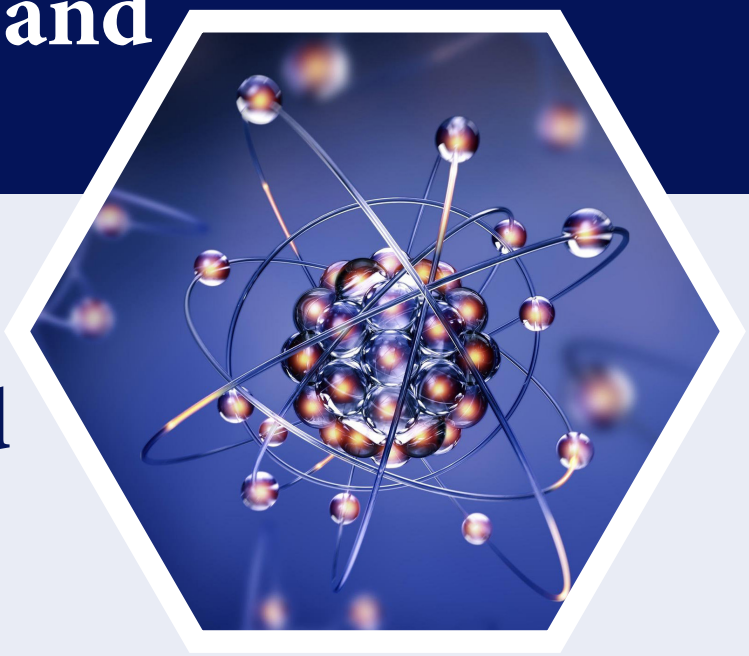
International Conference on

Materials Science and Engineering

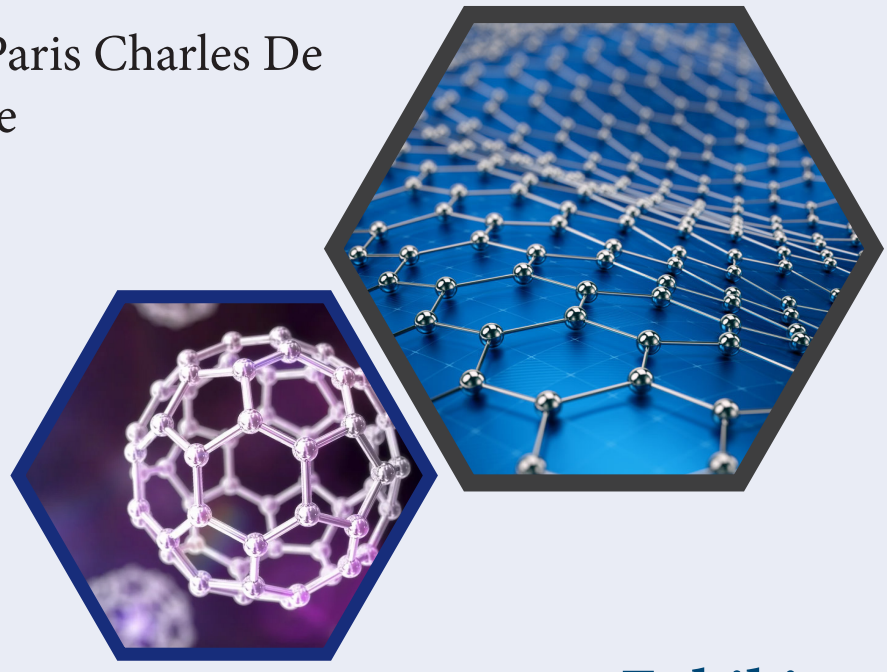
&

International Conference on

Nanomaterials and Nanotechnology



March 27-28, 2023
Millennium Hotel Paris Charles De Gaulle, Paris, France



Exhibitor

HEIDELBERG INSTRUMENTS

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Conference Programme

Conference Programme

March 27-28, 2023, Millennium Hotel Paris Charles De Gaulle, Paris, France

Day 1, March 27, 2023

Meeting Hall: Blériot

8.30 - 8.45	**Registrations**
8.45 - 9.00	**Introduction**

Keynote Presentations

9.00 - 9.45	**Sina Khoshsima,** Jozef Stefan Institute, Slovenia

Title: An Environmentally Friendly Approach to Selective Chemical Leaching and $Nd_2Fe_{14}B$ Magnetic Phase Extraction from Feedstock $Nd_2Fe_{14}B$ Type Powders

9.45 - 10.30	**Viktoria Milkova,** Bulgarian Academy of Sciences, Bulgaria

Title: Design of Biopolymer-Based (Nano) Formulations for Potential Treatment of Coronavirus Infection

Group Photo: 10.30 - 10.45

Networking and Refreshments @ Foyer: 10.45 - 11.00

Oral Presentations

Session Chair:	**Sina Khoshsima,** Jozef Stefan Institute, Slovenia
Session Chair:	**Valeri Ligatchev,** Member of The Electrochemical Society, Singapore
Session Chair:	**Mothibeli Pita,** University of South Africa, South Africa
Session Co-chair:	**Hosam El-Sayed,** National Research Centre, Egypt

Sessions: Materials Science and Engineering | Functional Materials | Smart Hybrid Materials |3D Printing & Additive manufacturing | Polymer Technology and Plastics | Graphene Technology | Forensic Nanotechnology | Nano Mechanics | Fundamentals and Properties of Nanomaterials | Applications of Nanotechonology | Materials Chemistry | Metals and Mining Materials | Nanoengineering and It's Applications | Structural Materials | Composite, Coating and Ceramic Materials | Carbon Nanotubes | Metallurgy | Chemical Engineering |Lipid Nanotechnology | Polymer Nanotechnology | Quantum Nanotechnology | Nano Medicine & Life Sciences | Nano Physics & Nano Chemistry | Molecular Nanotechnology | Nnotoxicology | Computational Nanotechnology

11.00 - 11.25 **Michał Pikuła,** Medical University of Gdańsk, Poland

Title: Adipose-Derived Stromal Cells as A Tool in Biomedical Engineering and Nanotechnology

11.25 - 11.50 **Mothibeli Pita,** University of South Africa, South Africa

Title: Investigation of the Effect of Tool Temperature on Microstructure and Mechanical Properties of Aluminium 6061-T6 Alloy During Friction Stir Welding

11.50 - 12.15 **Valeri Ligatchev,** Member of The Electrochemical Society, Singapore

Title: On Nature of Cooper Pairs Formation Mechanism in Phonon-Mediated Superconductors

12.15 - 12.40 **Stepan Gamanov,** CEITEC Brno University of Technology, Institute of Physics of Materials, Czech Academy of Sciences Czech Republic

Title: Manufacturing and High Temperature Properties of Fe-10Al-4Cr-4Y_2O_3 ODS Nanocomposite, Aimed for Structural Applications Above 1100°C

12.40 - 13.05 **Hosam El-Sayed,** National Research Centre, Egypt

Title: Preparation of Nonionic Softener Based on Wool Wax and its Utilization in Functionalization of Textile Fabrics

Lunch @ Restaurant: 13.05 - 14.00

14.00 - 14.25 **Galina Lasko,** Institute for Materials Testing, Materials Science and Strength of Materials, Germany

Title: FEM-Simulations of Fatigue Crack Initiation in the Oligocrystalline Microstructure of Stents

14.25 - 14.50 **Zhengming Wu,** Heidelberg Instruments Nano AG, Switzerland

Title: NanoFrazor Lithography for Advanced 2D & 3D Nanodevices

14.50 - 15.15 **Mohamed Hassen V. Baouab,** University of Monastir, Tunisia

Title: Macrocycles Tetra Aza-Microcrystalline Bacterial Cellulose Doped with Magnetite Nanoparticles Catalytic and Microbiological Application

15.15 - 15.40 **Bertrand Roussillo--David de Beaufort,** French Atomic Energy and Alternative Energies Commission, France

Title: Improvement of Electrospun Carbon Nanofiber Material as Gas Diffusion Layer for Proton Exchange Membrane Fuel Cell

15.40 - 16.05 **Mavis Sika Okyere,** University of Ghana, Ghana

Title: Flow Improvers and Pipeline Internal Coating Benefits and Limitations with Respect to Pipeline Capacity Enhancement: A Case Study

Networking and Refreshments @ Foyer: 16.05 - 16.30

16.30 - 16.55 **Emilia Visileanu,** The National Research and Development Institute for Textiles and Leather, Romania

Title: Composite Structures for Emergency Medicine

16.55 - 17.20 **Sergey Suchkov,** Institute for Biotech & Global Health of RosBioTech, and A.I. Evdokimov MGMSU, Russia

Title: Antibody-Proteases as Translational Tools of the Next-Step Generation to be Applied for Bioindustry and Clinical Applications

17.20 - 17.45 **Mohammed Saad Al-Ghamdi,** King AbdulazizUniversity, Saudi Arabia

Title: Effect of Quantum Confinement on Electrical Properties in GaInP Semiconductor Laser Diode Structures

17.45 - 18.10 **Lakshmi Sathi Devi,**University of Camerino, Italy

Title: Exploring Cyclodextrin/Hyaluronan Multifunctional Delivery Systems for Anticancer Therapy

18.10 - 18.35 **Francisco E Alban-Chacón,** ESPOL, Ecuador

Title: A Novel Physical Mechanism to Model Brownian yet Non-Gaussian Diffusion: Theory and Application

18.35 - 19.00 **Magda Silva,** University of Minho, Portugal

Title: Ligament Scaffolds based on PLA/Graphite Nanoplatelet Composites

19.00 - 19.25 **Mohammed Saad Al-Ghamdi,** King AbdulazizUniversity, Saudi Arabia

Title: Effect of Barrier Width on Optoelectronic Properties of InAsP Quantum Dot Laser Diodes

Day 1 Concludes

Day 2, March 28, 2023

Meeting Hall: Blériot

Keynote Presentation

10.00 - 10.45 — **Henrique Eisi Toma,** Universidade de São Paulo, Brazil

Title: A New Green Nanotechnological Process for Gold Extraction

Oral Presentations

Session Chair: **Henrique Eisi Toma,** Universidade de SãoPaulo, Brazil

Session Chair: **Sabrina Belbekhouche,** Université Paris Est Creteil, CNRS, France

Session Chair: **Yun-Hae Kim,** Korea Maritime and Ocean University, South Korea

Sessions: Nanomaterials and Nanotechnology | Nanoscience And Technology | Advanced Materials and Functional Devices | Nanoelectronics and Nanophotonics | Biomedical Engineering and Nanobiotechnology | Carbon Nanotubes | Graphene and Fullerenes | Materials Science and Engineering | Polymer Technology and Plastics | Graphene Technology | Nature and Properties of Materials | Computational Material Science | Magnetism and Multiferroism | Biomaterials and Medical Devices | Semiconductors | Nanodevices and Nanosensors | Industrial Nanotechnology | Advanced Energy Materials | Metamaterials | Polymers & Biopolymers

10.45 - 11.10 — **Asmaa Fathy Elfiky,** National Research Centre, Egypt

Title: Easily-Dyeable Polypropylene Fabric using Oxygen or Nitrogen Plasma-Mediated Treatments

Networking and Refreshments @ Foyer: 11.10 - 11.30

11.30 - 11.55 — **Joice Maria Joseph,** University of Camerino, Italy

Title: The Art of Preparations of PFCE Encapsulated PLGA Nanoparticles using Sonication and Homogenisation

11.55 - 12.20 — **Mothibeli Pita,** University of South Africa, South Africa

Title: Experimental Investigation of Different Spindle Rotational Speed and Constant Acceleration on Mechanical Properties and Microstructure of Aluminum 6082T651 During Friction Stir Welding

12.20 - 12.45 — **C S Ezeanyanaso,** National Agency for Science and Engineering Infrastructure, Nigeria

Title: Nanotechnology: The Emerging Field for Remediation, Restoration and Cleanup of Liquid Petroleum Hydrocarbon Spillage

12.45 - 13.10 **Donats Erts,** University of Latvia, Latvia

Title: Bi_2Se_3/SWCNT Heterostructures as A Perspective Anode for Lithium-ion Batteries

Lunch @ Restaurant: 13.10 - 14.00

14.00 - 14.25 **Ali Al-Samydai,** Al-Ahliyya Amman University, Jordan

Title: The Effectiveness of Rutin in Improving Anticancer Effect and Stability of PEGylated Nanoliposomes

14.25 - 14.50 **Sabrina Belbekhouche,** Université Paris Est Creteil, CNRS, France

Title: New Generation of Drug Delivery System Based on Stimuli-Responsive Particles (Capsules, Porous Particles…)

14.50 - 15.15 **Sudip Barman,** National Institute of Science Education and Research (NISER), India

Title: Metal Nanostructures for Electrochemical Energy Conversion and Storage

15.15 - 15.40 **Banshidhara Mallik,** National Institute of Advanced Manufacturing Technology, India

Title: Study on Synthesis and Characterisation of Al-Base *In-situ* Metal Matrix Nano Composites by Stir Casting

15.40 - 16.05 **Valeri Ligatchev,** Member of The Electrochemical Society, Singapore

Title: Size-Dependent Melting Temperatures of Graphene and MoS_2Nano-Flakes

Networking and Refreshments @ Foyer: 16.05 - 16.30

16.30 - 16.55 **Mohamed A.E.M. Ali,** Military Technical College, Egypt

Title: Static Performance and Gamma Sheilding Characterisitics of Ilmentite Cementitious Plaster

16.55 - 17.20 **Lucy Vojtova,** CEITEC - Central European Institute of Technology, Brno University of Technology, Czech Republic

Title: Biomimetic Polydopamine-Modified Nanofibrous Bilayer Scaffolds used for Full-Thickness Skin Regeneration in a Porcine Animal Model

17.20 - 17.45 **Jeetendra Gupta,** Institute of Engineering and Ocean Technology, Oil and Natural Gas Corporation Ltd , India

Title: Failure Analysis of A Metallic Ring Gasket: A Case Study

Poster Presentations

PP-01 **Henry R. Chance,** Georgia Institute of Technology, USA

Title: Nanoscale 3D Printed Microsupercapacitors

PP-02 **Oleksandr Dekhtiar,** G.V. Kurdyumov Institute for Metal Physics of National Academy of Sciences of Ukraine, Ukraine

Title: Improving the Fatigue Properties of Ti-6Al-4V Powder Alloy by Surface Carbon Deposition with the Help of Graphite Evaporation by Laser Irradiation

PP-03 **Lorenzo Signorelli,** Friedrich-Alexander University, Germany

Title: Design of Magnetoelectric Nanofibers for Wireless Electrical Neuromodulation

PP-04 **Elif Koçar,** Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Title: Functionalization and Optimization of Magnetic Nanoparticle Systems: Designing Magnetic Protein Sensors

PP-05 **Didzis Salnajs,** University of Latvia, Latvia

Title: Synthesis and Characterization of Nanostructured Bi_2Se_3 films and Bi_2Se_3@ SWCNT Heterostructures

PP-06 **Yun-Hae Kim,** Korea Maritime and Ocean University, South Korea

Title: Synergetic Effects of Nanoparticles in Thermoset Composites

PP-07 **Hesham A. Hamad,** City of Scientific Research and Technological Applications, Egypt

Title: $Co_xCu_yFe_2O_4$ as Novel Nanocatalysts for Production of Biodiesel from Waste Frying Oil

e-Poster Presentations

EP-01 **Saulius Grigalevicius,** Kaunas University of Technology, Lithuania

Title: New Fluorene Based Derivatives for Solar Cells

EP-02 **Joanna Sypniewska, Gdansk** University of Technology, Poland

Title: Surface Structure Properties of $Ti_{13}Nb_{13}Zr$ Titanium Alloy Subjected to Laser Modification and MAO Process

Day 2 Concludes followed by Panel Discussion - Awards & Closing Ceremony

Virtual Programme

Virtual Programme

March 27-28, 2023, Virtual Program

Day 1 March 27, 2023 GMT (London Time: 10.00 - 15.50)

10.00 - 10.15 **Introduction**

Oral Presentations

10.15 - 10.40 **Zihao Tan,** Institute of Metal Research, Chinese Academy of Sciences, China

Title: Thermal-Mechanical Fatigue Behavior and Damage Mechanisms of A Fourth-Generation Single Crystal Superalloy

10.40 - 11.05 **Ailar Assambayeva,** I.M.Sechenov First Moscow State Medical University (Sechenov University), Russia

Title: The First Experience of Using Tissue-Engineered Constructs for Surgical Correction of Anterior Vaginal Wall Prolapse

11.05 - 11.30 **Łukasz Pawłowski,** Gdańsk University of Technology, Poland

Title: Properties of Smart CS/EE100 and CS/P4VP Biopolymer Coatings Electrophoretically Deposited on Modified Titanium Surfaces

11.30 - 11.55 **Athanasios Katsouras,** University of Ioannina, Greece

Title: Design and Development of Binary Blends Consisted of New Conjugated and Diblock Copolymers for Applications in Active Packaging

11.55 - 12.20 **Debojyoti Mandal,** Lovely Professional University,India

Title : Formulation and Optimization of Sinapic Acid (SA) Loaded Guar Gum Nanoformulation *via* Box–Behnken Design Against Diabetic Wound Healing

12.20 - 12.45 **Khadija Boukholda,** Faculty of Sciences of Sfax,Tunisia

Title : Silica Nanoparticles Induce Neurotoxicity in Striatum Region by Activating Oxidative Stress and Apoptosis-Related Gene Expression in Adult Male Rats: Possible Involvement of Nrf2/HO-1 and Apoptotic Pathways

12.45 - 13.10 **Tan Eng Pei,** Universiti Tunku Abdul Rahman, Malaysia

Title: Antifungal Activity of Zinc Oxide Nanoparticles Against Saccharomyces Cerevisiae

Lunch (13.10 - 13.40)

13.40 - 14.05 **Venu Madhav V. V.,** Velagapudi Ramakrishna Siddhartha Engineering College, India

Title: Influence of the Laminate Thickness and the Thermal Loads on the Buckling of a Cylindrical Shells

14.05 - 14.30 **Refka Sai,** Université de Carthage, Tunisia

Title: Impact of Iron Pyrite Nanoparticles Sizes in Photovoltaic Performance

14.30 - 14.55 **Ali Rezaei,** Iran University Of Science And Technology, Iran

Title: Graphene-Oxide (GO) Electrophoretic Thin Film Deposition on Titanium

14.55 - 15.20 **Alicja Stanislawska,** Gdansk University of Technology, Poland

Title: Determination of Nanomechanical Properties of Bacterial Nanocellulose Modified *In situ* with Hyaluronic Acid

Keynote Presentation

15.20 - 15.50 **Orlando Auciello,** University of Texas-Dallas, USA

Title: Science and Technology of Unique Multifunctional Ultrananocrystalline Diamond (UNCD™) Coating for New Generations of Industrial, High-Tech and Implantable Medical Devices/Prostheses

Day 1 Concludes

Day 2 March 28, 2023 GMT (London Time: 10.00 - 16.45)

Keynote Presentations

10.00 - 10.30 **Tokeer Ahmad,** Jamia Millia Islamia, India

Title: Binary and Ternary Heterostructured Nanomaterials for Catalysis in H_2 Generation

10.30 - 11.00 **Osman Adiguzel,** Firat University, Turkey

Title : Deformation-Temperature Dependent in Memory Behavior of Shape Memory Alloys

Poster Presentation

11.00 - 11.15 **Phanitchanun Thanawattana,** Chulalongkorn University, Thailand

Title: Effect of PLA-g-HA on Mechanical and Thermal Properties of PLA/PCL Blend Nanocomposites

11.15 - 11.30 **Hameed Ullah,** Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences,China

Title: A Fast Method for Nanocomposite PbS Synthesis: Preparation and Characterization

11.30 - 11.45 **Alicja Stanislawska,** Gdansk University of Technology, Poland

Title: Determination of Nanomechanical Properties of Coatings Produced by the Micro Arc Oxydation Method on 5056 and 7075 Aluminum Alloys

11.45 - 12.00 **Maryam Moghtaderi,** University of Tehran, Pasteur Institute of Iran , Iran

Title: PEGylated Bleomycin-Loaded Liposomes as a New Approach to Cancer Treatment

12.00 - 12.15 **Yakov G. Verkhivker,** Odessa National University of Technology, Ukraine

Title: Use of Nanotechnologies in the Production of Canned Ketchup and Sauces

12.15 - 12.30 **Ales Mishchenko,** A.A. Galkin Donetsk Institute for Physics and Engineering, Ukraine

Title: Effect of Structure Defects on Spectrum of Electromagnetic Excitations in Coupled Microcavities Array Containing Quantum Dots

Oral Presentations

12.30 - 12.55 **Twinkle Garg,** Banasthali Vidyapith, India

Title: Design, Development and Characterization of Rivastigmine Loaded Herbal Hybrid Nanoparticles for Treatment of Alzheimer's Disease

12.55 - 13.20 **Thierno Souleymane Barry,** Pan African University Institute for Basic Sciences Technology and Innovation, Kenya

Title: Bayesian Joint Spatial Modelling of Anemia and Malaria in Guinea

13.20 - 13.45 **Niharika,** Metro College of Health Sciences and Research, India

Title: Pressure Sensitive Adhesives in Transdermal Drug Delivery

13.45 - 14.10 **Sujoy Kumar Dey,** Sikkim Manipal University, North East Regional Institute of Science and Technology (NERIST), India

Title: Porous PEEK/HA Composites: A Candidate of Orthopedic Implant Material

14.10 - 14.35 **Vladimir V. Egorov,** FSRC"Crystallography and Photonics", Russian Academy of Sciences, Moscow, Russia

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

14.35-15.00 **Zaineb Bakari,** National Engineering school of Sfax, Tunisia

Title: Potential Valorization of Agricultural Waste into Low-Cost Activated Carbon for the Removal of Organic and Inorganic Contaminants from Wastewater

15.00-15.25 **Subhajit Kar,** Indian Institute of Science Education and Research, India

Title: Carbon Based Nanomaterials for Energy Application

15.25-15.50 **Ali Rezaei,** Iran University Of Science And Technology,Iran

Title: Dc Electroplating of Cobalt-Nickel Thin Film on Copper Substrate for Magnetic Applications

15.50-16.15 **Jagadish Chandra Tarafdar,** Indian Council of Agricultural Research, India

Title : Nanofertilizer: Unique Material for Global Farming

Video Presentation:

16.15 - 16.30 **Yarub Al-Douri,** American University of Iraq, Iraq

Title : Quinternary Alloy for Optoelectronic Applications

16.30 - 16.45 **Shymaa S. Medany,** Cairo University, Egypt

Title: NiO Nanparticles as an Electrocatalyst for Urea Electro-Oxidation in Alkaline Medium

Day 2 Concludes Followed by Vote of Thanks

For time reference please check with time Zone at:
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Exhibitor

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Day 1

Materials Science & Nanomaterials Conference 2023

Keynote Presentations

AN ENVIRONMENTALLY FRIENDLY APPROACH TO SELECTIVE CHEMICAL LEACHING AND $Nd_2Fe_{14}B$ MAGNETIC PHASE EXTRACTION FROM FEEDSTOCK $Nd_2Fe_{14}B$ TYPE POWDERS

Sina Khoshsima
Jožef Stefan Institute, Slovenia

Abstract:

The exponential growth of the electric vehicle market and the scarcity of rare-earth elements (REEs), which are the major constituents of the Nd-Fe-B magnets, have already increased the price of the REEs and exposed the importance of effective repurposing and recycling the end-of-life magnets for achieving sustainability and foreign independency. In this study, we took into consideration a strip-cast, hydrogenated, jet-milled Nd-Fe-B powder, a precursor to sintered Nd-Fe-B magnets, as a case study to investigate the possibility of selective chemical leaching of the Nd-rich phase to extract the $Nd_2Fe_{14}B$ matrix phase. Diluted citric and nitric acids with 0.01, 0.1, and 1 M concentrations were considered potential leaching mediums, and the leaching time was 15 minutes. The microstructural investigation, magnetic characterization, and elemental compositional analysis were performed to investigate the leaching efficiency and selectivity. Based on SEM analysis, Nd/Fe ratio monitoring via ICP-MS, and the high moment/mass value at 160 emu/g for the sample leached with 1 M citric acid, the latter proved highly selective toward the Nd-rich phase. Exposure to nitric acid resulted in a structurally damaged $Nd_2Fe_{14}B$ matrix phase and severely diminished moment/mass value at 96.2 emu/g, thus making the nitric acid unsuitable for selective leaching. The presence of hydrogen introduced into the material via the hydrogen decrepitation process did not notably influence the leaching dynamics. The proposed leaching process based on mild organic acids is environmentally friendly and can be upscaled and adopted for reprocessing of industrial scrap or end-of-life Nd-Fe-B magnets to obtain single-phase Nd-Fe-B powders that can be used for novel magnet-making.

Biography

Sina Khoshsima completed his Ph.D., in Material Science and Engineering, and postdoctoral studies at Koç University, Turkey. He has been working as a Marie-Curie fellow, at Jozef Stefan Institute (IJS) in Slovenia since 2021. His work on grain boundary engineering of NdFeB hard magnets make a pathway to understand and optimize the mechanism of magnetism and the effects of the grain boundary conditions (composition, thickness, etc.) on the overall magnetic properties of the magnets and is considered the grounds for up and coming in-situ grain boundary engineering of NdFeB permanent magnets field which enables a novel green route for sustainable recycling of critical raw materials. He is a well-established interdisciplinary scientist with a published track record in both material science and biomaterials.

DESIGN OF BIOPOLYMER-BASED (NANO) FORMULATIONS FOR POTENTIAL TREATMENT OF CORONAVIRUS INFECTION

Viktoria Milkova
Bulgarian Academy of Sciences, Bulgaria

Abstract:

The polymer-based nano - or micro-formulations have remarkable features enable to design smart delivery systems. The engineered delivery carrier can be produced by suitable selection of components (biodegradable and biocompatible polymers; drugs or bio-active molecules with a proven efficacy; fluorescence nanoparticles or quantum carbon dots for imaging and visualization) and the final smart scaffolds are able to ensure stability and to protect the therapeutic and diagnostic cargo from degradation and various toxic interactions with biological environment, and to ensure prolonged release of the bio-active substances. In the presentation will be illustrate the application of chitosan-based composite (nano)structures (liposomes, capsules, particles and polyplexes) for encapsulation and target delivery of Remdesivir for potential treatment of coronavirus infection. The model investigations on the interactions of the produced structures and model biological membrane will be also presented. Remdesivir is appears to be one of the most promising drug for COVID-19 therapy. The drug is a broad-spectrum antiviral substance with pronounced in vitro and in vivo activity against coronaviruses that results from the inhibitor activity of the drug regarding to RNA-dependent RNA polymerases (RdRps). RdRps is responsible for viral RNA synthesis and replication in the host cells. Remdesivir has completed phase III clinical trial for treatment of Ebola virus infection and the pharmacokinetics and safety for the human cells or tissues have relatively complete data. Several clinical trials evaluating the efficacy of the drug in patients infected with SARS-CoV-2 are currently being conducted.

Biography

Viktoria Milkova is a Head of Interfaces and Colloids Department at the Institute of Physical Chemistry, Bulgarian Academy of Sciences. Her expertise is in the field of Colloid chemistry and Electrokinetics. At the present time her studies are focused on design and characterization of the surface properties and stability of nanoparticles or advanced polysaccharide-based (nano)structures. She has received five National Awards in the field of Physical Chemistry for young or established researchers. She participate in more than 20 national and international interdisciplinary research projects as a coordinator or participant. Since 2019 she is editorial board member of Colloid and Surface Science and review board member of Nanomaterials.

Materials Science & Nanomaterials Conference 2023

Day 1

Oral Presentations

ADIPOSE-DERIVED STROMAL CELLS AS A TOOL IN BIOMEDICAL ENGINEERING AND NANOTECHNOLOGY

Michał Pikuła, A Tymińska, K Czerwiec, A Skoniecka, M Deptuła, M Zawrzykraj, J Zieliński, A Kosiński and P Skowron

Medical University of Gdansk, Poland

Abstract:

In the human body adipose tissue has a number of functions such as mechanical, supporting, metabolic, endocrine and also immunological. For many years, the adipose tissue removed during various surgical procedures has been treated as medical waste. However, it has occurred that this tissue contains important and promising adipose-derived stromal cells (ADSCs). These cells have a huge regenerative potential due to the production of a number of growth factors, cytokines, and the ability to differentiate into other cells such as adipocytes, osteocytes, chondrocytes. These cells also produce exosomes, which are an increasingly important component in regenerative medicine therapies. Therefore, ADSCs are referred to as medical signaling cells. Apart from cell therapies, ADSCs can also serve as a great tool for *in vitro* testing of various types of active compounds, nanoparticles, bionanomaterials, and tissue scaffolds. These cells are easy to culture *in vitro*, they have a high proliferative potential which in that case is hardly dependent on the age of a donor. They are relatively easy material to obtain for transcriptomic, biological, immunological and molecular research. These cells are relatively sensitive to stimuli, hence the possibility of studying nanoparticles and nanomaterials. Moreover, ADSCs can also be modified and prepared in this way that the next-generation of stem cells can be created. They can be administered to patients with various types of inflammatory diseases as well as patients with various types of soft tissue defects and loses. Therefore, the future of adipose-derived stromal cells in biomedical engineering and nanotechnology seems to be promising.

This work was supported by National Centre for Research and Development, Poland, grant Bionanova.

Biography

Michał Pikuła, MSc, PhD is a Full Professor at the Laboratory of Tissue Engineering and Regenerative Medicine, Div. of Embryology, at the Medical University of Gdansk (MUG), Poland. He completed his M.Sc. from University of Gdansk (Molecular biology, 2003), M. Pharm. from Medical University of Gdansk (Pharmacy Practice, 2005), and his PhD in medical biology from Medical University of Gdansk (specialty cell biology, 2007). He is a Professor of medical sciences and health sciences (2020). Prof. Pikuła is a specialist in regenerative medicine, tissue engineering, and experimental dermatology. Prof. Pikuła is currently responsible for several projects focused on stem cells, wound healing, new biomaterials, and biologically active peptides. Prof. Pikuła is a group leader in the interdisciplinary consortium grant BIONANOVA "New generation bioactive molecules delivery systems, based on chemically synthesised and obtained through genetic engineering nanobiomaterials" and a Principal Investigator in the project "Effect of adipose-derived stem cells on *in vitro* cultured skin cells obtained from patients undergoing chemotherapy". He also conducts didactic courses for medical students and PhD students of the Medical University of Gdańsk. Prof. Pikuła is a Deputy Director of the First MUG Doctoral School (medical science).

INVESTIGATION OF THE EFFECT OF TOOL TEMPERATURE ON MICROSTRUCTURE AND MECHANICAL PROPERTIES OF ALUMINIUM 6061-T6 ALLOY DURING FRICTION STIR WELDING

Mothibeli Pita and D Cebo
University of South Africa, South Africa

Abstract:

Friction stir welding tool is a critical component to the success of the welding process. The aim of the paper is to investigate the effect of tool temperature on microstructure and mechanical properties of aluminium alloy during friction stir welding process. The welding experiment was conducted at tool rotational speed of 550 rpm and tool temperature was measured every 60 mm distance. Three different tool temperatures were obtained and samples were characterized by scanning electron microscopy (SEM). ASTM E384 standard was followed when conducting Vickers hardness test. The results will be analysed and presented on the manuscript.

Biography

Mothibeli Pita is currently a senior lecturer, and associate chair of lab commercialization and collaboration at the University of South Africa in the Department of Mechanical Engineering (South Africa). He obtained his PhD in 2020 at the University of Johannesburg specializing in physical material processing. He holds a Bachelor of Engineering in Mechanical Engineering from Central University of Technology Bloemfontein and a Master's degree in Engineering Management at University of Johannesburg. He is the solar car project coordinator at University of South Africa.

ON NATURE OF COOPER PAIRS FORMATION MECHANISM IN PHONON-MEDIATED SUPERCONDUCTORS

Valeri Ligatchev
Member of The Electrochemical Society, Singapore

Abstract:

Electron-phonon (e-p) interactions play the crucial role in the phonon-mediated superconductivity (PMSC). Key features of its Cooper's pairs (CPs) are eventually defined by parameters of the electron and phonon quasi-particles on the given SC material, while strength of e-e interactions is commonly presumed to be determined by exchange with the appropriate phonons. In this presentation, phonon-mediated e-e interactions are re-represented (and visualized) as 3-dimensional (3D) in general single-phonon attractive 'sombrero'-like 'potential'(s), composed by superposition of all allowed acoustic single-phonon modes, weighted by the conventional (Planck's) temperature-dependent occupation factor. Energetic characteristics of this 3D potential could be evaluated readily using 3D inverse cosine Fourier transform of the acoustic phonons spectrum of the given material, while spatial characteristics of such potentials are affected as well by the (anisotropic in general) sound velocities. This allows one to evaluate readily the critical temperature, T_c, of the transition to the SC state for the given material and, in particular, for the heavily boron-doped (B-doped) diamond with II-type SC. Simulation results obtained for the latter case reveal *crystalline-orientation-dependent* T_c quantity, in apparent similarity with results of appropriate experiments

Biography

Valeri Ligatchev's areas of scientific interest and expertise comprise of experimental and computational studies on electronic, optical, vibrational, relaxation time and defect states spectra as well as thermal properties of various (predominantly spatially non-homogeneous) semiconductors insulators and even superconductors, including nominally undoped and heavily doped polycrystalline and nano-crystalline diamond(s), flakes of two-dimensional semiconductors, silicon-germanium 'quantum dots', 'molecular wires', silicon micro- and nano-wires, hydrogenated amorphous silicon-based films, porous 'low-k' organic and inorganic insulating layers, as well as ceramic insulators with 'gigantic dielectric response' (GDR). His so-called 'Generalized Skettrup Model' becomes expedient in several areas: from realistic simulations on optical and electronic properties of polycrystalline and spatially non-homogeneous amorphous semiconductors and insulators as well as of their low-dimensional counterparts to convincing estimations on the harmonic and anharmonic fractions of lattice thermal capacity of such materials. He also substantiated condensed phases of Fröhlich polarons as the essence of the GDR phenomenon. Furthermore, he had implemented broadly advanced mathematical methods at deconvolution and interpretation of data of several well-established techniques of defect states spectroscopy. Valeri Ligatchev 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.

MANUFACTURING AND HIGH TEMPERATURE PROPERTIES OF Fe-10Al-4Cr-4Y_2O_3 ODS NANOCOMPOSITE, AIMED FOR STRUCTURAL APPLICATIONS ABOVE 1100°C

Štěpán Gamanov, Lenka Kunčická, Radim Kocich, Jakub Holzer, Natália Luptáková, Denisa Bártková and Jiří Svoboda

CEITEC Brno University of Technology, Institute of Physics of Materials, Czech Academy of Sciences, Czech Republic

Abstract:

The Fe-10Al-4Cr-4Y_2O_3 nanocomposite (FeAlOY) represents a new generation of oxide dispersion strengthened (ODS) materials, containing an order of magnitude more Y_2O_3 nanodispersion than traditional ODS materials. Unique chemical composition and optimized manufacturing route (mechanical alloying of powders, hot consolidation, and annealing) results in microstructure of elongated coarse grains (several mm in length) strengthened with Y_2O_3 nanodispersion (20-40 nm particle diameter). The ultimate tensile strength (UTS) of the FeAlOY exceeds the UTS of top Ni-based superalloys at T > 1100°C. The combination of Al, Cr and Y in the matrix results in an excellent high temperature oxidation resistance at 1200-1400°C. Moreover, the high thermal stability of Y_2O_3 nanodispersoid at 1200-1400°C ensures a rather high threshold stress for creep and thus outstanding potential of the FeAlOY for long-term applications requiring a high shape stability of the loaded hot parts. The manufacturing processes are studied to optimize for the properties of FeAlOY as well as the processing costs. Several conditions of mechanical alloying of powders, their hot consolidation and final annealing are tested and evaluated via microstructure analysis and slow tensile testing at high temperature (T = 1100°C, $\dot{\varepsilon} = 10^{-6}$). The slow tensile tests are used mainly to evaluate and compare various batches of FeAlOY prepared with different manufacturing conditions. Such slow tensile tests can also provide a good estimate for creep behaviour, which was found while testing previous batches of FeAlOY *via* both slow tensile tests and creep tests. Overall, FeAlOY has promising potential for applications such as pull rods and grips in high-temperature mechanical testing machines and later as turbine blades.

Biography

Štěpán Gamanov is PhD student, studying at the Central European Institute of Technology in Brno and working in various projects at the Institute of Physics of Materials of Czech Academy of Sciences. During his master studies at the Brno University of Technology he was interested in powder metallurgy, ODS materials, high entropy alloys and creep deformation. His dissertation topic is concentrated on High Resolution EBSD mapping of deformed creep specimens. His expertise lies predominantly in microstructure characterization *via* SEM and related techniques. However, his skills repertoire also includes TEM, and other techniques commonly used in material science and engineering. Besides his dissertation topic, he also became significantly involved in the project of Dr. Jiří Svoboda, who has been studying Fe-Al based ODS alloys for the last 8 years. Štěpán's contribution to this project includes microstructure analysis, performing of the experiments and writing and editing of the papers. His greatest contribution to the project so far resulted in his first-author publication in the Journal of Corrosion Science. Štěpán would like to continue working within the field of ODS alloys and their high temperature applications after finishing his PhD study.

PREPARATION OF NONIONIC SOFTENER BASED ON WOOLWAX AND ITS UTILIZATION IN FUNCTIONALIZATION OF TEXTILE FABRICS

Hosam El-Sayed, Salwa Mowafi and Marwa Abou Taleb
National Research Centre, Egypt

Abstract:

Textile industries utilize huge amounts of auxiliaries to impart certain desired properties to the final textile goods. Herein we prepared a non-ionic softener based on wool wax which is a by-product from the wool scouring process. Fatty acid(s), isolated from wool wax, was reacted with a bifunctional amino aliphatic compound to synthesize the proposed auxiliary. The prepared softener was utilized as a finishing agent that imparts luxurious desirable touch for selected textile fabrics with the minimum accumulated electrostatic charge. Wool wax was extracted and purified from wool fleece to obtained lanolin. The extracted lanolin was saponified followed by neutralization to obtain free fatty acid. The free fatty acid was reacted with a dihydroxy amino saturated aliphatic hydrocarbon to produce a condensate whose softening action of textile fabrics. The chemical structure of the prepared non-ionic softener was elucidated using FTIR and ^{13}C NMRC. The physical, chemical, and mechanical properties of the treated fabrics were evaluated using the appropriate methods of analysis. The scanning electron microscopy was used to monitor the change in the fibre morphology after application of the prepared softener.

Biography

Hosam El-Din Zakaria El-Sayed is a professor of Textile Chemistry and Technology at the Textile Technology Research Institute of the National Research Centre (NRC) in Cairo, Egypt. He published 86 research papers in internationally recognized highly impacted journals. He is the principal investigator, co-principal investigator, member, and consultant of 26 research projects funded from local and international organizations. He participated in more than 40 conferences around the world as an invited speaker and regular speaker. He travelled in scientific missions to Germany, USA, Poland, Czech Republic, Tunisia, Ghana, Sri Lanka, China, Kazakhstan, Japan, Italy, South Korea, Thailand, and Malaysia. Prof. El-Sayed is the former Head of the Proteinic and Man-made Fibers Department at the NRC. Currently he is the Assistant Vice President for Research at the NRC. He was awarded the National Research Centre prize of scientific appreciation in the New Technological Sciences which support the basic science, for the year 2021.

FEM- SIMULATIONS OF FATIGUE CRACK INITIATION IN THE OLIGO-CRYSTALLINE MICROSTRUCTURE OF STENTS

Lasko Galina[1], Yitong Yan[2], Siegfried Schmauder[1], Sabine Weiss[2] and Kiarash Dogahe[1]

[1]Institute for Materials Testing, Materials Science and Strength of Materials (IMWF), University of Stuttgart, Germany
[2]Branderburgische Technische Universität Cottbus-Sennfeld, Germany

Abstract:

According to the data of the World Health Organization (WHO), cardio vascular diseases take the first place in death numbers among all reasons of mortality in the developed countries, even cancer and diabetes. One of the methods to treat the disease is the application of coronary stents, which are put in the arteries to extend the vessel in order to eliminate the obstacle (the plaque) to the blood flow. A high-purity oligocrystalline austenitic steel is usually applied for the production of the stents. Among the many problems, which should be addressed, the studies of the mechanical properties of the stents, and in particular the prediction of their life cycles, are in the focus of materials research. In our contribution within the Finite Element method a many scale model of crack initiation in the microstructure of stents is elaborated. The approach is developed within the framework of the physically based Tanaka-Mura Model (TMM), considering the evolution of shear bands during the crack initiation phase. Using this model, the number of cycles for crack initiation has been predicted. The model allows analyzing the microstructure with respect to the lifecycles of real materials. Simulations of crack initiation have been performed using representative volume elements of the microstructure obtained from scanning electron microscopy. The initiation of cracks was studied numerically in detail under tensile and bending loading. Wöhler curves for crack initiation under cyclic loading conditions have been derived from the simulations. Effects of different loading conditions (tensile loading and bending) and grain orientations on the Wöhler curves have been analyzed. The Wöhler curves for crack initiation in oligocrystalline microstructures of stents could be compared with the ones in experiment taking into account that for LCF typically more than 70% of the cycles refer to crack initiation. The developed numerical tools could be used for the material design of stents. The estimations of the crack initiation lifetime in stents have been done depending on the blood pressure of the patients. The simulations of the estimated lifetime of all considered stents was predicted and lies below the fatigue strength of a stent material for load levels of blood pressure and typical heart beats.

Biography

Galina Lasko has a background in Solid State Physics from Tomsk State University and worked in the area of physical mesomechanics. In 2000 she received a Humboldt Fellowship for a research stay at the University of Stuttgart and in 2003 she joined IMWF Stuttgart, working within the frame work of research projects in the field of multiscale simulations. The expertise of Lasko lies in the area of numerical simulations of processes of plastic deformation and fracture in advanced metals, ceramics and composite materials.

NANOFRAZOR LITHOGRAPHY FOR ADVANCED 2D & 3D NANODEVICES

Zhengming Wu
Heidelberg Instruments Nano AG, Switzerland

Abstract:

NanoFrazor lithography systems were developed as a first true alternative or extension to standard mask-less nanolithography methods like electron beam lithography (EBL). In contrast to EBL they are based on thermal scanning probe lithography (t-SPL). Here a heatable ultra-sharp probe tip with an apex of a few nm is used for patterning and simultaneously inspecting complex nanostructures. The patterning depth of each individual pixel can be controlled with better than 1nm precision using an integrated *in-situ* metrology method. Furthermore, the inherent imaging capability of the NanoFrazor technology allows for markerless overlay, which has been achieved with sub-5 nm accuracy as well as it supports stitching layout sections together with < 20 nm error.

Pattern transfer from such resist features below 10 nm resolution were demonstrated. The technology has proven its value as an enabler of new kinds of ultra-high resolution nanodevices as well as for improving the performance of existing device concepts. The application range for this new nanolithography technique is very broad spanning from ultra-high resolution 2D and 3D patterning to chemical and physical modification of matter at the nanoscale. While patterning at below 10 nm resolution is achieved, an integrated laser write head for direct laser sublimation (DLS) of the thermal resist has been introduced for significantly faster patterning of micrometer to millimeter-scale features. The areas patterned by the tip and the laser are seamlessly stitched together and both processes work on the very same resist material enabling a true mix-and-match process with no developing or any other processing steps in between.

Biography

Zhengming Wu was an application and sales engineer for several years at the Aerial Ministry Research Institute before she received a MSc in physics at the University of Basel. During her PhD in Basel, she fabricated nano-devices using UV and e-beam lithography in the group of Prof Schönenberger. Afterwards she joined two startup companies which manufacture the high-tech equipment used in nano-technology research. She successfully set up and developed the sales network worldwide. Zhengming can be found at numerous international conferences, seminars and workshops where she explains the NanoFrazor technology and discusses about applications.

MACROCYCLES TETRA AZA-MICROCRYSTALLINE BACTERIAL CELLULOSE DOPED WITH MAGNETITE NANOPARTICLES CATALYTIC AND MICROBIOLOGICAL APPLICATION

Mohamed Hassen V. Baouab[1] and Emmanuel Beyou[2]

[1]*University of Monastir, Tunisia*
[2]*Lyon 1 University, France*

Abstract:

As the field of nanotechnology continues to develop, the evaluation of the catalytic and biological activity of magnetite (Fe_3O_4) nanoparticles is important for their continued application in the fine and applied chemistry field of biomedicine. We invested in this work on the evaluation of the results of research directed towards the synthesis and the characterization of cellulose complexes of the type [Tetraaza 2,3 dialdehyde microcrystalline cellulose@ Fe_3O_4] and classic complexes of the type [M ($C_{32}H_{28}N_4$)X_2], where M = Ni(II), Cu(II) and Fe(II), X = Cl- and a new complex of magnetite magnetic nanoparticles in a Schiff-based ligand: [Fe_3O_4MNP-INS-($C_{32}H_{28}N_4$)], which was prepared using a new method of Co-precipitation of coordinated ferric ion in [Fe($C_{32}H_{28}N_4$)Cl_2] complex under mild conditions. All complexes were characterized using various physicochemical techniques such as: Fourier transform infrared (FT-IR), ultraviolet and visible (UV-Vis), one-dimensional (1D), NMR spectroscopic techniques ^1H and ^{13}C, powder X-ray diffraction (PXRD), vibrating sample magnetometer (VSM), scanning electron microscopy (SEM), elemental analysis and molar conductance measurements. Furthermore, the highest magnetization at saturation was 26.56 emu.g^{-1}, obtained for [Fe_3O_4MNP-INS-($C_{32}H_{28}N_4$)], which allows easy separation by an external magnetic field. In addition to the very advanced catalytic activity for the degradation of dyes from the textile industry of the complexes [Tetraaza 2,3 dialdehyde microcrystalline cellulose@Fe_3O_4], the *in vitro* screening of all type compounds [M($C_{32}H_{28}N_4$)X_2] against different species of bacteria and fungi shows that [Fe_3O_4MNP-INS-($C_{32}H_{28}N_4$)][1] is an effective antidote against the tested strains compared to the macrocyclic ligand and the selected complexes. The anti-tumour activity of all compounds was also examined in 3 human tumour cell lines such as U87, MDA-MB-231 and LS-174. [Fe_3O_4MNP-INS-($C_{32}H_{28}N_4$)] complex exhibits moderate and strong antitumor activity against brain cancer, colon cancer and breast cancer (U87, MDA-MB-231 and LS-174 respectively). All our results suggest that these complexes can be guided to the target site, which produces local toxic effects on tumour cells, and could thus minimize side effects on normal tissues.

Biography

Mohamed Hassen V. Baouab is a Doctor in polymer chemistry at University Claude Bernard Lyon 1-France. Professor of chemistry at the Preparatory Institute of Engineering Studies in Monastir at the University of Monastir-Tunisia. His lines of research are oriented towards biomaterials and nanotechnologies affixed in (i) Intelligent textiles with catalytic and biological applications, (ii) Fluorescent materials and applications for selective cation sensing. (iii) Theoretical modelling of statistical physics, chemical and physisorption phenomena on functionalized biomaterials. He has over 50 publications in high-impact journals, 3 patents and 3 books published in specialized publishers. Former director of the Higher Institute of Arts and Crafts of the University of Monastir-Tunisia. Coordinator of a number of multilateral research projects and active member of a number of national and international associations for the diffusion of digital and scientific culture.

IMPROVEMENT OF ELECTROSPUN CARBON NANOFIBER MATERIAL AS GAS DIFFUSION LAYER FOR PROTON EXCHANGE MEMBRANE FUEL CELL

Bertrand Roussillo, Fréderic Fouda-Onana, Jean-Baptiste Ducros, Joël Pauchet and Marc Prat

French Atomic Energy and Alternative Energies Commission, France

Abstract:

PEM fuel cells represent the future of electric vehicles. This is why improvement of its performance is a major objective of this technology. The gas diffusion layer (GDL) has a critical role in performance of the fuel cell. Indeed, it ensures gas transport, electrical and thermal conductivities, and has to prevent the cathode from flooding while keeping the membrane well hydrated. Whereas standard GDL (paper, fabric, felt) are made of carbon microfibers (~5 µm), the purpose of this work is to manufacture tailored carbon fiber at nanoscale (~10-200 nm) by electrospinning. The principle of this novel method is to apply high voltage to the tip of a syringe containing the PAN solution. Thus, the precursor is ejected, the solvent evaporates and ultra-fine fibers are retrieved on the collector. The versatility of the electrospinning method allows modifying final structure of the material (fiber size and alignment, pore size distribution) which lead to different electrical, thermal and gas transport properties of the GDL. Therefore we study the influence of several electrospinning parameters (voltage, collector speed, concentration of the precursor, or also addition of metal nanoparticles to improve electrical conductivity) on the GDL structural properties and on its performance in fuel cells. Besides, an objective of this thesis is to design empty nanofibers, resulting in a carbon nanotube material, by using a sacrificial phase in a coaxial syringe. We then proceed to a complete characterization of these homemade components through electrical and thermal measurements, and imaging techniques (SEM, X-Ray tomography, FIB-SEM). The 2D and 3D images obtained are analyzed to determine structural properties, and GeoDict Software is used to make calculation of gas transport properties from the 3D structure. To complete the characterization, performance of these electrospun GDL in a single cell is investigated. Hence, we examine the links between performance and nanostructural properties, and we establish a comparison with commercial GDL.

Biography

Bertrand Roussillo is currently working as a PhD Student in the fuel cell components laboratory of the French Atomic Energy and Alternative Energies Commission in Grenoble. He is a graduate of the French Engineering School of Caen (specialized in materials for energy), and of the Master of Caen University "Materials, Nanosciences and Energy" (MaNE). During his studies, he focused its expertise on hydrogen energy by choosing to work in a 6-month project about future of hydrogen, and writing down a state of the art of this energy. He completed his master by working in a 6-month internship with Générale du Solaire, by developing projects for the production of green hydrogen by electrolysis. After this experience, he decided to focus on the fundamental technology of fuel cells. Thus, since October 2021, he is preparing a thesis about a carbon nanofiber material produced by electrospinning and used as gas diffusion layer in the PEM fuel cell.

FLOW IMPROVERS AND PIPELINE INTERNAL COATING BENEFITS AND LIMITATIONS WITH RESPECT TO PIPELINE CAPACITY ENHANCEMENT: A CASE STUDY

Mavis Sika Okyere, Lucas Nana Wiredu Damoah, Emmanuel Nyankson and David Sasu Konadu

University of Ghana, Ghana

Abstract:

Pipeline capacity is the amount of natural gas or liquid that can be transported through a pipeline at any given time. The design capacity of a pipeline is mostly less than its operational capacity due to pipeline maintenance and backhauling that could affect available flow. A pipeline capacity is mainly associated to its diameter, its length, inlet and outlet pressure. When additional capacity is needed in a pipeline, the choices are simple:

- Add compressors / pump at select stations
- Add pipeline loops
- Increase maximum allowable operating pressure (MAOP)

An advantage is where for safety a reduction of operating pressure is required. The pipe must then be replaced, or a loop added if pressure reduction is not acceptable. However, the use of an internal coating or flow improver will permit compensating increased flow at lower operating pressures, and is a lower cost alternative. The synergetic effect of a flow improver and an internal coating with respect to throughput (capacity) enhancements have been studied theoretically on a 12-inch, 18-inch, 24-inch, 30-inch, 36-inch, and 42-inch diameter gas and oil transmission pipeline. The American Gas Association (AGA) equation, Modified Colebrook-White equations and Darcy Weisbach-equation were used to estimate the capacity of the pipeline in its existing state, after internally coating and after injecting a flow improver in the internally coated pipeline. By means of Darcy Weisbach equation, AGA equations and Modified Colebrook–White equations, it was observed that the combined use of a pipeline internal coating and a flow improver with a drag reduction rate of 70% can increase the pipeline capacity (throughput) above 116% for a gas and liquid pipeline system. The study shows that synergetic use of internal coatings and flow improvers increases the throughput or capacity of liquid and gas pipelines and is economically reasonable.

Biography

Mavis is a PhD Materials Science and Engineering student at University of Ghana. She studied MSc. Gas Engineering and Management at University of Salford, United Kingdom and BSc. Civil Engineering at Kwame Nkrumah University of Science and Technology, Ghana. She is a senior pipeline integrity engineer at Ghana National Gas Company. She has worked with LUDA Development Ltd, Bluecrest College, Pipeline Engineering Division of Worleyparsons Atlantic Ltd on the GNPC gas export pipeline project, as Structural Engineer trainee with Technip France on the Ghana jubilee oil project, Ussuya Ghana Ltd, and Ghana Highway Authority. She has published eleven (11) papers consisting of books, book chapters and journal articles, and is a member of many National and International organizations.A Specialist with extensive experience implementing and managing pipeline integrity programs of onshore high pressure gas pipeline systems and related facilities. A team player with experience of working with multidisciplinary project teams. She is organized and meticulous in both engineering work and documentation. She is proficient in technical report writing and engineering presentations. She is skilled in communicating both orally and in writing.

COMPOSITE STRUCTURES FOR EMERGENCY MEDICINE

Emilia Visileanu, Alexand Gabriela Ene, Sergiu Stelian Mayer, Diana Popescu and Alina Vladu

The National Research and Development Institute for Textiles and Leather, Romania

Abstract:

Treatments for burns have been described since ancient times. The application of dressings began in ancient times and included more and more explicit objectives of preventing infection, promoting re-epithelialization, avoiding water and heat losses, keeping the wound moist and reducing pain. The work presents complex composite matrices for haemostasis and connective tissue regeneration, formed of three layers, with structures and functions correlated with the geometric position. Layer I is a carrier, insulator and protector of the underlying layers, being elastic, resistant and submicron-porous (to block the physical access of microorganisms to the lesion), layer II – has the purpose of managing the liquid compositions in the lesion area, microporous and compressible, with open pores and high tortuosity and layer III - impermeable substrate - non-adherent, biologically inert and microporous. Comparative analysis of the biocompatibility, respectively of the MTT cell viability and LDH cell integrity tests for the textile structures, woven or non-woven, that form layer I and III, functionalized with active substances (chitosan, collagen, clay, CMC) by two methods: through fibres/ threads and by chemical treatment: padding or spraying, quantify the harmful effect of their presence on the cells belonging to a cell line, in the culture. The evaluation of the antimicrobial activity was carried out by determining the logarithmic and percentage reduction of some microbial populations. The standardized strains were used: Staphylococcus aureus ATCC 6538, Escherichia coli ATCC 8739 and Candida albicans ATCC 10231. The *in vitro* tests showed a good level of biocompatibility because the cell lines used adhered well to the fibrous surface, proliferated through the pores and interacted with surrounding fibres. Cell adhesion and growth after seeding are favoured by the surface characteristics of the materials, and various substrate-cell interactions contribute to cell adhesion and proliferation. *In vivo* studies highlight a rapid healing rate and after 7 days of treatment, 60-75% wound closure with areas of tissue regeneration was observed, depending on the type of functionalization.

Biography

Emilia Visileanu is a scientific researcher with her first degree and a PhD in sciences since 1996. During 1997-2011 General Manager of INCDTP Bucharest. The research activity focused on topics of more than 100 national and international projects (FP V, FP VI, FP VII, EUREKA, MANU NET, ERASMUS + etc.) both as project manager and member in the inter and transdisciplinary teams. Expertise in smart textiles materials obtained by classical and unconventional (electrospinning) technologies, technologies for functionalization textile materials with NP and studies on the influence of NPS on human health, textile medical devices (bandages, 3D textile structures for hernias and eventration, composite structures for healing burns etc.).The research activity was disseminated by the publishing of over 100 scientific papers in journals and proceedings volumes indexed by ISI/BDI, books and chapters of specialized books and 27 patents.

ANTIBODY-PROTEASES AS TRANSLATIONAL TOOLS OF THE NEXT-STEP GENERATION TO BE APPLIED FOR BIOINDUSTRY AND CLINICAL APPLICATIONS

Sergey Suchkov, Aleksandr Gabibov, R Holland Cheng and Harry Schroeder
Institute for Biotech & Global Health of RosBioTech, and A.I. Evdokimov MGMSU, Russia

Abstract:

Abs against myelin basic protein/MBP endowing with proteolytic activity (Ab-proteases with functionality) are of great value to monitor demyelination to illustrate the evolution of multiple sclerosis (MS). Anti-MBP autoAbs from MS patients and mice with EAE exhibited specific proteolytic cleavage of MBP which, in turn, markedly differed between: (i) MS patients and healthy controls; (ii) different clinical MS courses; (iii) EDSS scales of demyelination to correlate with the disability of MS patients to predict the transformation prior to changes of the clinical course.

Ab-mediated proteolysis of MBP was shown to be sequence-specific whilst demonstrating five sites of preferential proteolysis to be located within the immunodominant regions of MBP and to fall inside into 5 sequences fixed. The activity of Ab-proteases in combination with the sequence-specificity would confirm a high subclinical and predictive (translational) value of the tools as applicable for personalized monitoring protocols. Ab-proteases can be programmed and re-programmed to suit the needs of the body metabolism or could be designed for the development of principally new catalysts with no natural counterparts. Further studies on targeted Ab-mediated proteolysis may provide a translational tool for predicting demyelination and thus the disability of the MS patients.

Biography

Sergey Suchkov was born in the City of Astrakhan, Russia, and graduated from Astrakhan State Medical University. In 1985, maintained his PhD at the Institute of Medical Enzymology. In 2001, maintained his Doctor Degree at the National Institute of Immunology, Russia. From 1989 through 1995, was serving a Head of the Lab of Clin Immunology, Helmholtz Eye Res Institute in Moscow. From 1995 through 2004 - a Chair of the Dept for Clin Immunology, Moscow Clinical Research Institute (MONIKI). In 1993-1996, was a Secretary-in-Chief of the Editorial Board, Biomedical Science, an int journal (the USSR Academy of Sciences and the Royal Society of Chemistry, UK). At present, Dr Sergey Suchkov, MD, PhD, is: Professor and Chair of the Dept for Personalized Medicine, Precision Nutriciology & Biodesign of the Institute for Global Health of MGUPP, and Professor, Dept for Clinical Immunology, A.I. Evdokimov Moscow State University of Medical and Dentistry, Russia. Member:New York Academy of Sciences, USA; American Chemical Society (ACS), USA; American Heart Association (AHA), USA; European Association for Medical Education (AMEE), Dundee, UK; EPMA (European Association for Predictive, Preventive and Personalized Medicine), Brussels, EU; ARVO (American Association for Research in Vision and Ophthalmology); ISER (International Society for Eye Research); Personalized Medicine Coalition (PMC), Washington, DC, USA.

EFFECT OF QUANTUM CONFINEMENT ON ELECTRICAL PROPERTIES IN GaInP SEMICONDUCTOR LASER DIODE STRUCTURES

Mohammed Saad Al-Ghamdi and SD Al-Sahafi
King Abdulaziz University, Saudi Arabia

Abstract:

In this study, we have investigated the effect of quantum confinement on electrical properties in GaInP semiconductor laser diode structures. The GaInP semiconductor laser was grown on GaAs substrate using molecular beam epitaxy (MBE) technique. The devices structures, which are used in this study, contain either bulk, quantum well or quantum dot layers that all made of GaInP material and the variation between these structures are found in the degree of confinement for the carriers in these structures. The electrical parameters such as series resistance (Rs) and ideality factor (n) are calculated depending on the measurements of the current-voltage characteristic (I-V) at the temperature range of 77 K to 400 K with stepping of 25 K. The change of Rs and n with temperature for the three structures are plotted in two of the Figures that will be shown. From these figures, Rs and n are both generally decrease with increasing temperature. This decrees is due to the thermal energy for the carriers to be more released from their atoms which cause Rs to be decreased while this thermal energy enhance the carriers to transform thermionically which the an ideal way for its transition and hence decreasing n. The value of n approaches 1 as the carriers in the semiconductor laser diode transforms ideally. The effect of quantum confinement cause a decrease to Rs due to high carrier transition efficiency and increase to n due to the existence of barrier walls that account for the carrier's field emission. This is the main reason for high n in the structure.

Biography

Mohammed Saad Al-Ghamdi completed his Ph.D degrees at Cardiff University UK in 2010. Afterword he got position at King Abdulaziz University in Saudi Arabia. Then he established the optoelectronic laboratory at King Abdulaziz University. He supervised more than 10 postgraduate students and received more than 8 funded projects form outside and inside the university. Dr. Al-Ghamdi research interest includes the design and fabrication of semiconductor devices laser diode and studies the optoelectronic and electrical properties of these devices by measuring their absorption, spontaneous, stimulated emission spectra, ideality factor, barrier height and series resistance. The current research topics include red emitters quantum dot laser diode which used in photodynamic therapy for cancer treatment and also used in the manufacture of dual wavelength sources for data storage. Dr. Al-Ghamdi has over 35 publications that have been cited over 400 times, and his publication h-index is 12. He is a member of IEEE and OSA societies.

EXPLORING CYCLODEXTRIN/HYALURONAN MULTIFUNCTIONAL DELIVERY SYSTEMS FOR ANTICANCER THERAPY

Lakshmi Sathi Devi, Cristina Casadidio, Maria Rosa Gigliobianco, Piera Di Martino and Roberta Censi

University of Camerino, Italy

Abstract:

In the field of drug delivery systems, Polymeric Nanoparticles (PNPs) are promising candidates due to their tunability, biodegradability, and nano-scale dimensions that help with controlled release rate, drug dosage, and reduced side effects. Moreover, their high versatility allows the feasible release of both hydrophobic and hydrophilic molecules, and also improves targeted delivery *via* surface modification. Thus, PNP systems can boost therapeutic efficiency and multi-functionalities such as combination treatment and theranostics, to attain high sensitivity and specificity toward tumor areas. The aim of the study is to explore different methods of designing β-cyclodextrin-hyaluronic acid delivery systems crosslinked *via* Michael addition reaction. The process involves the functionalization of either cyclodextrin or hyaluronic acid with a nucleophile to act as Michael donor (thiol groups). This product is then allowed to react with an α,β-unsaturated carbonyl compound that acts as Michael acceptor (vinyl sulfone groups). The process also involved playing around with different degrees of substitutions of both functionalizations (thiols and vinyl sulfones). The formulated nanoparticle-based systems were subjected to structural and morphological characterizations such as nuclear magnetic resonance (NMR), Fourier transform infrared spectroscopy (FT-IR), RAMAN spectroscopy, rheology, dynamic light scattering (DLS), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). The structure of the obtained products was confirmed using NMR and FT-IR. The qualitative understanding of the crosslinks in the systems was studied using RAMAN, while DLS, SEM, and TEM helped to understand the particle size and morphology of the systems. Encapsulation and release studies of the systems were performed and evaluated using a hydrophobic model molecule (docetaxel) and a hydrophilic model molecule (bovin serum albumin). While β-cyclodextrin could hold hydrophobic moiety, hyaluronic acid has affinity to hydrophilic molecules. Thanks to their exclusive properties, β-cyclodextrin-hyaluronan conjugation could result in successful multifunctional delivery systems for co-delivery, combinatorial therapeutic strategies, and theranostic in cancer treatment.

Biography

Lakshmi Sathi Devi is a second-year doctoral student in Chemical and Pharmaceutical Sciences and Biotechnology at the University of Camerino in Italy. Lakshmi's research majorly focuses on exploiting polymer science and nanotechnology for designing and developing advanced multifunctional delivery systems. Focusing on early diagnosis followed by treatment ideology, she is currently working on developing polymeric nanoparticle-based systems for theranostic and combination therapeutic strategies against cancer. Her supervisors are Prof. Piera Di Martino and Prof. Roberta Censi. Lakshmi received her Master's degree in Chemistry and Advanced Chemical Methodologies from the University of Camerino, Italy. She completed her Bachelor's degree in Chemistry from Mar Thoma College, Kerala, India. As a researcher, her passion is in understanding the connection of nanotechnology-based studies with real-life applications, especially in the biomedical and pharmaceutical fields. And being a chemist, she has expertise in utilizing her critical thinking and applying her laboratory experiences to corresponding research aims.

A NOVEL PHYSICAL MECHANISM TO MODEL BROWNIAN YET NON-GAUSSIAN DIFFUSION: THEORY AND APPLICATION

Francisco E Alban-Chacón[1], Erick A Lamilla-Rubio[2] and Manuel S Alvarez Alvarado[1]

[1]*Escuela Superior Politécnica del Litoral, Ecuador*
[2]*Universidad de Guayaquil, Ecuador*

Abstract:

In the last years, a few experiments in the fields of biological and soft matter physics in colloidal suspensions have reported "normal diffusion" with a Laplacian probability distribution in the particle's displacements (i.e., Brownian yet non-Gaussian diffusion). To model this behaviour, different stochastic and microscopic models have been proposed, with the former introducing new random elements that incorporate our lack of information about the media and the latter describing a limited number of interesting physical scenarios. This incentivizes the search of a more thorough understanding of how the media interacts with itself and with the particle being diffused in Brownian yet non-Gaussian diffusion. For this reason, a comprehensive mathematical model to explain Brownian yet non-Gaussian diffusion that includes weak molecular interactions is proposed in this paper. Based on the theory of interfaces by De Gennes and Langevin dynamics, it is shown that long-range interactions in a weakly interacting fluid at shorter time scales leads to a Laplacian probability distribution in the radial particle's displacements. Further, it is shown that a phase separation can explain a high diffusivity and causes this Laplacian distribution to evolve towards a Gaussian *via* a transition probability in the interval of time as it was observed in experiments. To verify these model predictions, the experimental data of the Brownian motion of colloidal beads on phospholipid bilayer by Wang et al. are used and compared with the results of the theory. This comparison suggests that the proposed model is able to explain qualitatively and quantitatively the Brownian yet non-Gaussian diffusion.

Biography

Francisco E. Albán-Chacón received his bachelor's degree in Physics at Pennsylvania State University, PA, US in 2018. He is currently pursuing a master's degree in Physics at University of Heidelberg, Germany, while working as a researcher. His research interests are: stochastic dynamics and statistical physics in general, most recently to model biophysical and soft matter systems and particle swarm optimization *via* quantum mechanics and application to physics.

LIGAMENT SCAFFOLDS BASED ON PLA/GRAPHITE NANOPLATELET COMPOSITES

Magda Silva, Isabel Pinho, Hugo Gonçalves, Ana C Vale, Maria C Paiva, Natália M Alves and José A Covas

University of Minho, Portugal

Abstract:

The anterior cruciate ligament (ACL) of the human knee is often injured, requiring surgical intervention with auto- or allografts, with limitations that have prompted the development of tissue-engineered scaffolds. The major scaffold requirements concern biocompatibility, degradability and mechanical performance. Polylactic acid (PLA), a biocompatible and biodegradable polymer, was reinforced with graphite nanoplatelets (GN) (0.5 and 2wt.%) to form composite filaments by melt drawing. GN were also functionalized to form a strong interface with PLA (PLA+f-GN), and decorated with silver nanoparticles [PLA+((f-GN)+Ag)]. The composite filaments were used to produce ligament scaffolds by conventional braiding and by 3D-printing technology, controlling the size and pore structure. All constructs exhibited high porosity (> 60 %), pore interconnectivity, and pore size suitable for ligament tissue ingrowth. The wet state dynamic mechanical analysis at 37°C revealed an increase in the storage modulus of the scaffold constructs, compared to neat PLA scaffolds. Both braided and 3D-printed scaffolds presented storage moduli similar to that of the native ligament, with the 3D-printed scaffolds exhibiting the most approximate value. The tailorable structure of the braided scaffolds, and the reproducibility, speed, and simplicity of the 3D-printing process allowed to obtain two different scaffolds suitable for ligament tissue engineering.

Biography

Magda Silva has a Master in Biomedical Engineering at the University of Minho, Portugal. She is currently finishing her PhD thesis at the University of Minho on the doctoral program Science and Engineering of Polymers and Composites. In 2018 she was awarded a PhD scholarship from the Portuguese Foundation for Science and Technology in the topic "A new approach for ligament regeneration based on graphene nanocomposites". She has multiple published articles and was speaker in several conferences throughout her work.

EFFECT OF BARRIER WIDTH ON OPTOELECTRONIC PROPERTIES OF InAsP QUANTUM DOT LASER DIODES

Mohammed Saad Al-Ghamdi, NM Almalky, R Sait and IB Karomi
King Abdulaziz University, Saudi Arabia

Abstract:

In this work, InAsP quantum dots (QDs) is used as an active region with AlGaInP matrix barrier materials in semiconductor laser device structures. Barrier layer thickness separating the QD structure in QD laser diode devices can modify the optical properties and the performance of these devices. Here, three series of InAsP QD laser structures were papered with different barrier widths (i.e., 8, 16, and 24 nm) of (AlGa)InP quantum-wells. The device structures are designed as follows; GaAs as buffer material, GaInP as a cap material, AlInP as a cladding layer, InAsP as QDs material, and AlGaInP as a barrier material. The metal-organic vapor phase epitaxy (MOVPE) is used to grow these material structures at 730°C in a low-pressure horizontal flow reactor. The effect of different barrier widths, on the performance of laser devices in terms of threshold current density over a wide range of temperatures (190 k- 390 k) and the lasing emission spectra at room temperature are investigated in this article. The results showed that the barrier widths of 8 nm exhibited the lower threshold current density of a 2 mm cavity length uncoated facets laser in corporation with 16 and 24 nm barrier width laser samples over the measured temperatures. Moreover, emission wavelength measurements have been revealed to increase in read-shift with decreasing barrier thickness and the sample with an 8 nm barrier exhibited the longest wavelength of approximately 770 nm. Furthermore, the longer wavelength for 8 nm barrier InAsP QDs laser device makes it good candidates in several applications such as biphotonic, DVD laser, transmission deeper into blood tissue, microvasculature, and photodynamic therapy.

Biography

Mohammed Saad Al-Ghamdi completed his Ph.D degrees at Cardiff University UK in 2010. Afterword he got position at King Abdulaziz University in Saudi Arabia. Then he established the optoelectronic laboratory at King Abdulaziz University. He supervised more than 10 postgraduate students and received more than 8 funded projects form outside and inside the university. Dr. Al-Ghamdi research interest includes the design and fabrication of semiconductor devices laser diode and studies the optoelectronic and electrical properties of these devices by measuring their absorption, spontaneous, stimulated emission spectra, ideality factor, barrier height and series resistance. The current research topics include red emitters quantum dot laser diode which used in photodynamic therapy for cancer treatment and also used in the manufacture of dual wavelength sources for data storage. Dr. Al-Ghamdi has over 35 publications that have been cited over 400 times, and his publication h-index is 12. He is a member of IEEE and OSA societies.

Day 2

Materials Science & Nanomaterials Conference 2023

Keynote Presentation

A NEW GREEN NANOTECHNOLOGICAL PROCESS FOR GOLD EXTRACTION

Henrique Eisi Toma
Universidade de São Paulo, Brazil

Abstract:

The extraction of gold is of great interest to our society and economy, however it also brings many concerns, by involving adverse conditions and extremely toxic reagents, such as cyanide ions and mercury. Recently, we have shown that gold ions can be quantitatively converted into gold nanoparticles using a non-toxic reagent such as the ranelate ions, in aqueous solution, at room temperature. The resulting ranelate coated nanoparticles (AuNP@Ran) are very stable, exhibiting negative zeta potentials. In this way, they can be successfully employed to interact with positively charged magnetite (MagNP = Fe_3O_4) superparamagnetic nanoparticles, forming associated species which can be easily attracted by a magnetic field. This type of process, denoted magnetic nanohydrometallurgy, has proven very effective for the capture and separation of the chemical elements from the minerals. (Hydrometallurgy, 2022, 213, 2022, 105936). In this work, the nature of the associated species involving gold and superparamagnetic nanoparticles, AuNP@Ran//MagNP, has been investigated by microscopy techniques, dynamic light scattering, EDX, confocal and Raman spectroscopy. It was found that the nanoparticles are linked by strong electrostatic and coordination bonds through the ranelate ions. The results provided important clues for the application of the magnetic nanohydrometallurgy in the processing of gold, under green conditions.

Biography

Henrique E. Toma is supervising a research group in supramolecular nanotechnology at the University of São Paulo. He is author of about 475 ISI indexed papers and patents, 15 books and has received about 25 national and international prizes in science and literature. Google Scholar encompasses 13250 citations with h = 54.

Day 2

Materials Science & Nanomaterials Conference 2023

Oral Presentations

EASILY-DYEABLE POLYPROPYLENE FABRIC USING OXYGEN OR NITROGEN PLASMA-MEDIATED TREATMENTS

Asmaa Fathy Elfiky, Marwa Abou Taleb, Salwa Mowafi, and Hosam El-Sayed
National Research Centre, Egypt

Abstract:

Some polymeric materials, such as polypropylene, exhibit excellent properties of specific strength (lightness combined with good mechanical strength) with chemical inertia. Polypropylene is one of the most difficult polymeric materials to treat because it has poor adhesive properties and high chemical barrier responses. This work aims to adopt an easy applicable eco-friendly method to render polypropylene certain desired properties and functions suitable for clothing and applications. Activation of polypropylene surface was carried out using plasma discharge (oxygen or nitrogen). Two eco-friendly biopolymers; namely keratin or sericin, were extracted in our laboratory from their renewable natural resources. The said biopolymers were applied to the plasma-pretreated polypropylene fabrics using pad-dry-cure or exhaustion method. Plasma/biopolymers-finished polypropylene fabrics exhibited multifunctional properties including antimicrobial and ultraviolet protection that make it suitable for packaging. Moreover, the hydrophilicity and comfortability of polypropylene fabrics were enhanced which make it more appropriate for clothing field. The dyeability of the treated fabrics with acid, reactive and basic dyes was investigated. The alteration in the chemical composition of the treated polypropylene fabric was assigned using FTIR, EDX, and ^{13}C-NMR. The work has ecological, commercial and socioeconomic positive impacts. The use of eco-friendly method for activation of polypropylene surface, without need of aggressive chemicals, and the use of biopolymers (keratin and sericin) which are available as byproducts from textile industry (ecological demand). Obtaining polypropylene with multifunction properties will make it suitable for packaging and textile applications (commercial and socio-economical demand). Applying plasma technology in treatment of textiles will save large amounts of water and energy which is traditionally used in textile wet processing.

Biography

Asmaa Fathy Elfiky is a chemist graduated from the Faculty of Science, Menoufia University in 2016 with grade of "Excellent with honour degree". Mrs. Asmaa Ekfiky is a PhD student and her point of research is related to the Chemistry and Technology of Proteinic Fibres and Polymers. She is an assistant researcher at the Textile Research and Technology Institute, National Research Centre, Cairo, Egypt.

International Conference on
Materials Science and Engineering
&
International Conference on
Nanomaterials and Nanotechnology
March 27-28, 2023 | Paris, France

THE ART OF PREPARATIONS OF PFCE ENCAPSULATED PLGA NANOPARTICLES USING SONICATION AND HOMOGENISATION

Joice Maria Joseph[1], Cristina Casadidio[1], Qisan Ma[1], Maria Rosa Gigliobianco[1], Alvja Mali[2,3], Bita Mahdavi Firouzabadi[1], Mangala Srinivas[2,3], Roberta Censi[1], and Piera Di Martino[1,2]

[1]*University of Camerino, Italy*
[2]*Università degli Studi Gabriele d' Annunzio, Italy*
[3]*Leiden University Medical Center, Italy*

Abstract:

Perfluorocarbons (PFC) are unique molecules which have been used as blood substitutes and studies are underway regarding their use as contrast agents in noninvasive imaging techniques like fluorine magnetic resonance imaging (^{19}F-MRI). Since they possess simultaneous hydrophobic and lipophobic nature, it is encapsulated inside a biocompatible system to form a PFC-delivery system. Polymeric nanosystems with polylactic - *co* - glycolic acid (PLGA) is widely used for clinical formulations befitting to their biodegradable and biocompatible attributes and it is used in several FDA-approved therapeutic systems making them a suitor for PFC - delivery system. PFCs like perfluoro-15-crown-5-ether are predominantly used pertaining to the presence of 20 fluorine atoms in the same chemical environment. We have used PLGA for encapsulation of PFCE using homogenisation and sonication by emulsification for *in vivo* imaging. The techniques include homogenisation using ultra turrax, sonication using a sonicator and combined sonication and homogenisation process and studied their loading capacity (L.C) and encapsulation efficiency (E.E). Parameters including the molecular weight of the polymer, molecular weight of the surfactant (polyvinyl alcohol), the volume of PFCE and the washing conditions were studied to understand their individual role in the formulation. Nanoparticles of sizes 170 nm to 900 nm were formulated using these techniques and loading capacity as high as 70 percent. In conclusion, we have prepared customizable nanoparticles concerning their size and loading capacity.

Biography

Joice Maria Joseph is a third-year PhD student at the University of Camerino, Italy. She was working on the European project NOVA-MRI (Novel Applications in ^{19}F Magnetic Resonance Imaging), where the focus is to find a new contrast agent for magnetic resonance imaging. She has concentrated her work on the nanoformulation of these contract agents, mainly with polylactic-*co*-glycolic acid (PLGA) polymers.

EXPERIMENTAL INVESTIGATION OF DIFFERENT SPINDLE ROTATIONAL SPEED AND CONSTANT ACCELERATION ON MECHANICAL PROPERTIES AND MICROSTRUCTURE OF ALUMINIUM 6082T651 DURING FRICTION STIR WELDING

Mothibeli Pita
University of South Africa, South Africa

Abstract:

It is imperative to select the correct parameters during friction stir welding process. In this paper, analysis was conducted on the mechanical properties and microstructure of aluminium 6082T651 welded by friction stir welding at different spindle rotational speeds (500, 550, 600 and 650 rpm) and constant acceleration of 250 mm/min. Microstructure on base metal (BM), heat affected zone (HAZ) and weld zone were characterized by light microscope. Hardness and tensile test were conducted on weld zone. The results will be analysed and presented on the manuscript.

Biography

Mothibeli Pita is currently a senior lecturer, and associate chair of lab commercialization and collaboration at the University of South Africa in the Department of Mechanical Engineering (South Africa). He obtained his PhD in 2020 at the University of Johannesburg specializing in physical material processing. He holds a Bachelor of Engineering in Mechanical Engineering from Central University of Technology Bloemfontein and a Master's degree in Engineering Management at University of Johannesburg. He is the solar car project coordinator at University of South Africa.

GOLD NANOPARTICLE-BASED POINT-OF-CARE SENSOR FOR RAPID AND SIMULTANEOUS DETECTION OF MULTIPLE DOPING IN BLOOD AND URINE SAMPLES

Chang Liu,Wenjing Liu, Huixin Li, Mujia Liu, Jingshu Xu, Hantao Ke, Chengyi Hu, Yaxiu Hui, Mingkai Wang, Jinxin Qi, Jinqi Wang and Ruirui Gao

Beijing Sport University, China

Abstract:

Doping is contrary to medical ethics and the spirit of sport, undermines the principle of fair play and damages the reputation of nations, and is strictly prohibited in almost all countries and by all major sporting organizations in the world. Traditionally, samples had to be collected, stored and transported to large doping control laboratories for testing. This process is often costly, time-consuming and makes it difficult to examine the entire sample pool comprehensively and quickly. Point-of-care testing (POCT) has the capability to provide rapid on-site detection in resource-limited conditions. However, most POCT sensors can only detect a single substance in each measurement, which in most cases does not meet the requirements of simultaneous multi-components analysis. We report that a simple POCT detection sensor assembled from gold nanoparticles (AuNPs) with multiple aptamers promises not only fast and ultra-sensitive detection of testosterone (TES), but also simultaneous analysis of multiple dopings in blood and urine samples within seconds. Visual detection of multiple dopings has been successfully achieved in a single sensor. The mechanism is that stronger interactions between the aptamers and the dopings in the presence of the dopings induce the detachment of the aptamers from the AuNPs, and subsequent aggregation of the AuNPs under high salt conditions may further lead to significant changes in the color of the solution. In addition, a labelled fluorescence resonance energy transfer (FRET) platform based on cationic conjugated polymers and aptamers was constructed for the hyper sensitive and specific detection of ractopamine. The method has a wide linear range from 0.05 to 500 uM and a detection limit as low as 47 nM, ensuring sensitive detection of food-derived dopings.

Biography

Chang Liu holds a PhD in epigenetics of ageing from the Department of Dermatology and Allergy at the Technical University of Munich in Germany, an MSc in pharmaceutics from Peking University in China, and a BSc in pharmaceutics from South Central University for Nationalities in China. From November 2021 until May 2022, he served as a section member for the General Administration of Sport of China's Division of Science and Education. From June 2022, he will be working as a lecturer at Beijing Sport University's School of Sport Science's Department of Sport Biochemistry. In 2015, he received the Guanghua Scholarship from Peking University, and the Technical University of Munich gave him a PhD summa cum laude (top 1%) (2021).

Bi_2Se_3/SWCNT HETEROSTRUCTURES AS A PERSPECTIVE ANODE FOR LITHIUM-ION BATTERIES

Donats Erts, V Lazarenko, Y Rublova, R Meija and J Andzane
University of Latvia, Latvia

Abstract:

In recent decades, lithium-ion batteries (LIBs) dominate the energy storage field. While conventional LIBs are based on organic solvent-based electrolytes, aqueous electrolyte-based rechargeable lithium-ion batteries (ARLIBs) have also drawn research attention as cost-effective, safe, and environmentally friendly energy storage devices. Among the battery components, an anode is of great importance for the reliable and effective performance of the battery. One of the promising anode materials for application in LIBs is Bi_2Se_3, whose performance can be further improved by adding carbon nanotubes (CNT), generally by mixing approach. In this work, we present the application of nanostructured Bi_2Se_3 thin films as anodes in ARLIBs and Bi2Se3/single wall CNT (Bi_2Se_3/SWCNT) heterostructures as anodes in organic solvent-based LIBs. In contrast with previous studies, the Bi_2Se_3/SWCNT anodes were fabricated not by mechanical mixing, but by direct growth of Bi2Se3 on SWCNT networks by physical vapor deposition. Such a fabrication method ensures direct electrical and mechanical contact between Bi_2Se_3 and SWCNTs, which can improve the performance of the anode material in a battery application. In turn, bare Bi_2Se_3 nanostructured thin films were deposited on glass substrates. The electrochemical behaviour of Bi_2Se_3 nanostructured thin films was investigated in aqueous 5 M LiNO3 electrolyte. Bi_2Se_3 nanostructured thin films with formed solid electrolyte interphase (SEI) layer showed the highest capacity among reported state-of-the-art anode electrodes for aqueous electrolyte-based LIBs. The performance of anodes fabricated from heterostructures obtained by deposition of Bi_2Se_3 on SWCNT networks with different Bi_2Se_3 and SWCNT mass ratios was investigated for perspective application in organic solvent-based LIBs. It was found that the novel Bi_2Se_3/SWCNT electrodes demonstrated higher capacity in comparison to the anodes fabricated by mixing components.

Biography

Donats Erts obtained his degree of candidate of chemistry sciences (in 1992 equated to Dr. Chem.) from the Institute of Inorganic Chemistry, Academy of science of Latvian SSR. His PhD theses were devoted to the luminescence of radiation defects in alkali halides during dissolution. After graduating from Latvian State University in 1978, he continued to work at the University. From 1992 to 2009 he was a part-time visiting researcher at the Chalmers University of Technology, Sweden, Cork, and Dublin University Colleges. Ireland. D. Ert's research interests are synthesis, properties, and perspective applications of nanostructured materials in a variety of areas, including but not limited to nanoelectromechanics, thermoelectrics, batteries, quantum devices, and sensors. Currently, Donats Erts holds a Professor position at the Faculty of Chemistry, he is also a Leading Researcher and Deputy Director of the Institute of Chemical Physics (Director anActing Director 2002-2021), University of Latvia. Donats Erts is a Full member of the Academy of Science of Latvia. He is the author and co-author of more than 160 papers (h-index = 30), 2 book chapters, 3 review papers, 1 EU and 6 Latvia patents.

THE EFFECTIVENESS OF RUTIN IN IMPROVING ANTICANCER EFFECT AND STABILITY OF PEGylated NANOLIPOSOMES

Ali Al-Samydai, Lidia K Al Halaseh, Moath Al Qaraleh, Mohamad A K Mousa Maryam abdulmaged, Tabarek Hasan Mahmood, Rand Karem, Noorin Al-Ekaid, Fatima Alshaikh and Hasanain alzaidi
Al-Ahliyya Amman University, Jordan

Abstract:

Flavonoids are one of the most important active phytochemicals in plants and have proven their value as a source of molecules obtaining a therapeutic effect due to their antioxidant, anti-radical, estrogenic, anti-inflammatory, antiviral, antitumoral, and cytotoxic properties. Recent studies have shown that Rutin has profound anticancer effects in several types of human cancers. Rutin is one of the most often received dietary flavonoids by humans in the form of vegetables, fruits, and plant-derived drinks such as green and black tea. Rutin acts on cancerous cells by triggering apoptosis and stopping cell cycle progression in carcinogenic cell lines. It also boosts the antioxidant defense system by raising antioxidant biochemical/enzyme levels, making it more toxic-resistant. Liposomes are useful carriers for the targeted delivery of anticancer drugs. These nanocarriers solve the unwanted issues, allowing phytochemicals to be enclosed in nanoliposomes to have better pharmacokinetic features, increased anti-cancer action, and improved selectivity when compared to free drugs.

Aim: To investigate the impact of Rutin loaded into PEGylated Nanoliposomes loaded with oleuropein, and camptothecin to increase stability and activity.

Methodology: Thin film hydration method has been applied to prepare the formulation, Dynamic light scattering has been used to determine size, charge and polydisperse index. The stability of nanoparticles has been observed for one month. cytotoxicity against breast, lung and colorectal cancer has been studied. Finally, Rutin-loaded PEGylated nanoliposomes have been compared with PEGylated nanoliposomes not carrying Rutin in terms of selectivity.

Results: Rutin-loaded nanoliposomes in oleuropein and camptothecin have shown improvement in the formulation in terms of selectivity, anti-cancer activity as well as increased stability compared with oleuropein and camptothecin alone .

Conclusion: Rutinylated nanoliposomes have improved the anticancer activity, selectivity and stability of drugs loaded in PEGylated Nanoliposomes.

Biography

Ali Mahmoud Al-Samydai, PhD, Nanophytosome (Nano-based drug delivery systems), Assistant Professor at Al-Ahliyya Amman University, Faculty of Pharmacy, Department of Pharmaceutical and Pharmaceutical Technology, is interested in developing novel Nanoliposmes and Nanophytosome models, resulting in a formulation having higher activities by promoting pharmacokinetic and pharmacodynamic properties compared to the conventional drugs and herbal extracts. Currently, Dr. Al-Samydai is investigating the anti-cancer, anti-inflammatory, and wound healing activities of a novel model of encapsulated phytoconstituents in lipid-based nanoparticles. He published 43 articles in the fields of pharmaceutical sciences and pharmaceutical technology and had 32 articles indexed in SCOPUS from 2018–2022.

NEW GENERATION OF DRUG DELIVERY SYSTEM BASED ON STIMULI-RESPONSIVE PARTICLES (CAPSULES, POROUS PARTICLES…)

Sabrina Belbekhouche, Clea Chesneau, Malak Alaa Eddine, Sixtine De Chateauneuf
Université Paris-Est Créteil, France

Abstract:

Recent progress in supramolecular chemistry leads to unparalleled control over the composition and shape factor of colloidal systems. Among them, the design of capsules is a new expanding area of physical-chemical research. Here, we report on the development of tailor made polymer capsules for potential applications in biomedical field. The primary focus is to enhance the loading/release of therapeutic agents. The implemented strategy is mainly based on colloidal templating and self-assembly. Size, dispersity and concentration of the nanocapsules are easily fixed by the initial nanoparticle template, while wall thickness is dependent on the number of layers. The present strategy is advantageous in comparison with other synthetic routes because at all steps, only water is used as a solvent and not organic one. The possibility to control the mechanical property of the capsules brings new promising property which will be evidenced during the talk. The benefits of using these capsules will be presented in numerous biological applications.

Biography

Sabrina Belbekhouche is an Associate professor (East-Paris Institute of Chemistry and Materials Science University of Paris, France). Her core expertise is in polymer science, macromolecular assembly and surface modification. This includes the polymer synthesis; the study of the physical chemistry of surfaces/interfaces; and the use of controlled assembly at the sub-micrometer scale (nanoparticle, nanocapsule...) as well as stimuli-responsive systems. Current applications of her research are mainly for biological application.

METAL NANOSTRUCTURES FOR ELECTROCHEMICAL ENERGY CONVERSION AND STORAGE

Sudip Barman
National Institute of Science Education and Research (NISER), India

Abstract:

The hydrogen evolution reaction (HER) and hydrogen oxidation reaction (HOR) in aqueous medium are two fundamental reactions for the development of non-fossil energy storage and conversion devices. In the polymer electrolyte membrane fuel cell (PEMFC) carbon supported platinum (Pt/C) based catalysts are universally used in cathodes and anodes; however, the poor durability of Pt/C due to degradation of the catalyst in the strongly oxidizing environment prevents its widespread applications. It remains a great challenge to develop new electro catalysts with superior activity and very high durability for the HER/HOR. This study involves the synthesis of metal nanostructures on nitrogen doped carbon (MNSs-N@C; M=Pt, Pd etc.) composite for their superior activity and high durability toward the HER/HOR in acidic and alkaline media. These MNSs-N@C electro catalysts exhibited 3-5 time higher HER/HOR activity than that of commercial Pt/C in alkaline media whereas MNSs-N@C and commercial Pt/C catalysts are of similar HER/HOR activity. The stability tests of these catalysts were done through a large number of repeated potential cycles and long-term electrolysis. These confirmed the exceptional durability of these catalysts, which is much better than that of commercial Pt/C catalysts. Furthermore, these catalysts have also displayed superior HOR activity, measured by a rotating-disk experiment with a broad range of pH (0–14) in different buffer solutions. The HER/HOR activities of MNSs-N@C composite in different buffer solutions were correlated with the hydrogen binding energy (HBE) of the catalyst surface. The HER/HOR activity gradually decreases with an increase in the HBE as the solution pH increases.

Biography

Sudip Barman is an Associate Professor in School of Chemical Sciences, National Institute of Science Education and Research (NISER) Bhubaneswar, Odisha, India. He received his PhD degree from Indian Institute of Science (IISc), Bangalore, Karnataka, India. He joined NISER Bhubaneswar as assistant professor in 2009. His research interest includes design and development of nanostructured materials for electrochemical energy storage and conversion such as electrochemical water splitting, Supercapacitors, Sodium ion batteries, electrochemical CO_2 reduction etc.

NANOTECHNOLOGY: THE EMERGING FIELD FOR REMEDIATION, RESTORATION AND CLEANUP OF LIQUID PETROLEUM HYDROCARBON SPILLAGE

M S Haruna, C S Ezeanyanaso and M F Olagoke
National Agency for Science and Engineering Infrastructure, Nigeria

Abstract:

One of the greatest disasters to humanity across the globe till date is the imperiling of biota as a result of environmental pollution caused by petroleum hydrocarbon through oil spillage. By definition, oil spillage is referred to as the anthropogenic release of liquid petroleum hydrocarbons into the natural environment. It is evident that the entire humanity rely heavily on crude oil because of the huge benefit it offers as a limitless source of energy that drives further advancements, industrialization and economic prosperity across the world. What this simply means is that, for as long as the demand and utilization of crude oil keeps rising, its exploration and production will inevitably exacerbate the degradation and deprivation of the environment directly or indirectly. Torrent of negative impacts abounds from liquid petroleum hydrocarbon spillage. These include horrendous damage to marine ecosystem, loss of fertile land/soil for vegetation, soil erosion and flooding, extirpation of air and water quality, obliteration of trees and plants, extinction of human and animals, socio-economic catastrophe (poverty and hunger), annihilation of infrastructures as well as irreparable damage to humans (respiratory damage, liver and kidney damage, decreased immunity, increased cancer risks, reproductive damage and higher levels of some toxics like heavy metals build up in human bodies). All of these undesirable consequences of crude oil spillage have necessitated the need over the years to proffer effective solutions to the challenges of oil spills. Numerous conventional approaches such as the use of sorbents, use of dispersants, bioremediation, burning as well as use of skimmers and boom have been devised over the years in the removal of liquid petroleum hydrocarbon from contaminated sites. None of these conventional approaches holds the key to more effective oil spill remediation, restoration, recovery and cleanup on a large scale due to some downsides associated with them which may even cause secondary environmental damage. What is trending currently in research recommends that oil spill remediation using engineered nano-materials is a more effective option than the conventional methods. Hence, the use of Nano-science and Nanotechnology may be the anticipated environmental technology breakthrough discovery appropriate to assuage environmental damage through effective nano-remediation and subdue the severity that comes with crude oil spillage in the future. Although, nano-materials for oil spill remediation, restoration and recovery are still in their incipient stage but they potentially offer sustainable novel solutions to oil spill cleanup in the future as a result of their improved, superior performance and response coupled with their cheap, simple, non-toxic and eco-friendly nature as in the case of nano-organics molecules with special gelling abilities developed by a team of Researchers from the Institute of Bioengineering and Nanotechnology (IBN) of the Agency for Science, Technology and Research (A*STAR) in Singapore. The Emergence of these nano-organic molecules otherwise known as Supergelators was reported to also offer suitability for use in large oil spill areas when its technology is fully developed for commercial use.

Biography

Chika, S. Ezeanyanaso hailed from Anambra State, the Eastern part of Nigeria. She had her Bachelor of Science (B.Sc) and her Masters' of Science (M.Sc) in Industrial Chemistry (from Nnamdi Azikwe University, Awka, Nigeria). She holds a Doctoral Degree in Chemistry and Renewable Energy from Ahmadu Bello University Zaria, Kaduna State, Nigeria. Dr. Chika was the head of Polymer and Petrochemical division from 2009 to 2013 as well as the acting head, petrochemical and allied department from 2011 to 2013, both at the National Research Institute for Chemical Technology (NARICT), Zaria, Nigeria. Dr. Chika has also worked in the Federal Institute of Industrial Research Oshodi (FIIRO), Lagos, Nigeria for four years where she rose to the rank of Deputy Director in the year 2017. She was the Deputy Director and head, Polymer and Textiles division under Chemical, Fibre and Environmental Technology Department at FIIRO for several years before transferring her service to National Agency for Science and Engineering Infrastructure (NASENI), Abuja, Nigeria where she is currently the head, Research and Development Unit of the Agency. She has attended several national and international workshops and conferences. She has supervised several students in different researches related to her field and she has to her credit over 40 journal publications, 25 conference papers and some technical reports in book of proceedings both international and local. She is a fellow of many professional bodies such as Institute of Chemists of Nigeria (ICCON), Chemical Society of Nigeria (CSN), Polymer Institute of Nigeria.

STUDY ON SYNTHESIS AND CHARACTERISATION OF Al-BASE *in situ* METAL MATRIX NANO COMPOSITES BY STIR CASTING

Banshidhara Mallik
National Institute of Advanced Manufacturing Technology, India

Abstract:

Nanocomposites can be considered solid structures with nanometer scale dimensional repeat distances between the different phases that constitute the structure. Metal based nanomaterials have received considerable attention recently due to the nature and behaviour of the nano materials are different from that of the bulk material. Metal nanocomposites find wide application in various fields due to their different properties. Metal matrix nanocomposites are a new category of materials in which the reinforcements in the range nanometer size are being used. Aluminium metal composites are fabricated using traditional *ex-situ* approach in which externally prepared reinforcements added into the matrix material often accompany porosity, larger grain size, clustering of particles, poor bonding, improper wetting and undesirable interfacial product. To overcome these drawbacks a method has been developed in which reinforcements are established in the matrix by one or more chemical reactions which is termed as *in-situ* method. *In-situ* metal matrix nano composites can be defined as a multiphase material whose reinforcing phases are formed *in-situ* during fabrication of the metal by the reaction between the precursor materials used.

In the present paper, pure aluminium and Al 20 vol%(Al_2O_3+Fe-aluminide) *in-situ* nano composites were synthesized using stircasting and their mechanical, tribological properties were evaluated using different instruments like optical micrography, SEM/TEM analysis and other techniques. Some other mechanical properties like DPN, shear yield strength was evaluated and found to be superior to the base metal (pure Al).

Biography

Banshidhara Mallik was born in India. He had completed his degree in B. Sc. (Engineering), Mechanical at VSSUT, Sambalpur. Later He maintained his M. Tech. at Ranchi University, Ranchi. He completed his Ph.D. at Ranchi University, Ranchi. He specialisations are NDT, Metal Matrix Composites, Nanocomposite and he published twenty papers in different journals and conferences.

SIZE-DEPENDENT MELTING TEMPERATURES OF GRAPHENE AND MoS_2 NANO-FLAKES

Valeri Ligatchev
Member of The Electrochemical Society, Singapore

Abstract:

A 'discretized' version of the 2-dimensional (2D) 'Generalized Skettrup Model' (GSM) is implemented at simulations on temperature-dependent harmonic and anharmonic fractions of the lattice thermal capacity of rectangular (in general) graphene and molybdenum disulfide (MoS_2) nano-flakes as well as of their size-dependent melting temperatures. All mentioned above thermal characteristics of those graphene and MoS_2 nano-flakes are evaluated merely based on features of confined interacting in-plane acoustic phonons with the static plane-wave basis, while contributions from their in-plain 2D optical braches and 'outplane' ('flexural') modes are ignored completely because of their insignificant impact on the fraction of the anharmonic lattice thermal capacity in vicinity of melting point of those nano-flakes(s). Effective interactions among the in-plane acoustic phonons are taken into consideration *via* an approach, based essentially on the Fock space formalism, and using extrapolation of the temperature-dependent anharmonic fraction of the lattice thermal capacity till its 'critical' quantity. Obtained simulation results for the size-dependent melting temperature(s) of those graphene and MoS_2 nano-flakes with the rib length ranging from ~ 5 nm to ~ 20 nm and different aspect are discussed in comparison with their counterparts obtained *via* 'state-of-art' molecular dynamic simulations, nucleation theory, and atomistic approaches.

Biography

Valeri Ligatchev's areas of scientific interest and expertise comprise of experimental and computational studies on electronic, optical, vibrational, relaxation time and defect states spectra as well as thermal properties of various (predominantly spatially non-homogeneous) semiconductors insulators and even superconductors, including nominally undoped and heavily doped polycrystalline and nano-crystalline diamond(s), flakes of two-dimensional semiconductors, silicon-germanium 'quantum dots', 'molecular wires', silicon micro- and nano-wires, hydrogenated amorphous silicon-based films, porous 'low-k' organic and inorganic insulating layers, as well as ceramic insulators with 'gigantic dielectric response' (GDR).
His so-called 'Generalized Skettrup Model' becomes expedient in several areas: from realistic simulations on optical and electronic properties of polycrystalline and spatially non-homogeneous amorphous semiconductors and insulators as well as of their low-dimensional counterparts to convincing estimations on the harmonic and anharmonic fractions of lattice thermal capacity of such materials. He also substantiated condensed phases of Fröhlich polarons as the essence of the GDR phenomenon. Furthermore, he had implemented broadly advanced mathematical methods at deconvolution and interpretation of data of several well-established techniques of defect states spectroscopy.
Valeri Ligatchev 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.

STATIC PERFORMANCE AND GAMMA SHIELDING CHARACTERISTICS OF ILMENITE CEMENTITIOUS PLASTER

Mohamed A E M Ali, Mostafa A Abdelgawad and A F Tawfic
Military Technical College, Egypt

Abstract:

Concrete is the most utilized structural material all over the world. Due to rapid progress in nuclear weapons, explosions, and leakage during the last few decades, the attention of researchers was attracted to the importance of nuclear shielding. Nuclear shields are vital for nuclear reactors, hospitals, and military facilities, etc. This work aims at evaluating the static behaviour and penetrability of newly developed cementitious plaster electromagnetic gamma rays. Partial replacement of 10%, 20%, and 30% of conventional silica sand with ilmenite particles was investigated in this study. It was observed that the flowability increased due to ilmenite addition while the compressive strength was generally decreased. A superior shielding against gamma rays was achieved due to incorporating ilmenite particles in cement plaster production. This research work pave the way for structural application of such novel cementitious plaster shield probably in newly developed infrastructures and existing ones.

Biography

Mohamed A.E.M. Ali has expertise in evaluating the static performance and dynamic behaviour of structural materials and passion in developing new techniques and constituents for structural applications. While, Mostafa A. Abdelgawad and A.F. Tawfic have expertise in evaluating the nuclear shielding characteristics of materials and techniques. The authors have the ability to evaluate such performance experimentally and numerically also. Their work was done through years of research in this field. They develop their work to present new technique has the ability to provide safer civilian and military facilities for humanity.

BIOMIMETIC POLYDOPAMINE-MODIFIED NANOFIBROUS BILAYER SCAFFOLDS USED FOR FULL-THICKNESS SKIN REGENERATION IN A PORCINE ANIMAL MODEL

Lucy Vojtova[1], Katarina Kacvinska[1], Veronika Pavlinakova[1], Petr Polacek[1], Lenka Michlovska[1], Veronika Hefka Blahnova[2], Eva Filova[2], Martin Knoz[3], Bretislav Lipovy[1,3], Jakub Holoubek[3], Martin Faldyna[4], Zdenek Pavlovsky[3], Monika Vicenova[4], Michaela Cvanova[3] and Jiri Jarkovsky[3]

[1]*CEITEC - Central European Institute of Technology, Brno University of Technology, Czech Republic*
[2]*Institute of Experimental Medicine of the Czech Academy of Sciences, Czech Republic*
[3]*Masaryk University, Czech Republic*
[4]*Veterinary Research Institute, Czech Republic*

Abstract:

Treatment of complete loss of skin thickness requires expensive cell-laden materials and limited skin grafts. In this work, we present a cell-free biomimetic bilayer scaffold based on the cross-linked protein-polysaccharide biopolymeric network modified with an interpenetrated polydopamine (PDA) designed to imitate a bottom layer of the missing dermis and an upper layer of a thin basement membrane (BM). The microbial-protective alternate dermis layer is made from freeze-dried bovine type I collagen and antimicrobial chitosan (Coll/Chit) or collagen and an antimicrobial calcium salt of oxidized cellulose (Coll/CaOC). An alternate antimicrobial basement membrane layer is made from amphiphilic nanofibrous electrospun gelatin (Gel), polycaprolactone (PCL), and CaOC. We have found that PDA significantly improved the elasticity and strength of collagen-polysaccharide-based scaffolds, which favorably affected their swelling capacity, porosity, and stability in the physiological environment. Moreover, based on the *in vitro* evaluation, PDA significantly supported and maintained metabolic activity, proliferation, and viability of the murine fibroblast cell lines. The *in vivo* experiment carried out in a domestic Large white pig model resulted in the expression of pro-inflammatory cytokines in the first 1–2 weeks, however, in the middle and later stages, PDA caused a reduction in inflammation with the expression of the anti-inflammatory molecule IL10 and the expansion of the transforming growth factor β, which could support the formation of fibroblasts. Similarities in treatment with native porcine skin suggested that the fully resorbable bioactive biomimetic bilayer can be used as an implant for full-thickness skin wounds and thus eliminate the use of skin grafts.

Biography

Lucy Vojtova is currently a Group Leader of the Advanced biomaterials group https://biomaterials.ceitec.cz/ at the CEITEC - Central European Institute of Technology in the Brno University of Technology, Czech Republic. She has participated in projects supported by the US NSF and NIH within three years of her post-doctoral position at the Department of Chemical Engineering and Applied Chemistry at Columbia University in the City of New York, USA. Currently, she leads and participates in numerous national and international projects under the heading of CEITEC. She is a specialist in the advanced synthesis, characterization, and additive manufacturing (3D/4D bioprinting) of novel "smart" high-performance stimuli-responsive polymers, and composites with controlled lifetimes enabling the release of bioactive substances. Her group is focused on structure-property relationship evaluation, bioactive molecules and nanoparticle encapsulation, and preparation of cell or drug carriers based on natural or synthetic polymers and composites for regenerative medicine and tissue engineering. *In vitro* and *in vivo* evaluations are provided under wide collaboration with noticeable universities, research institutes, and industrial partners.

FAILURE ANALYSIS OF A METALLIC RING GASKET: A CASE STUDY

Jeetendra Gupta, Suraj Makkar, Arzoo Saini and Maushumi K Talukdar
Institute of Engineering and Ocean Technology, Oil and Natural Gas Corporation Ltd, India

Abstract:

This paper discusses about failure analysis of a metallic ring gasket installed at subsea tie-in point. Subsea tie-in assembly was used to join the two well fluid (gas) lines in western offshore of India. Failure of gasket caused gas leakages at subsea and hampered the production activities. Replacement of gasket at subsea was costly affair due to involvement of vessel and divers. So, a detailed failure analysis investigation was carried out to find out the root cause of failure and to suggest the suitable recommendations to avoid recurrence of such type of metallic gasket failure. Ring Gasket of ASME B 16.20 grade Soft Iron with zinc platting designed for 25 years, but failed within 11 years. Cross section of failed gasket was octagonal and its pressure class was 1500. The failed ring gasket sample was subjected to different tests e.g. chemical composition analysis, hardness testing, metallography, fractography etc. Material removal was observed from internal surface of the gasket throughout its circumference. Scallops features and corrosion pits were observed in the internal surface. Scanning Electron Microscopic (SEM) analysis revealed typical features of rod like bacteria mainly Sulphate Reducing Bacteria (SRB). Microbial analysis of produced water also revealed presence of SRB which might have caused the microbial induced corrosion. Energy Dispersive X-Ray Spectroscopic (EDS) analysis indicated presence of silica (fine sand) on the internal surface of gasket. The pipeline was connecting to subsea tie-in assembly through a bend which caused the flow disturbance. Impact caused by flow disturbance of the flowing fluid with fine sand caused erosion of internal surface of gasket. Detailed failure mechanism and suitable recommendations to avert this type of premature ring gasket failure are being discussed in this paper.

Biography

Jeetendra Gupta is a lead author of this paper and a Mechanical Engineer. He is M. Tech. in Mechanical Engineering from IIT-BHU, Varanasi, India. He is working as a Superintendent Engineer (Mechanical) in Materials & Corrosion Section of Institute of Engineering and Ocean Technology, Oil and Natural Gas Corporation Ltd., Panvel, Navi Mumbai, India. He has 12 years' experience in field of failure analysis, cathodic protection of offshore structures, materials selection for oil & gas fields, internal corrosion of pipelines and composite materials for oil & gas fields. He has authored/co-authored more than 30 technical papers in international journals and conferences. He is also a member of invention team of three patents in field of high density brines for oil & gas fields.

Day 2

Materials Science & Nanomaterials Conference 2023

Poster Presentations

NANOSCALE 3D PRINTED MICROSUPERCAPACITORS

Henry R Chance, Harnjoo Kim, Billyde Brown, and Sourabh Saha
Georgia Institute of Technology, USA

Abstract:

Herein we outline the use of high-throughput Two-Photon Lithography for creating nanoscale-ordered structures for use as electrodes within microsupercapacitors (MSC). When designing the electrode of an MSC, it is vital to maximize the properties of the material and structure of the electrode. Specifically, the specific surface area of the electrode is a key factor in determining the performance of an MSC. As the specific surface area is increased, both the specific capacitance and energy density of the device are also improved. Although this trend is well-studied, there is yet to be an expression directly quantifying this relationship. Through the use of high-throughput Two-Photon Lithography, electrodes can be additively manufactured to maximize specific surface area with knowledge of the specific surface area. The electrodes are printed with varying pore sizes and vertical heights. After printing, the electrodes are selectively coated, using a PMMA mask, with three different pseudocapacitive materials: TiO_2, TiN, and Ti_2AlN MAX Phase. Lastly, the performance of the MSCs is measured using electrochemical testing: cyclic voltammetry, electrical impedance spectroscopy, and galvanic charge-discharge. By varying pore sizes and electrode heights, the specific surface area of the electrode can be related to the performance of the MSC. By varying the surface coatings on the printed electrodes, the relationship can be validated. The novel use of high-throughput Two-Photon Lithography proposes a unique opportunity to both quantify the relationship of specific surface area to device performance of MSCs and explore the future use of this technology for mass-producing MSC electrodes.

Biography

Henry Chance is a DoD SMART Scholar and Watts Scholar studying Engineering-Physics and Materials Science Engineering at the Georgia Institute of Technology in Atlanta, GA. Henry Chance has researched at the U.S. Naval Research Laboratory in Washington, DC., Los Alamos National Laboratory in Los Alamos, NM., and currently researches microsupercapacitors at the Georgia Institute of Technology's Institute for Electronics and Nanomaterials. At the U.S. Naval Research Laboratory, Henry developed a drone swarm algorithm based on the behaviour of slime molds; this work resulted in a publication in the Journal of Artificial Life and Robotics. At Los Alamos National Laboratory, Henry worked on improving ion source performance for electromagnetic isotope separation using low work function materials for increasing thermionic emissions. Henry plans to graduate from the Georgia Institute of Technology in the fall of 2023 and pursue a PhD. in Materials Science and Engineering.

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PRODUCTION OF CELLULOSE NANOFIBRILS FROM SCHINUS MOLLE BY ENZYMATIC HYDROLYSIS: PREPARATION AND CHARACTERIZATION

Abir Razzak[1], Ramzi Khiari[2-34], Mohamed Naceur Belgacem[4] and Younes Moussaoui[1,5]

[1]*University of Gafsa, Tunisia*
[2]*University of Monastir, Tunisia*
[3]*Higher Institute of Technological Studies (ISET) of Ksar-Hellal, Tunisia*
[4]*University of Grenoble Alpes, Tunisia*
[5]*University of Sfax, Tunisia*

Abstract:

Cellulose nanofibrils (CNF) have shown a large attention since the last 15 years. Many raw materials such as wood, agricultural waste and/or biomass were used to preparing CNFs. During this work, cellulose nanofibers (CNF) were isolated from Schinus Molle. The CNFs were isolated from this biomass by using an enzymatic and mechanical treatment. The raw fibers were firstly extracted by a delignification-bleaching process (an alkaline treatment), then by an enzymatic treatment which was performed at 50°C during 2 h, pH= 7, and under mechanicalstirring. Two fibrillation processes were used to accomplish the defibrillation of fiber structure in order to obtain a high-quality CNF. The one was known as a pilot scale ultra-fine friction grinder (Masuko) and the second was twin screw extrusion (TSE). The obtained CNFs were characterized using several techniques such as optical microscopy, mechanical properties, turbidity, nanosized fraction, or quality index. The obtained result seems to so encouraging where the CNFs present a strong Young's modulus.

Biography

Abir Razzak is a Chemistry PhD student at the University of Gafsa, Tunisia.

IMPROVING THE FATIGUE PROPERTIES OF Ti-6Al-4V POWDER ALLOY BY SURFACE CARBON DEPOSITION WITH THE HELP OF GRAPHITE EVAPORATION BY LASER IRRADIATION

Oleksandr Dekhtiar, Mykola Shevchenko and Mykola Skoryk
G.V. Kurdyumov Institute for Metal Physics of National Academy of Sciences of Ukraine, Ukraine

Abstract:

A new method has been developed for healing the surface residual pores of powdered titanium alloy Ti-6Al-4V by treating the surface with a stream of atomic carbon evaporated from reactor graphite under the laser irradiation. The average pore size is 15 μm, the maximum pore size is 38 μm, and the average volumetric porosity does not exceed 2%. Due to the high kinetic energy, carbon atoms penetrate into the alloy on depth from 50 up to 500 μm. Some of them are captured by the pores, and the concentration of carbon atoms in the pore is sufficient to fill almost the entire volume of the pore. The effect of such treatment on fatigue properties is studied. It turned out that if the evaporation regimes are very intense, then carbon atoms fill predominantly large pores and create high tensile stresses around them, which usually causes deterioration in fatigue characteristics. Optimal evaporation modes have been elaborated, under which almost all residual pores (up to a depth of 200 μm) are filled with carbon without the formation of significant tensile stresses. The correspondence between the fillings of pores with carbon atoms was studied by scanning electron microscopy. The study of the fatigue characteristics of graphite-treated samples by bending rotation showed the effectiveness of the proposed method of healing surface porosity both to increase the limit of long-term fatigue strength and short-term strength. Moreover, surface treatment with laser-evaporated graphite has the advantage of increasing fatigue resistance over other surface treatments, such as ultrasonic impact, ion-plasma and electric spark, followed by diamond burnishing. The advantages of this method are also manifested in the fact that, like others, it does not change either the shape or the size of the product being processed.

Biography

Oleksandr Dekhtyar studied Physics and Materials Science at the Shevchenko Kiev National University, Ukraine and graduated as MS in 1970. He then joined the research group of Prof. Kononenko at the G.V. Kurdyumov Institute for Metal Physics of National Academy of Sciences of Ukraine (NASU). He worked in the field of creep of refractory metals and alloys and in 1978 received a degree in R&D. Then he continued to work at the same institute in the department of inhomogeneous metallic materials under the guidance of Prof. Ivasishin. He received his Doctor of Science degree in 2003. He obtained the position of a Leading Researcher, which occupied now. He has published more than 80 research articles in SCI(E) journals.

DESIGN OF MAGNETOELECTRIC NANOFIBRES FOR WIRELESS ELECTRICAL NEUROMODULATION

Lorenzo Signorelli, Jonas Englhard, Elif Koçar and Danijela Gregurec
Friedrich-Alexander University, Germany

Abstract:

Magnetoelectric materials are able to convert magnetic field energy into electric energy, a property leveraged in this work to develop neural interface for activation of electrically active neurons. Neuronal activity can be modulated by changes in the membrane voltage, an approach that is commonly used in current invasive electrode interfaces. Aim of this work is development of electrically active interfaces for transferring electrical stimulus wirelessly, overcoming limitation of invasiveness with macro scale electrodes. Magnetoelectric Nanofibers (MEFs) presented in this work were developed through innovative engineering approach by magnetic nanodiscs (MNDs) embedded into piezoelectric nanofibers made of pure Polyvinylidene fluoride (PVDF). MNDs are novel class of nano-ferromagnets developed in our group. In ground state, they exhibit vortex organization of magnetic spins which transitions to in-plane alignment with applied magnetic fields (MFs) alternating at low frequencies (<10Hz) and amplitudes of <30 mT. This transition triggers torques, and when embedded into MEF cores, application of MF releases a flux of electrons due to kinetically active MNDs and leads to efflux of electrons trough composite resulting in polarization of the fibers. This study investigates variety of preparatory formulations including mixtures of PVDF with solvents for fibers of controllable stability, magnetoelectric coefficient and thickness in electrospinning process. MNDs and mixture of PVDF are investigated in means of PVDF: MND ratio at different electrospinning parameters. Due to the hydrophobicity of PVDF, chitosan coating has been applied for achieving biocompatible, hydrophilic substrates. Biocompatibility and efficacy of MEFs as electric wireless neural interfaces is being presented in preliminary data for converting MFs into electric stimulus for neurons *in vitro*.

Biography

Lorenzo Signorelli has master's degree in Chemical and Pharmaceutical Technologies from the University of Parma (Italy), with background in inorganic and organic chemistry, biology and pharmacology. His research interests lie at the intersection of neurobiology and materials science. Early in his research career he studied the correlation of the aggressiveness with the male's reception of female pheromones in rodent models. His expertise with rodent models involves behavioral tests and immunohistochemical analyses of neurological tissues. Lorenzo's PhD work in the biointerfaces lab, led by Prof. Gregurec at FAU Erlangen (Germany), is extended from neurobiology to materials science for developing new interfaces for neuromodulation applied in the deep brain and overcome limitations of existing neuromodulation approaches. He is testing cutting-edge approaches to design nanoscale materials capable to communicate remotely with the deep brain neurons. Besides magnetoelectric materials, he is developing magnetic nanotransducers for remote, cell specific and temporally precise neuromodulation leveraging his skills in synthesis and coating of functional nanomaterials.

PREPARATION AND CHARACTERIZATION OF NANOFIBRILS OBTAINED BY TEMPO MEDIATED OXIDATION OF ALKALINE PULP FROM *Schinus molle*

Abir Razzak[1], Ramzi Khiari[2,3,4], Mohamed Naceur Belgacem[4] and Younes Moussaoui[1,5]

[1]*University of Gafsa, Tunisia*
[2]*University of Monastir, Tunisia*
[3]*Higher Institute of Technological Studies (ISET) of Ksar-Hellal, Tunisia*
[4]*University of Grenoble Alpes, , Tunisia*
[5]*University of Sfax, Tunisia*

Abstract:

Cellulose nanofibrils (CNFs) were prepared for this time. This nanocellulose presents many advantages such as excellent properties of transparency and/or barrier and/or mechanical and thermal. This paper devoted to presenting the preparation of CNFs from *Schinus molle* by a succession of chemical and mechanical treatments. A chemical modification was used to increase the charge of surface cellulose fiber in order to facilitate their nanofibrillation during the mechanical step. After, TEMPO- mediated oxidation, a mechanical process was done. The extracted cellulose nanofibers were characterized by several techniques such as Atomic Force Microscopy (AFM), optical microscopy, Morfi, and by the determination of their degree of polymerization. The obtained CNFs seem to be interesting since the width in the range of 19-20 nm and excellent mechanical properties (Young's modulus around 14.34 GPa) were obtained.

Biography

Abir Razzak is a Chemistry PhD student at the University of Gafsa, Tunisia.

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FUNCTIONALIZATION AND OPTIMIZATION OF MAGNETIC NANOPARTICLE SYSTEMS: DESIGNING MAGNETIC PROTEIN SENSORS

Elif Koçar, Lorenzo Signorelli, Vicente Durán Toro, Andreas Wolf, Sebastian Bochmann and Danijela Gregurec

Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Abstract:

Magnetic nanoparticles are intriguing systems in the field of biomedical research since they offer convenient ways to communicate with biological models through converting magnetic field energy into qualitative signals upon changes in their properties. Molecules absorbing onto nanoparticle's surface can therefore be dynamically observed as increase in higher harmonic amplitude in magnetic particle spectroscopy (MPS). For applications in biomedical assays, nanoparticles have to be colloidally stable, biocompatible and target specific which can be achieved with a careful design of the surface coating. That includes also nanoparticle investigation in various forms of bioconjugation to biological models. This work focuses on the study of three different magnetite/maghemite nanoparticle systems which exhibit different magnetic behaviour. Conventional 'spherical' ferrimagnetic iron oxide nanoparticles (FIONs), superparamagnetic iron oxide nanoparticles (SPIONs) and ferromagnetic iron oxide nanodiscs (MNDs) with vortex spin alignment and large magnetic moment are investigated in MPS application for specific binding of streptavidin to biotin. Functionalization of the surface for biocompatibility, stability and streptavidin-specificity is achieved by coating all particles with Poly (maleic anhydride-alt-1-octadecene) (PMAO), methoxypolyethylene gylcole (mPEG), (3-Aminopropyl)triethoxysilane (APTES) and Amine-PEG_{11}-Biotin. This coating permitted stable particle dispersions at physiological pH. Bioconjugation of biotinylated particles to streptavidin is studied in MPS and dynamic light scattering (DLS). Fluorescence assays are enabled through Dylight 550-streptavidin complex. Results display MPS results associated with different magnetic properties, implying that most appropriate system are superparamagnetic iron oxide nanoparticles.

Biography

Elif Koçar, with master's degree in Molecular Science at Friedrich-Alexander-University Erlangen Nürnberg has background in inorganic, theoretical, physical chemistry, and molecular biology. Her research in the biointerfaces group, led by Prof. Gregurec, has focused mainly on the engineering of magnetic nanoparticle systems for biomedical applications and towards quantitative and rapid 'nanosensors'. She has experience in synthesis of isotropic and anisotropic magnetic nanoparticles, surface polymer coatings for stability, fluorescent labelling and bioconjugation. Her practical skills involve characterisation and analysis of bio- and inorganic materials in VSM, DLS, SEM, TEM, fluorescence microscopy and spectroscopy. Elif is starting her PhD in biointerfaces lab under exciting EIC Pathfinder Open 2022 project 'BRAINSTORM' to apply, and further develop her knowledge in application of anisotropic ferromagnetic nanomaterials as neural interfaces for wireless multimodal neurostimulation of the deep brain. Elif is enthusiastic to study the ability of these nanomaterials to replace current invasive neurostimulation approaches, and to help advancing the field of magnetic nanomaterials in therapies of debilitating neural diseases, such as epilepsy.

SYNTHESIS AND CHARACTERIZATION OF NANOSTRUCTURED Bi_2Se_3 FILMS AND Bi_2Se_3@SWCNT HETEROSTRUCTURES

Didzis Salnajs, Vitalijs Lazarenko, Yelyzaveta Rublova, Raimonds Meija, Vanda Voikiva and Jana Andzane and Donats Erts

University of Latvia, Latvia

Abstract:

Bismuth selenide (Bi_2Se_3) is a bismuth chalcogenide group compound with promisingly wide application possibilities in thermoelectrics, topological insulator research, photodetector/sensor development and energy storage solutions. With its unique structural, mechanical, and electrical properties, Bi_2Se_3 is a promising candidate for use as an anode material in rechargeable battery cells.

The structure of Bi_2Se_3 consists of quintuple layers separated by relatively weak Vander Walls gaps that allow for the intercalation of cations and offer almost two orders of magnitude higher electrical conductivity than other bismuth chalcogenide compounds. The usage of CNTs as a carbon matrix in anode materials serves as a structural backbone for nanostructured anode materials. Combined with Bi_2Se_3, CNT network offers more enhanced electronic transfer, and helps to improve structural stability by alleviating the degradation that often results from significant volume change with battery cell cycling.

In this study we present a physical vapor deposition method for the synthesis of Bi_2Se_3 nanostructured thin films on a glass substrate, as well as fabrication of heterostructures by deposition of Bi_2Se_3 on single wall CNT (SWCNT) networks. Electrochemical measurements (cyclic voltammetry, EIS) were carried out on the fabricated materials in organic and aqueous lithium-based electrolytes to investigate their Li-ion transfer characteristics in different environments. Surface analysis methods such as scanning electron microscopy energy dispersive x-ray spectroscopy and x-ray photoelectron spectroscopy were used to characterize the materials, before and after electrochemical measurements to investigate their structural stability in different electrolytes and potential ranges.

Biography

Didzis Salnajs is a student of chemistry at the University of Latvia. He is particularly interested in the field of nanochemistry, with a particular focus on material synthesis and characterization for applications in energy storage systems.

SYNERGETIC EFFECTS OF NANOPARTICLES IN THE THERMOSET COMPOSITES

Yun-Hae Kim and Sanjay Kumar
Korea Maritime and Ocean University, Republic of Korea

Abstract:

Composite materials are known for their high strength-to-weight ratio and high stiffness-to-weight ratio. Composite materials are preferred over traditional metal materials in a variety of industrial and research applications due to these advantageous properties. Nowadays, fiber-reinforced polymer composites (FRPCs) are extensively used in automobile structures, aircraft structures, urban air mobility, shipbuilding, and offshore plants. Therefore, FRPCs, directly and indirectly, influence the modern lifestyle. And this modern lifestyle is demanding improvement in the mechanical and thermal properties of FRPCs. In order to significantly improve these properties, nanoparticles are being applied to thermoset composites using techniques such as *in-situ* polymerization, solution, and melt intercalation. Thus, the role of nanoparticles in the improvement of various properties in thermoset composites was systematically investigated by incorporating nano-particles with different techniques. In particular, the reinforcement mechanism and hybrid effect with composites for research and industrial applications purpose were analyzed. The findings show that good dispersion of the nanoparticles promoted the interaction between the nanoparticles and the polymer, which enhances the strengthening effect and delays the failure of the fiber-reinforced plastic. Also, the bridging effect caused by nanoparticle deposition on the fiber surface enhances the bonding strength between interlayer interfaces and suppresses the expansion of cracks. Although small numbers of nanoparticles act as an additive and improve the properties, their use as a structural material is relatively limited as the structure becomes larger. Furthermore, developed interleaved structures demonstrated excellent reinforcement effects and applicability of nanoparticles as a structural material, which was of great importance in real practical applications. Therefore, this work paves the way for effective methods to aid the advanced development of FRPCs by incorporating nanoparticles.

Biography

Yun-Hae Kim is a professor at Korea Maritime and Ocean University (KMOU), Korea. His doctoral study was completed at Kyushu University in Japan. After that, he served in the position of Invited Research Professor at the National Institute of Standards and Technology in the United States in 1997 and at Tokushima University in Japan in 2004. In KMOU, he served on the following chair.
Dean of Student Affairs at KMOU, 2014.02-2015.11.
Dean of Academic Affairs at KMOU from 2015.11-2016.08
Acted President of KMOU from 2016.01-2016.08.
Executive Vice President of the Korean Society of Composite Materials from 2023.01 until 2023. 12.
Together with his institutional efforts, He served as the editor of the SCI journal MPLB, and chief editor of the journal Nano Hybrids and Composites. He contributed to over 60 conferences and symposia and published over 200 papers in both national and international journals. In the last few years, he particularly attended over 20 conferences as a keynote speaker and conference co-chair. He established two international conferences: Asian Conference on Engineering Education (ACEE, 2009) and Asian Conference on Campus Sustainability (ACCS, 2015). He currently also holds the position of Executive Vice President of the Korean Society for Composite Materials.

$Co_xCu_yFe_2O_4$ AS NOVEL NANOCATALYSTS FOR PRODUCTION OF BIO-DIESEL FROM WASTE FRYING OIL

Hesham A Hamad, Rehab M Ali and Nada A Eldeeb
City of Scientific Research and Technological Applications, Egypt

Abstract:

Energy shortage is one of the most critical issues that Egypt seriously concerns about. Recently, Egypt is suffering from a gap between fuel production and consumption leading to fuel importation. Biodiesel is one of the most notable sustainable sources of energy for the time being that has many advantages; it is a non-toxic, renewable, biodegradable source of energy that can be produced domestically. On another side, catalysis can play a role in solving many problems facing Egypt such as more efficient energy production.

For the first time, this work investigates the performance of $Co_xCu_yFe_2O_4$ nanoparticles as a heterogeneous catalyst for effective and sustainable biodiesel production *via* waste frying oil (WFO) transesterification process. The surface features of the nanocatalysts were evaluated with X-ray Diffractometer (XRD), Scanning Electron Microscope (SEM), High-Resolution Transmission Electron Microscope (HRTEM), Atomic Absorption Spectroscopy (AAS), and Vibrating Sample Magnetometer (VSM) approaches. The effect of different molar ratio between Co^{2+} and Cu^{2+} on the physic-chemical properties and biodiesel production was investigated. The performances of the catalysts were also studied in the transesterification reaction of WFO conversion to biodiesel under ultrasonic treatment. The process was optimized through Response Surface Methodology (RSM) method. The influences of major factors, including methanol to oil molar ratio (6:1–18:1), catalyst weight (0.5–1.5 wt.%), and time (4–12 min.), were examined on the reaction behavior. The results showed that the sample $Co_{0.25}Cu_{0.75}Fe_2O_4$ is much higher biodiesel yield than other molar ratios.

The experimental investigations show that the optimum operating conditions are 12 min reaction time under ultrasonic amplitude 13%, 6:1 methanol to oil molar ratio, 1.5% wt. of catalyst at 25°C to produce 97.79 % biodiesel yield. Furthermore, it can be concluded that the $Co_xCu_yFe_2O_4$ nanocatalyst can be applied as an efficient and promising heterogeneous catalyst in biodiesel generation from WFO.

Biography

Hesham Hamad is an assistant Professor at Fabrication Technology Research Department, Advanced Technology and New Materials Research Institute (ATNMRI), City of Scientific Research and Technological Applications (SRTA-City), Egypt. He earned his Ph.D in Chemistry, Faculty of Sciences, Granada University, Spain. Then he worked as a research scientist of Padova University and University of Warsaw, respectively. His present research projects involve studies on sustainable catalytic materials for organic synthesis, biodiesel bioethanol, photocatalysis, electrocatalysis, adsorption, water treatment, and photocatalytic applications. He has published over 61 international papers, 51 of them as a corresponding author in authentic journals. To date, he has more than 2669 citations and an h-index of 28. He selected top 2 % scientists across the world released by Stanford University from 2020 till now.

HYDROGEN SPILLOVER THROUGH NANOCONFINEMENT OF METAL ORGANIC FRAMEWORKS GLASS COMPOSITES FOR ENHANCED PROTON COUPLED ELECTRON TRANSFER REACTION

Si Chen and Xiaohu Li
Beihang University, China

Abstract:

Proton-coupled electron transfer (PCET) reactions are critical for many classes of enzyme-like catalyzed systems. In this work, Metal Organic Frameworks (MOFs) glass complexes (g-ZIF62@g-ZIF-8) were used as a platform to promote PCET by enhancing hydrogen spillover through the confinement effect of nanopores. The results clearly show that confinement effect of nanopores in ZIF-62 glasses could greatly improve short-lived active hydrogen transfer and promote the PCET reaction by enhancing hydrogen spillover. The interface electric field (IEF) of g-ZIF-62@g-ZIF-8 promotes photogenerated carrier separation, mediates electron-directed transport and promotes Fe(III)/Fe(II) cycling in g-ZIF-8. Benefit from the synergistic effect of proton transfer and electron transfer, Fe(IV)=O efficiently and selectively extracts H· from phenol converting it into phenoxy radicals, which into macromolecular. This enables low carbon purification and organic carbon recovery in wastewater. Our work provides new insights into the application of the confinement effect to enhance hydrogen spillover and thus regulate the PCET process.

Biography

Si Chen has her expertise in advanced oxidation catalyst regulation construction mechanism and simulation calculation; advanced oxidation new materials and engineering application, wastewater treatment. Her research has been highly innovative and contributed considerably to improving the fundamental understanding of Metal-Organic Frameworks materials and developing cutting-edge, efficient, and economic-affordable technical solutions in the Water-Food-Energy-Climate nexus for sustainable development and green transition.

Day 2

Materials Science & Nanomaterials Conference 2023

e-Poster Presentations

NEW FLUORENE BASED DERIVATIVES FOR SOLAR CELLS:

Saulius Grigalevicius and Ewa Schab-Balcerzak
Kaunas University of Technology, Lithuania

Abstract:

The solar energy is a very important way to solve environmental pollution and deficiency of current energy. Development of efficient and cheap solar cells is a technological area where traditional silicon-based solar cells have been successfully commercialized regardless of some disadvantages. At this time, perovskite solar cells (PSCs) are regarded as one of the best alternatives to silicon based devices. PSCs possess strong light absorption, high bipolar charge transporting possibility, long carrier diffusion length and lifetime as well as low exciton binding energy. PSCs can be made with a low-temperature screen-printing process that is not only less energy-intensive but also less expensive. Moreover, it is believed that PSCs have lower carbon footprints and shorter energy payback periods than silicon. Here, we report new materials containing diaryl-substituted fluorene fragments for perovskite solar cells. The new derivatives were investigated and tested as hole transporting materials in PSCs. Some of the devices yielded a maximum power conversion efficiency of 4.7%.

Biography

Saulius Grigalevicius received his B.S. degree in Chemical engineering, M.S. degree in Polymer chemistry, Ph.D. degree in Chemistry, and Habilitation in Chemistry from Kaunas University of Technology, Lithuania, in June 1994, June 1996, December 2000, and October 2007, respectively. From 2007 to 2008, he served as a Senior Researcher and an Associate Professor at Kaunas University of Technology. From 2008 to 2010, he worked as a Leading Researcher and an Associate Professor at Kaunas University of Technology. Since 2010, he has been working as a Professor and a Leading Researcher at the Faculty of Chemical Technology, Kaunas University of Technology.

SURFACE STRUCTURE PROPERTIES OF $Ti_{13}Nb_{13}Zr$ TITANIUM ALLOY SUBJECTED TO LASER MODIFICATION AND MAO PROCESS

Joanna Sypniewska
Gdansk University of Technology, Poland

Abstract:

Laser modification and micro arc oxidation are surface modification methods that are widely discussed by many researchers and are gaining increasing scientific interest. These techniques are simple to carry out, relatively inexpensive and, very importantly, they give reproducible results and the process itself can be controlled at every stage. They are generally applied to titanium materials as single modifications. The main purpose of these modifications is to change properties such as the hardness of the material, change the Young's modulus value and improve the surface structure properties of the material. In this work, the influence of a double modification: Nd:YAG laser and MAO technique for two different combinations will be presented. Changes in the surface properties of titanium alloy $Ti_{13}Nb_{13}Zr$, such as wettability, roughness and surface porosity, will be presented, as these properties are very important for the osseointegration of the implant into the bone and, to a certain extent, determine the ability of the material to bond with the bone. In addition, the author will point out changes in the chemical composition of the material, focusing on the presence of calcium and sodium ions, which do not occur in the $Ti_{13}Nb_{13}Zr$ alloy, but their presence as a result of the micro-arc oxidation technique can improve the biocompatibility of the material, as these ions are also present in the chemical composition of the bone tissue and additionally influence the osseintegration process itself. In addition, attention will be paid to examining the heat-affected zone of the native material for each of the Nd:YAG laser-MAO and MAO-laser Nd:YAG modification combinations.

Biography

Joanna Sypniewska is a PhD student at the Gdansk University of Technology. Her research interests are in studying the effects of laser modification and micro arc oxidation techniques on selected surface properties of titanium alloy $Ti_{13}Nb_{13}Zr$. In her work, the author is concerned with obtaining modified surfaces to improve the properties of materials used for bone and dental implants, which is important due to the increasingly ageing population and high demand for such materials. Her research mainly focuses on analysing changes in surface properties through optical microscopy, atomic force microscopy and SEM. She has documented her work by publishing two articles in the field of laser modification and also by participating in conferences.

Virtual Presentations

Virtual

Materials Science & Nanomaterials Conference 2023

Keynote Presentation

International Conference on
Materials Science and Engineering
&
International Conference on
Nanomaterials and Nanotechnology
March 27-28, 2023 | Paris, France

SCIENCE AND TECHNOLOGY OF UNIQUE MULTIFUNCTIONAL ULTRANANOCRYSTALLINE DIAMOND (UNCD™) COATING FOR NEW GENERATIONS OF INDUSTRIAL, HIGH-TECH AND IMPLANTABLE MEDICAL DEVICES/PROSTHESES

Orlando Auciello
University of Texas-Dallas, USA

Abstract:

Science/technology of a unique paradigm material named ultrananocrystalline diamond (UNCD™) in film form, and application to new generations of industrial, high-tech, external/implantable medical devices will be discussed, as described below:

UNCD films co-developed/patented by Auciello and colleagues are synthesized by microwave plasma chemical vapor deposition and hot filament chemical vapor deposition, using a patented Ar-rich/CH_4 chemistry that produces diamond films with the smallest gran size demonstrated today (3-5 nm). UNCD films exhibit lowest friction coefficient (0.02-0.04) compared with metals (≥ 0.5) currently used in mechanical pump seas/bearings, prostheses (e.g., dental implants, hips, knees); N atoms in grain boundaries produce electrically conductive N-UNCD films. UNCD coatings exhibit best biocompatibility because they are made of C atoms (element of life in the human DNA, cells, and molecules), demonstrated as superior scaffolds for embryonic cell growth and differentiation.

Technological applications include: 1) UNCD-coated pump seals/bearings/AFM tips (marketed by Advanced Diamond Technologies (Auciello/co-founder); 2) High-tech/medical devices, marketed by Original Biomedical Implants (OBI-USA/OBI-México/Auciello-co-founder), described from less to highest current development, namely: a) UNCD-MEMS cantilevers biosensors and biting heart cells energy generation, powering new generation defibrillator/pacemaker, cell phones and mobile electronics; c) New generation of Li-ion batteries with ≥ 10x longer life/safer, using N-UNCD-based electrodes; d) New generation of implantable prostheses (e.g., dental implants (in clinical trials in humans-50 patients received UNCD-coated DI in World Class clinic in Querétaro-México), hips, knees, stents and more) coated with UNCD, eliminating failure of current metal implants due to synergistic mechanical wear / blood interaction / chemical corrosion by body fluids; e) UNCD-coated silicon microchip implantable inside the eye as a key component of the artificial retina to return partial vision to people blinded by genetically-induced degeneration of photoreceptors (a device named Argus II is currently in the USA and EU markets by Second Sight, returning partial vision to people blinded by retinitis pigmentosa).

Biography

Auciello graduated with honors: M.S. (1973), PhD. (1976) – Physics, Institute "Balseiro"/Universidad Nacional Cuyo-Argentina); EE-Universidad Córdoba-Argentina (1964-1970). Postdoctoral-McMaster University, Canada (1977-1979); Distinguished Research Scientist-University of Toronto-Canada (1979-1984), Associate Professor/North Carolina State University-USA (1984-1988), Distinguished Scientist-Microelectronic Center North Carolina-USA (1988-1996), Distinguished Argonne Fellow (1996-2012)-Argonne National Laboratory-USA. Currently (2012-present), Auciello is Distinguished Endowed Chair Professor-University of Texas-Dallas, Materials Science/Engineering and Bioengineering Departments. Auciello directs basic/applied research on multifunctional oxide [ferroelectric (piezoelectric)/high-K dielectrics films], and nanocarbon films

(novel Ultrananocrystalline Diamond (UNCD™) and graphene films) and applications to industrial, high-tech, and external and implantable medical devices. UNCD film technology is commercialized for industrial products by Advanced Diamond Technologies (Auciello/Carlisle founders -2003, profitable in 2012, sold to large company for profit-2019), and by Original Biomedical Implants (OBI-USA, 2013) and OBI-México (2016) (Auciello and colleagues /founders), for new generations of superior medical devices/prostheses and other implants. Auciello edited 31 books and published about 600 articles in several fields, holds 23 patents, He was Associate Editor of Applied Physics Letter, and currently of Integrated Ferroelectrics, Functional Diamond, and Coatings. He was President of the Materials Research Society (2013) Auciello is Fellow of AAAS and MRS and has numerous Awards.

BINARY AND TERNARY HETEROSTRUCTURED NANOMATERIALS FOR CATALYSIS IN H_2 GENERATION

Tokeer Ahmad
Jamia Millia Islamia, India

Abstract:

Multifunctional nanostructures find the possibility for their applications in water splitting processes for hydrogen generation as a renewable source of green energy. The studies of some multifunctional nanoparticles especially heterostructures by chemical synthesis reveal the formation of monophasic structures with fairly uniform distribution of nearly spherical particles, high specific surface area and visible optical band gap. Photocatalytic generation of hydrogen in water splitting process by using as-prepared doped and heterostructure nanoparticles has also been studied under the visible light irradiations which showed a significant H_2 evolution reaction rate. The development of nanostructured catalysts has also been preferred to carry out the heterogeneous catalytic organic transformations because of greater number of surface-active sites for catalytic processes, high catalyst recovery rate, especially their environment friendly nature and their ease of synthesis. Herein, we also discuss some nanocatalysts for certain organic transformation reactions with enhanced activity as well as in water splitting reactions for hydrogen production.

Biography

Tokeer Ahmad is graduated from IIT Roorkee and PhD. from IIT Delhi. Presently, he is full Professor at Department of Chemistry, Jamia Millia Islamia, New Delhi. Prof. Ahmad has supervised 11 PhD's, 77 postgraduates, 9 projects, published 147 research papers, one patent and two books with research citation of 5250, h-index of 44 and i10-index of 106. Prof. Ahmad is active reviewer of 123 journals, delivered 117 Invited talks and presented 126 conference papers. Prof. Ahmad has received DST-DFG award, SMC Bronze and ISCAS Medals, Inspired Teacher's President Award, Distinguished Scientist Award, Maulana Abul Kalam Azad Excellence Award of Education, Teacher's Excellence Award and elected as Member of National Academy of Sciences India. Prof. Ahmad has been figured in World Top 2% Scientists for consecutive three years in both coveted lists including career long by Stanford University, USA.

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DEFORMATION-TEMPERATURE DEPENDENT IN MEMORY BEHAVIOR OF SHAPE MEMORY ALLOYS

Osman Adiguzel
Firat University, Turkey

Abstract:

Shape memory effect is a temperature dependent phenomenon exhibited by certain alloy systems called shape memory alloys which take place in the class of smart and functional materials, with the response to the variation of temperature and external conditions. This phenomenon is initiated on cooling and deformation, and performed thermally on heating and cooling, with which shape of material cycles between between original and deformed shapes in reversible way. Therefore, this behavior can be called thermoelasticity. The origin of this phenomenon lies in the fact that the material changes its internal crystalline structure with changing temperature Thermoelasticity is governed by thermal and stress induced martensitic transformations on cooling and stressing. Thermal induced martensite occurs along with lattice twinning and ordered parent phase structures turn into twinned martensite structures by means of lattice invariant shears on cooling, and these structures turn into detwinned martensitic structures by means of stres induced transformation with deformation. Lattice Twinning occurs in two opposite directions, <110 > -type directions on the {110}-type plane of austenite matrix in self-accommodating manner and consists of lattice twins. The twinning occurs with internal stresses, while detwinning occurs with the external stresses. These alloys exhibit another property called superelasticity, which is performed by stressing and releasing materials in elasticity limit at a constant temperature in parent phase region, and shape recovery occurs instantly upon releasing, by exhibiting elastic material behavior. Superelasticity is governed by stress induced transformation by stressing and releasing materials at a constant temperature in parent phase region. Superelasticity is also result of the stress induced martensitic transformation and ordered parent phase structures turn into detwinned martensitic structure with stressing. The crystal structure cycles between detwinned martensite structures and ordered parent phase structure with stressing and releasing. Twinning and detwinning processes can be considered as elementary processes activated during the transformations. Shape memory effect is performed in a temperature interval after first cooling and stressing processe, whereas superelasticity is performed mechanically in a constant temperature in parent phase region, just over the austenite finish temperature. Deformation at different temperature exhibits different behavior beyond shape memory effect and superelasticity.

Copper based alloys exhibit this property in metastable beta-phase region, which has bcc based structures at high temperature parent phase field. Lattice invariant shear is not uniform in these alloys and cause to the formation of complex layered structures, depending on the stacking sequences on the close-packed planes of the ordered lattice.

In the present contribution; x-ray and electron diffraction studies were carried out on two solution treated copper based CuZnAl and CuAlMn alloys. Electron and x-ray diffraction exhibit super lattice reflections. Specimens of these alloys were aged at room temperature, and a series of x-ray diffractions were taken at different stages of aging in a long-term interval. X-Ray diffraction profiles taken from the aged specimens in martensitic conditions reveal that crystal structures of alloys chance in diffusive manner, and this result refers to the stabilization.

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 70 online conferences in the same way in pandemic period of 2020-2021. 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 Diffraction File.

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Oral Presentations

THERMAL-MECHANICAL FATIGUE BEHAVIOR AND DAMAGE MECHANISMS OF A FOURTH-GENERATION SINGLE CRYSTAL SUPERALLOY

Zihao Tan, Xinguang Wang, Jinguo Li, Yizhou Zhou and Xiaofeng Sun
Institute of Metal Research, Chinese Academy of Sciences, China

Abstract:

The turbine blades of aero-engines are subjected to a complex and ever-changing combination of temperature and stress during the service, thereby bringing about severe cyclic temperature/strain damages and resulting in thermal-mechanical fatigue (TMF) failure of the alloy. In the present work, TMF tests under temperature of 600~1000°C and strain amplitudes of 0.5%~0.9% were conducted on a newly developed fourth-generation single crystal superalloy. The fatigue behavior, deformation and damage mechanisms of the alloy were systematically investigated. The results illustrated that under in-phase (IP) cycling condition, the alloy exhibited an initial cyclic hardening during high-temperature half cycles when the mechanical strain amplitude was 0.9%. With increasing strain amplitudes, the dominant damage mechanism of the alloy was changed from oxidation damage to plastic deformation damage, while the prevailed deformation mechanism transformed from Orowan bypassing to superdislocation shearing γ′ phase. At out-phase (OP) cycling conditions, the entire fatigue life under different strain ranges had evidently decreased compared to IP cycling conditions. When the strain range was 0.5%~0.6%, the fatigue cracks were basically initiated from NiO hillocks on the outer surface of the alloy, meanwhile, some deformation twins presented in the vicinity of pores or crack tips. Nevertheless, once the strain range exceeded 0.8%, plenty of twinning lamellae were generated throughout the specimen, which provided path for crack propagation and thereby dramatically accelerating the fatigue fracture failure of the alloy. Moreover, as the strain amplitude increased from 0.5% to 0.9%, the dominant deformation mechanism during OP-TMF was changed from Orowan bypassing to the mode of stacking faults shearing or twinning-shearing. The present research results provide guidance for the safe service of advanced single crystal superalloys.

Biography

Zihao Tan is a PhD student of Superalloy Department, Institute of Metal Research, Chinese Academy of Sciences. Tan is mainly engaged in the design and research of advanced Ni-based single crystal superalloy. He has assisted in the composition design and development of a novel low-cost third-generation single crystal superalloy. He has systematically investigated the tensile, creep and oxidation performances of the above low-cost single crystal superalloy. The corresponding tensile deformation mechanisms at different temperatures, creep deformation behaviors at different conditions as well as oxidation dynamics at high temperatures have been clearly clarified, and the relevant research results have been published in Materials Science and Engineering A (2019,761:138042) (2020,776,138997), Metals and Materials International (2022,28,1599-1610) and Vacuum (2020,175,109284). Recently, Tan is devoted to the investigation of composition optimization and mechanical properties of the advanced fourth-generation single crystal superalloy. The optimum addition of Co content in the Ru-containing single crystal superalloys has been determined by balancing the high-temperature creep property and microstructural stability of the alloys, and the research results has been published in Materials Science and Engineering A (2021, 825:141906).

THE FIRST EXPERIENCE OF USING TISSUE-ENGINEERED CONSTRUCTS FOR SURGICAL CORRECTION OF ANTERIOR VAGINAL WALL PROLAPSE.

Ailar Assambayeva, Anatoly I Ishchenko and Irina D Khokhlova
I.M.Sechenov First Moscow State Medical University (Sechenov University), Russia

Abstract:

Objective: To study the effectiveness and safety of new surgical method for correcting the anterior vaginal wall prolapse tissue-engineered constructs.

Patients and methods: After preliminary experimental work on the creation and evaluation of the biocompatibility of tissue-engineered constructs based on non-biodegradable (polypropylene (n=3) and titanium endoprotheses (n=3)) mesh implants with an autologous cellular component (rat and human dermal fibroblasts), six patients aged 44, 54, 58, 62, 70 and 75 years were examined. Inclusion criteria: anterior vaginal wall prolapse (stage II-III); consent to the installation of tissue-engineered construct. A four-stage surgical program providing for the correction of stage II-III anterior vaginal wall prolapse using tissue-engineered constructs of individual size was used.

Results: In the early postoperative period, one patient was diagnosed with a small hematoma of the anterior vaginal wall. During the first month after surgery, one patient complained of gradual perineal pain, another patient- of frequent urination. Subsequently, these symptoms stopped. After 3, 6, 9, 12, 24 months after surgery, during the pelvic examination at rest, the Valsalva maneuver and transperineal ultrasound, no displacement of organs was detected, ultrasound clearly visualized a tissue- engineered construct without displacement and deformation.

Conclusion: We have developed an original method for correcting the prolapse pf the anterior vaginal wall using tissue-engineered constructs based on polypropylene and titanium with an autologous cellular component, which helps to optimize the results of surgical treatment, reduce the frequency of disease recurrence and the risk of developing mesh-related complications.

Biography

Ailar Assambayeva is currently working as assistant of the department of Obstetrics and Gynecology of I.M. Sechenov First Moscow State Medical University (Sechenov University). Simultaneously she is a resident and PhD student in the department of Obstetrics and Gynecology at the Clinical Center of Motherhood and Childhood in Moscow. In 2021 she graduated with honor faculty of "Future Medicine" in Sechenov University. Ailar is an intrapreneur in the sphere of professional communication - Diploma (2020). She is a winner at the IV All-Russian Conference of Young Scientists with International Participation "Women's Health in the 21st Century" (2020) and winner of the Science4health conference at People's Friendship University of Russia (2021). Participated in international programs: • Internship in France, Angers, Vascular medicine in 2018; • Internship in Malaysia, Penang, Department of Endocrinology in 2018 and 2019; • Internship in Malaysia, Penang, Department of Obstetrics and Gynecology 2018 and 2019; • Internship in China, Harbin, Department of Cardiology in 2019.

PROPERTIES OF SMART CS/EE100 AND CS/P4VP BIOPOLYMER COATINGS ELECTROPHORETICALLY DEPOSITED ON MODIFIED TITANIUM SURFACES

Łukasz Pawłowski and Andrzej Zieliński
Gdańsk University of Technology, Poland

Abstract:

Load-bearing metallic implants still do not meet all the requirements. A significant problem is post-operative bacterial infections, which usually result in the development of inflammation of the surrounding tissues, often requiring reimplantation. To reduce the adhesion of bacteria on the implant its surface is modified, for example, by depositing coatings with components displaying antibacterial properties. However, the problem is the controlled release of the active substance from the coating for an extended implant lifetime while maintaining high osteointegration properties. The purpose of the present study was to prepare by electrophoretic method and to characterize smart biopolymer coatings based on chitosan, Eudragit E 100, and poly(4-vinylpyridine) on modified (by electrochemical oxidation and deposition of silver nanoparticles) titanium surface. The produced coatings were tested for microstructure, roughness, and chemical composition, adhesion to metallic substrate, corrosion resistance, and ability to release active substance, wettability, antimicrobial activity, and cytotoxic properties in contact with human bone cells. Biopolymer coatings were successfully deposited on titanium substrates by one-step electrophoresis. The proposed modification of the titanium substrate contributed to a change in surface roughness and thus wettability. A slight decrease in the corrosion resistance of the samples after modifications was observed, but, notably, the produced coatings improved antimicrobial activity and exhibited reduced cytotoxicity compared to bare substrates. The study showed a more rapid release of silver from the fabricated coatings in an acidified (typical for local tissue inflammation) simulated body fluid compared to a neutral pH value. The adhesion of coatings to the modified titanium substrate needs further improvement.

Such coatings, which exhibit controlled antimicrobial activity without adversely affecting human bone cell adhesion, are promising for designing metallic load-bearing implants to remain in the human body for an extended time.

Biography

Łukasz Pawłowski is a Ph.D. student and research assistant at the Institute of Manufacturing and Materials Technology, Faculty of Mechanical Engineering and Ship Technology, Gdańsk University of Technology. His research work includes surface modification of materials intended for implants, mainly titanium and titanium alloy, by electrochemical oxidation, deposition of metallic nanoparticles as well as composite coatings by the electrophoretic method. Of particular importance to him is the production of smart coatings that will release antibacterial substances in a controlled manner while maintaining high osteointegration properties. For this purpose, he uses smart biopolymers that show sensitivity to the external environment, such as temperature changes, pH changes, or exposure to the electric or magnetic field.

DESIGN AND DEVELOPMENT OF BINARY BLENDS CONSISTED OF NEW CONJUGATED AND DIBLOCK COPOLYMERS FOR APPLICATIONS IN ACTIVE PACKAGING

Athanasios Katsouras, Andreas Karydis-Messinis, Gkreti-Maria Manesi, Dimitrios Moschovas and Apostolos Avgeropoulos

University of Ioannina, Greece

Abstract:

Conjugated polymers represent one of the most important classes of materials for the fabrication of many optoelectronic applications, such as light emitting diodes, field effect transistors, organic photovoltaics, sensors, etc. In this work, our studies were focused on binary blends consisted of donor-acceptor (D-A) conjugated polymers containing indacenodithiophene (IDT) and indacenodithienothiophene (IDTT) moieties as electron donating units with various electron withdrawing building blocks, such as thienopyrrolodione (THPE) and diblock copolymers of the PS-b-P_2VP or PS-b-P_4VP (where PS: polystyrene, P_2VP: poly(2-vinylpypridine) and P_4VP: poly(4-vinylpyridine)] sequences in a ratio of 1/1. These blends were applied for the first time for the preparation of a membrane that could potentially be used for smart packaging. Useful structure-property-performance correlations have been obtained and will be presented. More specifically, our studies were based on the color change of the membrane according to external stimuli (pH and/or temperature) between the material that will be incorporated as packaged material and the membrane itself. Active packaging involves the alternation between the packaged product (internal indicator) and the overall packaging (external indicator). Such indicators are time-temperature indicators, gas sensors, thermochromic inks or thermochromic sensors. Our results are preliminary and involve studies related to the pH and temperature dependence as well as exposure in the infra-red regime.

Acknowledgement: We acknowledge support of this work by the project "Development of research infrastructure for the design, production, development of quality characteristics and safety of agrofoods and functional foods (RI-Agrofoods)" (MIS 5047235) which is implemented under the Action "Reinforcement of the Research and Innovation Infrastructure", funded by the Operational Programme "Competitiveness, Entrepreneurship and Innovation" (NSRF 2014-2020) and co-financed by Greece and the European Union (European Regional Development Fund).

Biography

Athanasios Katsouras is a Materials Science Engineer MSc., and Post-Doctoral Researcher from Laboratory of Polymer Science and Engineering, Department of Materials Science Engineering, School of Engineering University of Ioannina, University Campus - Dourouti, I.M.B.B., FORTH, Ioannina 45110, Greece. His scientific research interests include: Synthesis and characterization of new conjugated polymers for organic photovoltaic applications. He is also an expert in specific characterization techniques such as: Nuclear Magnetic Resonance "^{1}H (proton), ^{13}C (carbon)" NMR, Size Exclusion Chromatography (SEC or GPC), Thermogravimetric Analysis (TGA), Absorption Spectroscopy (UV-Vis), Cyclic Voltammetry, Surface Profilometer.

FORMULATION AND OPTIMIZATION OF SINAPIC ACID (SA) LOADED GUAR GUM NANOFORMULATION *via* BOX–BEHNKEN DESIGN AGAINST DIABETIC WOUND HEALING

Debojyoti Mandal and Jeena Gupta
Lovely Professional University, India

Abstract:

The most prevalent illness, diabetes mellitus, is characterized by hyperglycemia. Chronic hyperglycemia may cause an excess generation of free radicals, which causes oxidative stress and hinders wound healing. There is an increasing demand for wound care, and its management presents a substantial clinical issue. Therefore, developing better wound dressings remains a hotspot in the field of chronic wound care. By encouraging the correct progression through the various healing phases, nanotechnology provides an excellent method for speeding the recovery from both acute and chronic wounds. Recently, Guar gum-based drug carrier systems have attracted interest for the regulated and sustained release of a wide variety of medicinal drugs. Because of its natural occurrence, accessibility, biocompatibility, biodegradability, and simple and mild manufacturing processes, guar gum provides a safe and efficient route for drug delivery. Anti-diabetic and antioxidant activities have been attributed to sinapic acid (SA), a naturally occurring phenolic molecule found in many plants. The purpose of this work is to develop nanoparticles of Sinapic acid and investigate its hypoglycemic and wound healing properties. By using the oil in water emulsion approach, nanoparticles of guar gum loaded with sinapic acid were developed. Utilizing response surface methods and Box-Behnken design, the preparation procedure and formulation factors were optimized to produce the lowest particle size and highest encapsulation efficiency. Nanoparticle size (NP), PDI value, zeta potential, entrapment capacity and in vitro drug release were taken for determination of the optimal NP formulation. Formulated nanoparticles were analyzed with Scanning electron microscope (SEM) and FTIR. The findings for particle diameter, PDI, zeta potential, and drug entrapment were around 200 nm, 0.5, -30 millivolts, and 80-90%, respectively. Based on the data, nano formulation of guar gum with SA was found potential approach for improving wound healing properties of Sinapic acid.

Biography

Debojyoti Mandal is from Lovely Professional University (LPU), India. Mr. Debojyoti Mandal had completed his Master's degree from Vidyasagar University, India. He is pursuing his PhD in Lovely Professional University (LPU) in India, while concurrently working as a principal investigator in Bio affinities group of LPU. His current research interests include diabetes, wound healing, nano formulation, and nanomedicine. He has expertise in a wide range of disciplines, including water microbiology, plant taxonomy, phytomedicine, nano formulation, and more. Docking, animal cell culture lab, animal handling, and other areas of animal care are among his areas of competence. He had successfully enrolled in four courses through the Indian Institute of Technology in Kanpur's NPTEL programme. Several manuscripts of his are now being reviewed, and he has published one. In three separate instances, he was asked to discuss the results of his research at three we known international conferences (like ICDD-2022). He is actively looking for research writing opportunities in addition to collaboration projects.

SILICA NANOPARTICLES INDUCE NEUROTOXICITY IN STRIATUM REGION BY ACTIVATING OXIDATIVE STRESS AND APOPTOSIS-RELATED GENE EXPRESSION IN ADULT MALE RATS: POSSIBLE INVOLVEMENT OF Nrf2/HO-1 AND APOPTOTIC PATHWAYS

Khadija Boukholda and Hamadi Fetoui
University of Sfax, Tunisia

Abstract:

The Extensive use of silica nanoparticles (SiNPs) in biomedical and industrial fields has increased the risk of exposure, resulting in concerns about their safety. However, information regarding their neurotoxic effects through different pathways particularly by perturbing the oxidative/nitrosative balance and causing striatum damage is scarce. The objective of this study was to further assess mechanisms involved in SiNPs-induced neurotoxicity in the striatum using a rat model. Results showed a significant increase in lipid peroxide levels (LPO), reactive oxygen species (ROS), nitrite (NO) and protein carbonyl contents in the striatum, whereas there was a significant decrease in antioxidant enzyme activities (SOD, CAT and GPx) and glutathione (GSH) levels in rats following a subacute intraperitoneal injection of SiNPs (at 25 and 100 mg/kg bw/day for 28 days) compared to controls. Furthermore, immunohistochemical analyses of the striatum revealed a significant increase in protein expression of antioxidant markers, in particular nuclear factor erythroid-2-related factor-2 (Nrf2) and Heme oxygenase-1 (HO-1). Quantitative real-time PCR also showed that SiNPs induced an up-regulation of pro-apoptotic gene expression (Bax, p53, Caspase-9/3) and down-regulation of anti-apoptotic factor Bcl-2 in this brain region, with a concomitant upregulation of the Bax/Bcl-2 ratio. Our findings suggest that oxidative/nitrosative stress-mediated apoptosis is involved in the striatum neurotoxicity induced by SiNPs by activating Nrf2/HO-1 and apoptotic signaling pathways.

Biography

Khadija Boukholda is working in the University of Sfax's US Department of Biology. She completed her PhD Candidate, Laboratory of Toxicology, Microbiology and Environmental Health, Sfax.

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ANTIFUNGAL ACTIVITY OF ZINC OXIDE NANOPARTICLES AGAINST SACCHAROMYCES CEREVISIAE

Tan Eng Pei[1], Sinouvassane Djearamane[1], Ling Shing Wong[2], Sharolynne Xiao Tong Liang[1], Ranjithkumar Rajamani[3], Ashok Kumar Janakiraman[4] and Suresh Kumar Subbaih[5]

[1]*Universiti Tunku Abdul Rahman, Malaysia*
[2]*INTI International University, Malaysia*
[3]*Viyen Biotech LLP, Coimbatore, India*
[4]*USCI University, Malaysia*
[5]*Bharath Institute of Higher Education and Research, India*

Abstract:

Zinc Oxide Nanoparticle (ZnO NP) is widely used in biomedical applications due to its antimicrobial and antioxidant properties. The objective of the present study was to determine the antifungal activity of ZnO NPs against the yeast *Saccharomyces cerevisiae*. The turbidity test results showed a significant ($p < 0.05$) dose-dependent growth inhibitory effect of ZnO NPs on *S. cerevisiae* as the growth inhibition increased from 7.04±0.64 to 70.30±3.19% as the concentration of ZnO NPs increased from 5 to 150 µg/mL. The SEM-EDX analysis showed the cellular accumulation of ZnO NPs on S. cerevisiae and the subsequent morphological alterations such as regional invagination, pitting, cracks, wrinkle and cell rupture. In addition, the FTIR spectrum revealed the possible involvement of hydroxyl, alkene, amides, carbonyl and phosphate groups from phospholipids, polysaccharides and polypeptides of the yeast cells wall for binding of ZnO NPs on the cell surface. The present study has demonstrated the antifungal activity of ZnO NPs on *S. cerevisiae* through growth inhibition and the morphological damages resulted from the treatment of ZnO NPs.

INFLUENCE OF THE LAMINATE THICKNESS AND THE THERMAL LOADS ON THE BUCKLING OF A CYLINDRICAL SHELLS

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

Velagapudi Ramakrishna Siddhartha Engineering College, India

Abstract:

The buckling load factor (BLF) is the safety factor against the buckling. The optimization of the BLF reduces the mass of the cylindrical shell while keeping it intact against the buckling load. In the present study, a generalized cylindrical shell was modelled and the shell configurations were designed for the optimal BLF. The cylindrical shell with radius of 250 mm, free length of 500 mm was designed. The thickness of each ply in the shell was varied from 0.25 mm to 0.5 mm. The shell was fixed at one end and the other end was left free where the mechanical load of 1 N and a thermal load of -65°C to 55°C. With the increase in the thickness of the laminate, the buckling load required increased. Although the increase in the buckling load is achieved, the higher thickness means higher weight of the structure which is not desirable. The highest possible thickness as per the allowed parameters needs to be chosen during design stage. For the increase in the thermal load from -65°C, the buckling load increased till 25°C and then reduced drastically. The most movement of the buckling load capacity was within the range of 0°C and 35°C. This behaviour can be attributed to the loss of the material properties at the higher temperatures and the brittle nature of the epoxy at the lower temperatures. The present study shows that the laminate thickness should be as high as possible and the thermal loads should be between 0°C and 35°C for the best performance of the cylindrical shell in buckling.

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.

IMPACT OF IRON PYRITE NANOPARTICLES SIZES IN PHOTOVOLTAIC PERFORMANCE

Refka Sai and Rasha A Abumousa
Université de Carthage, Tunisia

Abstract:

With rising energy demand and depleted traditional fuels, solar cells offer a sustainable and clean option. In recent years, and due to its acceptable band gap, high absorption coefficient, and inexpensive cost, iron pyrite (FeS_2) is a popular material for solar cells. Earth abundance and nontoxicity further boost its photovoltaic possibilities. The current study examined the influence of sulfurization at 350-400°C on iron pyrite layers fabricated using spray pyrolysis. The morphology and size from TEM confirmed the XRD results of synthesizing a pyrite FeS_2 with an average particle size of 10^{-23} nm at 350-400°C, respectively. The direct band gap calculated by DFT as a function of temperature was found to be consistent with the experimental findings, 0.87 eV (0.87) and 0.90eV (0.95) at 350°C and 400°C, respectively. We found high-performing photovoltaic cells on ITO/ ZnO/ FeS_2/MoO_3/Au/Ag, obtained with an excellent quality of nanoparticles and nanostructures of FeS_2 pyrite, which improved with the method of preparation and growth parameters.

Biography

Refka Sai has completed her PhD. (with Highest Honors) in Sciences and Technology (Major: Physics) from University of Carthage, Faculty of Sciences of Bizerte, Tunisia in December 2021. She has a good experience of research and has been a research fellow at Leading instutions, Laboratoire de Physique du Solide au CNRS de Bellevue and laboratory of Semiconductors, Nanostructures and Advanced Technologies, Tunisia. She also served as Visiting researcher at Department of Electronic Engineering University of Rome, Torvergata, Italy and Faculty of Sciences of Sciences of Tunis El Manar University, Tunisia. Her research experiences manifested in over 7 research papers. Her area of expertise includes Condensed Matter Physics, Advanced Materials, Nano Science and Nanotechnology, Energy and Biosensor Field.

GRAPHENE-OXIDE (GO) ELECTROPHORETIC THIN FILM DEPOSITION ON TITANIUM

Ali Rezaei
Iran University of Science and Technology, Iran

Abstract:

A thin film of graphene-oxide (GO) is electrophoresed on titanium (Ti) metal sheet in a liquid dispersion of GO by De-ionized (DI) water. To have a better discerning of surface morphology and crystallinity, the film was characterized by field emission scanning electron microscopy (FESEM) and flake-like morophology was observed on the surface. Furthermore, Raman spectroscopy assessments validate existence of carbon lattice in 2D dimensions by matching G, D, 2D and G+D peaks with previous literature. Adherence capability of the deposited film was tested by exposing to salt spray chamber for 50 hours and no macroscopic damage was observed after removal.

Biography

Ali Rezaei is a passionate researcher particularly interested in nanotechnology and sensors; Fully operationalized with academic and professional working skills to start adding value to an existing team; Keenly interested in and up-to-date with the latest developments in the realization of micro and nano-based devices.

DETERMINATION OF NANOMECHANICAL PROPERTIES OF BACTERIAL NANOCELLULOSE MODIFIED *in situ* WITH HYALURONIC ACID

Alicja Stanisławska and Marek Szkodo
Gdansk University of Technology, Poland

Abstract:

Heart disease has been one of the leading causes of death in the world for years. The heart valves begin to degrade after working through millions of cycles. As a result of calcification, they become stiff and lose their functionality. Then it is necessary to replace the diseased valve with a new one. One of the solutions is to use a heart valve made of bacterial nanocellulose, which has a number of valuable properties. This paper presents the results of the research on bacterial nanocellulose modified with hyaluronic acid. The obtained modifications were freeze-dried and convection-dried at the following temperatures: 20°C, 105°C, and then soaked in distilled water for 2 hours at a temperature of 20°C. The resulting modification was analyzed in terms of the influence of temperature and drying conditions on nanomechanical properties such as nano-hardness, reduced Young's modulus and creep rate, which were determined using the nanoindentation technique. Additionally, the value of the second type of residual stress was determined, as well as the size of the crystallites and the degree of crystallinity using the X-ray diffraction method. The use of in situ modification with hyaluronic acid with the subsequent dehydration and rehydration process may contribute to obtaining a material with good mechanical properties and probably with increased biocompatibility compare to bacterial cellulose. This kind of BNC modification could be used to create implants in cardiac surgery and vascular surgery, especially for aortic heart valves with dimensions individually tailored for each patient.

Biography

Alicja Stanisławska - doctor of technical sciences in the discipline of materials engineering. She has experience in the field of mechanical and physicochemical research of biomaterials, as well as other construction materials. Alicja Stanisławska works as an assistant professor at the Department of Biomaterial Technology at the Gdańsk University of Technology. She uses the nanoindentation technique to determine the nanomechanical properties of various materials and their modifications. In addition, she uses an atomic force microscope to determine the surface topography, and performs morphological analyses using a scanning electron microscope with energy dispersive microscopy attachment and optical microscope. Also she has an experience in X-Ray diffraction analysis, thermogravimetric analysis and differential scanning calorimetry analysis. In addition, in the years 2014-2016, she participated in an interdisciplinary project on the use of bacterial nanocellulose as a material for artificial heart valves and is the co-author of the national and European patent application, which was created during the implementation of this project.

DESIGN, DEVELOPMENT AND CHARACTERIZATION OF RIVASTIGMINE LOADED HERBAL HYBRID NANOPARTICLES FOR TREATMENT OF ALZHEIMER'S DISEASE

Twinkle Garg, Rakesh Yadav and Sachdev Yadav
Banasthali Vidyapith, India

Abstract:

Alzheimer's disease is one of the common type of dementia, is a progressive disease starting with mild memory loss that leads to loss of the ability to a conversation and respond to the environment. Four set of hybrid nanoparticle were selected after preparing and optimizing from twenty eight sets of hybrid nanoparticles with various concentrations of lipid, herbal extract and polymers i.e. PLA and PLGA. One set containing drug Rivastigmine alone and second set contains drug Rivastigmine and Shankhpushpi (herbal extract) for each set of polymers. Hybrid nanoparticles were prepared by using film hydration method, with slight modification. Here, oleic acid: span 80: soya lecithin (1:1:1) and PLA were dissolved in methanol: Chloroform (3:2) followed by evaporation of solvent under vacuum to remove even the last traces of organic solvent.

The zeta potential of selected F4, F11 and NF4 was found -24.4 ± 0.4, -21.2 ± 0.9, and -25.6 ± 0.9 mV respectively, NF11 showed -38.9 ± 0.4 mV. F4, F11, NF4 and NF11 retained prominent peak in XRD with change in magnitude at 2θ =220. This confirms that there was no significant interaction of drug with excipients. Optimized hybrid nanoparticles were evaluated further using TEM, turbidity measurements, drug loading and entrapment efficiency.

Formulation F-4 (86.19%) showed maximum release of the drug at the end of 24th hr. F-11, NF-4, NF-11 showed the release up to 84.25%,76.46%, 79.14%, respectively in 24 hours. The particle size is inversely proportional to drug release i.e., as the size of the nanoparticles decreases it increase the drug release. Higher concentration of surfactant showed faster drug release nearly 50% at end of 5th hour (85:15). All formulations were found stable with respect to particle size and drug loading for 4 week period under 5 ± 3°C/ 75 ± 5%RH and 40 ± 2°C/ 75 ± 5%RH

Biography

Twinkle Garg has her expertise in academics and Research evaluation. She is passionate in improving the health and wellbeing while putting her best efforts into the pharmaceutical research and academic. She has keen interest in the area of Novel drug delivery systems. She has worked on an alternate of managing the Alzheimer's disease, which is still seeking for a perfect treatment and has gained a lot attention worldwide for the best treatment/ management. Her formulation for the treatment of the Alzheimer's based on herbal nanoparticle promises a lot in the treatment of this disease and it is an revolutionary model for improving healthcare.

BAYESIAN JOINT SPATIAL MODELLING OF ANEMIA AND MALARIA IN GUINEA

Thierno Souleymane Barry, Oscar Ngesa, Jeremiah Kimani Kiingati, Nelson Owuor Onyango, Aurise Niyoyunguruza, Alexis Habineza, Henry Mwambi and Henri Bello Fika

Pan African University Institute for Basic Sciences Technology and Innovation, Kenya

Abstract:

In sub-Saharan Africa, anemia and malaria are the leading causes of morbidity and mortality among children under the age of five years. Guinea is one of the countries where the two diseases have devastating effects. Both of these diseases have been studied separately, but the two diseases exhibit inherent dependence between them, therefore, modelling them in isolation negates practical reality. This study aims at jointly estimating the spatial linear correlation between anemia and malaria, as well as to investigate the differences in contextual, socioeconomic and demographic factors affecting morbidity among children under five years in Guinea. Statistical approaches are used to handle modelling of binary outcomes with allowance for spatial components and joint responses. In particular, a latent model approach is proposed in the methodology to investigate the linear correlation between anemia and malaria allowing for spatial and non-spatial effects. All the parameters are estimated using Bayesian approach based on Markov chain Monte Carlo (MCMC) technique. According to the findings, 76.15% of children under the age of five years in Guinea were anemic, and 14.31% had malaria. Furthermore, the results showed that the child's malaria status is significantly associated with the place of residence, his/her age and ownership of television as an indicator of well being. In terms of anemia in children, there was a significant association with age, mother's education level and ethnicity group of the household head. The Nzerekore region, had both high malaria and anemia prevalences in children under five years. The latent model results showed that there was weak positive correlation between anemia and malaria in Nzerekore and Boke regions. Based on the shared component model, there was a significant unobserved risk factor that both diseases share.

Biography

Thierno Souleymane Barry is specialized in diseases modeling and has over seven years of experience working in international organizations such as Plan International and Jhpiego. As for his academic achievements, he has published many papers related to the public heath, sociodemographic sectors and mathematics fields, all of them in high-impact journals. Thierno Souleymane Barry thrives on challenges and constantly sets goals for himself to keep him motivated. He is not at ease with defeat, and he is constantly looking for ways to improve and achieve greatness. He is an enthusiastic person, adaptable, and a fast learner with a broad and willing interest in the discovery of new innovative fields. Therno Souleymane Barry particularly enjoys collaborating with scientists from multiple disciplines to develop new skills and solve new challenges.

PRESSURE SENSITIVE ADHESIVES IN TRANSDERMAL DRUG DELIVERY

Niharika and Praveen Kumar Gaur
Metro College of Health Sciences and Research, India

Abstract:

The skin offers an available and advantageous site for the administration of medicament. For millennia, individuals have used substances on the skin for remedial impacts and, in the modern era, a variety of dermal formulations have been developed to treat local and systemic indications. A dermal patch, also known as a skin patch, is a medicated adhesive patch that pertains to the skin to deliver medication. It incorporates an attractive substitute for oral delivery of drugs and is poised to provide an alternative to hypodermic injection too. Dermal patches are often known as Transdermal Patches and with the constant development of new and innovative approaches; they have been proposed as a safe and effective way to deliver drugs through the skin. But, for appropriate drug delivery from a dermal patch, its adhesion to the skin is the primary factor. This is crucial to the products safety, potency, and quality. The US Food and Medication Administration (FDA) has received multiple reports of adhesional failure for transdermal drug delivery devices through the Drug Quality Reporting System (DQRS). It is expected that in transdermal patches, adhesive will maintain a near bond with the skin, once the release liner has been removed and deliver therapeutic action and desired adhesion to the skin without causing any kind of skin irritation. The focus is primarily on the utilization of adhesives in the fabrication of dermal patches, the mechanism of adhesion, tests to determine the efficacy of adhesives, and possible adhesion failures of transdermal patches. Moreover, this chapter includes a summary of the factors that influence skin adhesion, adhesive types, adhesive properties, prediction of patch *in vivo* adhesive performance, regulatory strain, as well as quality control analyses. This chapter concludes with an overview of the potential prospects of novel adhesives in Transdermal Drug Delivery.

Biography

Niharika is working as an Associate Professor at Metro College of Health Sciences and Research, Greater Noida. She is PhD., and M.Pharm in Pharmaceutics, and has 7 years of teaching and research experience. She has 7 years of teaching experience with a diploma, bachelor and postgraduate students. She is having a total of 25 publications in international journals, and many of her articles are indexed in Scopus and SCI journals. During her PhD. she worked on 'Design and characterization of an Acrylic Pressure sensitive adhesive-based Transdermal therapeutic system which she has appreciated by the Department of Polymer Sciences, IIT Kharagpur. Her area of interest is Transdermal Drug delivery and gastroretentive drug delivery.

POROUS PEEK/HA COMPOSITES: A CANDIDATE OF ORTHOPEDIC IMPLANT MATERIAL

Sujoy Kumar Dey[1,2], Ankita Das[3] and Ananya Barui[3]

[1]Sikkim Manipal University, India
[2]North East Regional Institute of Science and Technology (NERIST), India
[3]Centre for Healthcare Science and Technology, Indian Institute of Engineering Science and Technology, India

Abstract:

Porosity is a very important parameter for an orthopedic implant material. Many research reports showed that the porosity can overcome the limitation of poor osseointegration with the help of encouraging bone ingrowth of poly-ether-ether-ketone (PEEK). On other hand porosity reduce the implant strength and which in turn hamper the potentiality of the implant. This study tries to find the out the appropriate PEEK/hydroxyapatite (HA) composites. In this motive many kinds of characterization and its analysis were done like, effect of hydroxyapatite (HA) on porosity, mechanical strength and the biocompatibility of the composites material. End of all experiments, it is revealed that porosity; strength and *in-vitro* biocompatibility of PEEK5HA composite is most nearable character of human bon. So it is appropriate for the orthopedic implant material and it would be a good replacement of the existing metallic material.

Biography

Sujoy Kumar Dey is an Assistant Professor at Sikkim Manipal University, India. He has completed his PhD at North Eastern Regional Institute of Science and Technology, India. His research area is about enhancement of thermal and mechanical properties for CF peek and Ha based bio inspired composite.

QUANTUM-CLASSICAL MECHANICS: PRINCIPLES, APPLICATIONS, AND PROSPECTS

Vladimir V Egorov
Russian Academy of Sciences, Russia

Abstract:

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

Biography

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

POTENTIAL VALORIZATION OF AGRICULTURAL WASTE INTO LOW-COST ACTIVATED CARBON FOR THE REMOVAL OF ORGANIC AND INORGANIC CONTAMINANTS FROM WASTEWATER

Zaineb Bakari, Nesrine Boujelben, Massimo Del Bubba, Boubaker Elleuch
National Engineering school of Sfax, Tunisia

Abstract:

The fast increase registered actually in the industrial activities is accompanied by a growing production of wastewater that in turn need to be well treated before rejecting. Treated wastewater can contain toxic organic, mineral or biological pollutants that require urgent treatment before reused or being returned to the environment. In this context, the reuse of waste as adsorbent may be both efficient and economical solution to remove or reduce these environmental hazards. A low-cost activated carbon produced from palm wastes, widely planted in Tunisia, was performed in this study to investigate the removal of both dyes and heavy metals from aqueous media in individual systems. The aforementioned material was used for the first time in the carbon production. The preparation conditions were optimized by evaluating the adsorptive characteristics of the resulting absorbent. Batch tests were performed to optimize the effect of different parameters on the removal process such as pH, contact time and initial pollutant concentration. Langmuir and Freundlich isotherms were applied to fit and explain the experimental data. Kinetic study was done to more explain the adsorption mechanism process. Adsorption tests showed that Langmuir adsorption isotherm and pseudo-second order models well fitted well the adsorption of the tested ions. The maximum capacity of activated carbon was relatively higher than other materials obtained from low-cost biomasses which were used to adsorb the metallic ions from aqueous solutions. Results demonstrated that the prepared activated carbon obtained from palm waste may be a promising material to remove dyes and heavy metals ions from wastewater.

Biography

Zaineb Bakari has her expertise in evaluation the environmental and materials chemistry and water treatment. Her attention is focused in the environmental impact of reusing of treated wastewater activities, in particular regarding potentially toxic elements pollution. The main concerns of her interest is Environmental Impact Assessment by the study of soils, plants and fruits contamination after irrigation using treated wastewater; and the purification of contaminated water from organic and inorganic pollutants using different supports. Her open and contextual evaluation model creates good pathways for improving the environment protection and healthcare. She has worked in the adsorbent's materials characterization, surface characterization and micropollutants adsorption.

CARBON BASED NANOMATERIALS FOR ENERGY APPLICATION

Subhajit Kar and Santanu Bhattacharyya
Indian Institute of Science Education and Research, India

Abstract:

Complete metal-free P-functionalized carbon nanomaterials are synthesized from a single molecular precursor, Phytic acid, for photocatalytic solar H_2 production and simultaneous organic transformation of 4-methyl benzyl alcohol to 4-methyl benzaldehyde by managing the complete redox cycle. Increasing the carbonization time, P-functionalized amorphous carbon dots convert to the highly defined 2D sheet-like nanostructure with optimum P-functionality and exhibit optimum photocatalytic efficiency. Finally, the highly defined sheet-like structure converts to a more defected aggregated form, resulting in the depletion of photocatalytic efficiency. The structural and elemental features are further correlated with the ongoing photo physics using steady-state and time-resolved fluorescence spectroscopy. Transient photocurrent responses and Mott-Scotty plots and detailed computational studies support the optimization of P-functionalized carbon nanostructure for efficient photocatalysis. Overall, the in-depth structure–property correlation and critical optimization of the heteroatom functionalized carbon nanomaterials will open up new possibilities for further development of metal-free photocatalysts for solar-energy conversion devices.

Biography

Subhajit grew up in Karrampur, a small village somewhere in Bankura, West Bengal, India. He pursued his B.Sc. in *Chemistry honours* (2015) at Bankura Sammilani College (Burdwan University). Further, he completed the M.Sc program in *Chemical Sciences* at the Central University of Gujarat (2017). His Master's project on the Bio-organic chemistry of oligo-peptides is an introduction to carrying out broad-based research in chemistry. He joined his PhD. at IISER-Berhampur (Dec 2018 –till date) in Physical Chemistry /materials Science, where he is trying to develop and understand the photo-physics of unique luminescent carbon-based materials and utilizing them for potential photocatalytic application.

DC ELECTROPLATING OF COBALT-NICKEL THIN FILM ON COPPER SUBSTRATE FOR MAGNETIC APPLICATIONS

Ali Rezaei
Iran University of Science and Technology, Iran

Abstract:

In this work, a thin film of cobalt (Co) and nickel (Ni) alloy has been deposited on a copper (Cu) substrate by means of electroplating from aqueous solution of their constituent salts. Morphological characteristics of the thin film were investigated by field emission scanning electron microscopy (FESEM). X-ray diffraction (XRD) analysis and Raman spectroscopy were employed to validate the structural properties of the film. Vibrating sample magnetometer (VSM) was utilized to extract the magnetization curve of the electroplated film and afterwards, coercivity, retentivity and saturation flux density of it. The extracted magnetic curve proves that the deposited layer exhibits magnificent magnetic properties which make it a proper choice for magnetic sensors fabrication.

Biography

Ali Rezaei is a passionate researcher particularly interested in nanotechnology and sensors; Fully operationalized with academic and professional working skills to start adding value to an existing team; Keenly interested in and up-to-date with the latest developments in the realization of micro and nano-based devices.

NANOFERTILIZER: UNIQUE MATERIAL FOR GLOBAL FARMING

Jagadish Chandra Tarafdar
ICAR-CAZRI, India

Abstract:

Nanofertilizers can be synthesized by various physical, chemical, aerosol and biological methods. It has the potential to enhance plant productivity, nutrient use efficiency, stress management, soil health management and environmental protection. Microbial synthesized nano-nutrients application in agriculture may serve as an opportunity to achieve sustainability towards global food production. Important benefits of nanonutrients over conventional chemical fertilizers rely on nutrient delivery system. For example, nutrient can be released over 40-50 days in a slow-release fashion rather than 4-10 days by the conventional fertilizers. The nutrient use efficiency also improved by 2-20 times, therefore, nutrient requirements is less as well as reduces the need for transportation and application costs. Moreover, by using small quantities soil does not get loaded with salts that usually are prone to over application using conventional fertilizer. Nanonutrients also can be used as nanobioformulations. The formulations containing one or more beneficial microorganisms after blending of required nanoparticles to enhance soil productivity. Nanobioformulations can be helpful to enhance the stability of biofertilizers with respect to desiccation, heat and UV inactivation. It can also solve some limitations of biofertilizers such as ease to handling, enhanced stability, protection against oxidation, retention of volatile ingredients, taste making, consecutive delivery of multiple active ingredients etc. In general, microbial synthesized nanomaterial mobilizes 30% more native nutrient than conventional fertilizer application. The average improvement of yield, irrespective of crops and soil types, varies between 24-32% as compared to 12-18% under chemical fertilizers. Additionally, nanofertilizer have been implicated in the protection of plants against oxidative stress as they mimic the role of antioxidative enzymes such as superoxide dismutase (SOD), catalase (CAT) and peroxidase (POX). Nanonutrients may be applied both on soils and on leaves as foliar. This can also be applied through drip, hydroponic, aqua and aeroponic. With recommended doses of application, it can be envisaged to become major economic driving force and benefit consumer and farmers with no detrimental effect on the ecosystem.

Biography

Jagadish Chandra Tarafdar did his M. Sc. and PhD. degrees in Soil Science and Agricultural Chemistry from Indian Agricultural Research Institute, New Delhi and Post Doctorate from Institute of Agricultural Chemistry, Goettingen, Germany. He has made original and well recognized contribution on mobilization of native phosphorus. He has developed an *in-vivo* filter paper technique for phosphatase estimation. He is successfully developed biosynthesized nano nutrients and nano induced polysaccharide powder for agricultural use. He also developed a sequential P fractionation scheme and a rapid method for assessment of plant residue quality. Dr. Tarafdar has pioneered in finding out the origin of different phosphatase fractions and also developed a potential biological indicator. His developed notable other techniques are: Visual demonstration technique of germinating AM spore, Soil solarization technique for mass scale production of AM fungi, Freeze-drying technique to understand nutrient movement and Electrofoccusing technique to demonstrate the origin of enzymes. Dr. Tarafdar has published 379 research articles in national and international journals which include 42 book chapters and five books. He has four patents and 73 new organisms in his credit. He has to his credits >8600 citations and 44 h-index. Dr. Tarafdar has been placed amongst the top 2% scientists, across all sciences in the world, by Stanford University, USA.

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QUANTUM-CLASSICAL MECHANICS: PRINCIPLES, APPLICATIONS, AND PROSPECTS

Vladimir V. Egorov
FSRC"Crystallography and Photonics", Russian Academy of Sciences, Russia

Abstract:

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

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Poster Presentations

EFFECT OF PLA-g-HA ON MECHANICAL AND THERMAL PROPERTIES OF PLA/PCL BLEND NANOCOMPOSITES

Phanitchanun Thanawattana and Siriwan Phattanarudee
Chulalongkorn University, Thailand

Abstract:

In recent years, researches involve biopolymer/bioceramic composites have been increasing in field of bone regeneration, which is driven by the need for repairing bone defects resulted from infections, tumours or bone loss by trauma. Poly(lactic acid) (PLA) and polycaprolactone (PCL) are among the widely used biodegradable polymers for bone tissue engineering since they are known for their biocompatibility and controllable degradation rate after introduction into human body. Nano-hydroxyapatite (n-HA) is a kind of nanomaterials and mostly studied in the biomedical fields. The main use of hydroxyapatite found in hard tissue regeneration since it contains similar inorganic component of bones and teeth. By incorporating hydroxyapatite into biopolymer matrix is able to enhance not only osteoinductivity, osteoconductivity, bone tissue formation but also mechanical and thermal properties of the nanocomposite materials, which is important for scaffold construction. Interface bonding has always been the most crucial issue in composite materials, which is related to homogeneity, strength, and functionality of the composites. The current research focuses on preparation of poly(lactic acid) grafted hydroxyapatite (PLA-g-HA) by using melt grafting method to enhance the bonding force between the blend and nanocomposite and attain satisfying dispersion. Various concentrations of HA were studied. %Grafting and functionality were characterized by thermogravimetric analysis and Fourier-transform infrared spectroscopy. The results exhibited significant peak position corresponding to carbonyl band in the ester structure, while %grafting was obtained in a range of 14-17%. The prepared PLA-g-HA was later added to PLA/PCL blends at different concentrations. Physical and thermal properties of the obtained blend nanocomposites were then analysed in terms of morphology, glass transition temperature, %crystallinity, crystal structure, degradation temperature, and tensile strength.

Biography

Phanitchanun Thanawattana currently pursues her master degree in the program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University, Bangkok, Thailand. The thesis title is "Physical and thermal properties of PLA/PCL/PLA-g-HA nanocomposites", and supervised by Associate Prof. Dr. Siriwan Phattanarudee. She has got a bachelor degree in Petrochemicals and Polymeric Materials, Faculty of Engineering and Industrial Technology, Silpakorn University in 2020. Her undergraduate project related to the synthesis and properties of biocomposite films obtained from chitosan and hydroxyapatite.

A FAST METHOD FOR NANOCOMPOSITE PbS SYNTHESIS: PREPARATION AND CHARACTERIZATION

Hameed Ullah and Yanqing Sheng
MM Pakistan Pvt. Ltd , Chinese Academy of Sciences, China

Abstract:

PbS nanoparticles (Nps) were synthesized by a chemical route at room temperature. Lead acetate and Thiourea were employed as sources of Pb^{2+} and S^{2-} ions respectively. The elemental composition of synthesized nanoparticles was evaluated by using dispersive energy analysis of X-rays (EDS). The EDS spectra show the peaks of Pb and S elements. The X-ray diffraction (XRD) pattern shows the cubic phase of PbS NPs. The broadening of the XRD peaks indicates the nanocrystalline nature of the synthesized sample. The crystallite size calculated from the Scherrer formula and it is 16.81nm. The SEM and TEM conform the morphological characteristics of the PbS NPs. The nanoparticles have been also investigated by X-ray photoelectron spectroscopy (XPS).

Biography

Hameed Ullah has expertise in Nanoparticle synthesis and its characterization. The research on nanoparticles and its toxicity effect to plant, Bioaccumulation, biotransformation in plants and its mechanism of uptake from soil, or water medium to plant. Beside that he has also work on heavy metal pollution and its health risk assessment in different plant. He wants to expand his knowledge and research about NPs to know its effect to environment, plant, and human health.

DETERMINATION OF NANOMECHANICAL PROPERTIES OF COATINGS PRODUCED BY THE MICRO ARC OXYDATION METHOD ON 5056 AND 7075 ALUMINUM ALLOYS

Alicja Stanisławska and Marek Szkodo
Gdansk University of Technology, Poland

Abstract:

Aluminum alloys are widely used due to their low density. For this reason, many components made of aluminum alloys have found their application in the aviation industry. Unfortunately, aluminum alloys also have disadvantages. The main one is low hardness, and therefore low tribological properties. In order to improve these properties, it is possible to apply layer or coating produced by various techniques, to the alloy. Tribological properties of created coating should be higher than those of aluminum alloys. The paper presents the results of investigations of aluminum oxide coatings produced by the micro arc oxydation (MAO) method on 7075 and 5056 aluminum alloys. The paper analyzes the residual stresses and the size of crystallites, which were determined using the Williamson-Hall method, as well as nanomechanical properties such as resistance on scratch, hardness, Young's modulus and critical stress intensity coefficient, which were determined using the nanoindentation technique. A 2-phase coating consisting of alpha and gamma phases was obtained on the 7075 aluminum alloy, and a single-phase gamma Al_2O_3 coating was produced on the 5056 alloy. The residual stress of the second type has a tensile character. Residual stresses and crystallite sizes on both coatings were respectively: 354 MPa and 11.7 nm for the alloy 7075 and 657 MPa and 9 nm for the gamma phase and 768 MPa and 7.2 for the alpha phase of 5056 alloy. Young's modulus and critical stress intensity factor of the coating on 7075 alloy were smaller than the coating on 5056 alloy, and its hardness was higher, although the stresses in the two-phase structure had a higher amount of tensile stresses. To conclude, MAO coatings improve the tribological properties of aluminum alloys.

Biography

Alicja Stanisławska - doctor of technical sciences in the discipline of materials engineering. She has experience in the field of nanomechanical and physicochemical research of biomaterials, as well as other construction materials. Alicja Stanisławska works as an assistant professor at the Department of Biomaterial Technology at the Gdańsk University of Technology in Poland. She uses the nanoindentation technique to determine the nanomechanical properties of various materials and their modifications. In addition, she uses an atomic force microscope to determine the surface topography, and performs morphological analyses using a scanning electron microscope with energy dispersive microscopy attachment and optical microscope. Also she has an experience in X-Ray diffraction analysis, thermogravimetric analysis and differential scanning calorimetry analysis. In addition, in the years 2014-2016, she participated in an interdisciplinary project on the use of bacterial nanocellulose as a material for artificial heart valves and she is the co-author of the national and European patent application, which was created during the implementation of this project.

PEGylated BLEOMYCIN-LOADED LIPOSOMES AS A NEW APPROACH TO CANCER TREATMENT

Maryam Moghtaderi, Meysam Ebrahimifar and Mohsen Chiani
University of Tehran, Pasteur Institute of Iran , Iran

Abstract:

Emerging nanoparticles (NPs) in biomedical science and utilizing them in many aspects such as imaging, drug delivery, oncology, etc. help scientists worldwide develop novel treatments for cancer, a challenging disease in the clinical therapy responsible for one in six deaths according to World Health Organization. Nanomedicine in cancer treatment should be safe and efficient. The prominent constitute of a drug delivery system is a reliable drug carrier; For this aim NPs with biocompatible and biodegradable properties are promising. Liposomes as encouraging nanoparticles that are approved and used in clinical treatment appeal to us to take advantage of these NPs in our study. Bleomycin like many chemotherapy medications with low solubility and severe side effects on non-cancerous cells makes the researchers find novel formulations to cope with these challenges. Although the bleomycin encapsulated in liposomes is significantly more soluble and biocompatible, the structure could be more convincing when Polyethylene glycol (PEG) was coated to the formulation. The liposomes containing bleomycin were developed by the thin film hydration technique. The size, zeta potential, entrapment efficiency, drug release, and cytotoxicity of structures were analyzed in TC-1, LLC1, and HFLF-PI5 cell lines. The average size and zeta potential of the PEGylated and non-PEGylated bleomycin-loaded liposomes were measured to be 99.4 nm and −34.83 mV; and 112.2 nm and −27.5 mV, respectively, and stayed for more than two months. The entrapment efficiency of PEGylated and non-PEGylated bleomycin-loaded liposomes was found about 83.1 and 78, respectively. Drug release profiles indicated that PEGylated formulations lead to a controlled pattern without a significant burst release. Decreased toxicity in comparison to free bleomycin in TC-1 and HFLF-PI5 cells, and increased cytotoxicity in LLC1 cells were observed in the liposomal structure. All the mentioned outcomes introduce the PEGylated bleomycin-loaded liposomes as a promising formulation to treat tumors.

Biography

Meysam Ebrahimifar received his master of medical toxicology from the University of Sahreza branch and bachelor of medical entomology and controlling vectors and upper diploma of general health from Hamedan University of Medical Sciences, Iran. Mr. Meysam Ebrahimifar has published several articles and books in the field of nano drug delivery and also he is serving as an editorial board member for reputed scientific journals. Currently he is prior to that he worked as a researcher on the topic of *in vitro* study of various nanoparticles for anti-cancer drugs that led to several publications at Pasteur Institute of Iran. He is a researcher, peer-reviewed scholar, educator, & has authored many academic and health and wellness books. Mr. Ebrahimifar is on the review board for various academic and medical journals.

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EFFECT OF STRUCTURE DEFECTS ON SPECTRUM OF ELECTROMAGNETIC EXCITATIONS IN COUPLED MICROCAVITIES ARRAY CONTAINING QUANTUM DOTS

Ales Mishchenko[2], V.V. Rumyantsev[1,3], S.A. Fedorov[1], K.V. Gumennyk[1] and A.E. Rybalka[1]

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[2]Institute for Research in Computer Science and Automation, France
[3]Mediterranean Institute of Fundamental Physics, Italy

Abstract:

Designing and utilization of novel materials for manufacturing of the sources of coherent irradiation is currently a vast interdisciplinary area, which spans various theoretical and fundamental aspects of laser physics, condensed matter physics, nanotechnology, chemistry as well information science. Physical realization of corresponding devices requires the ability to manipulate the group velocity of propagation of electromagnetic pulses, which is accomplished by the use of the so-called polaritonic crystals. The latter represent a particular type of photonic crystals featured by a strong coupling between quantum excitations in a medium (excitons) and optical field.

The report is devoted to elucidation of the effect of point-like defects on electromagnetic excitations (polaritons) dispersion in a coupled 1D microcavity (microresonator) array with embedded one-level quantum dots. It is shown that the presence of vacancies in the microcavity and atomic (quantum dots) subsystems results in a substantial renormalization of polariton spectrum and thus in a considerable alteration of optical properties of the structure. Introduction of defects leads to an increase in the effective masses of polaritons and hence to a decrease of their group velocity. Our model is primarily based on the virtual crystal approximation, which is often employed to examine quasiparticle excitations in sufficiently simple disordered superstructures. More complex systems usually require the use of more sophisticated methods such as the (one- or multinode) coherent potential approximation, the averaged T-matrix method and their various modifications The obtained numerical results help to obtain new composite polariton structures and expand the prospects for their use in the construction of solid-state devices with controlled propagation of electromagnetic waves.

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USE OF NANOTECHNOLOGIES IN THE PRODUCTION OF CANNED KETCHUP AND SAUCES

Yakov G. Verkhivker
Odessa National University of Technology

Abstract:

Various vegetables are the basis of ketchups and sauces that are in high consumer demand. The interest of producers in sauce products is due to the fact that by combining raw materials it is possible to expand the range of sauces, adjust the cost, price and profitability of production. The main trends in the development of the sauces segment around the world are the orientation of consumers towards healthy food, the desire to consume organic products and the interest in the new and original. Among the range of spices used in the industry for the production of sauces, we can name the following traditional for consumers. These are fragrant, black, red and white (in a small amount), chili pepper, paprika, coriander, bay leaf, mustard, garlic, onion, celery, dill, paprika, turmeric, ginger, basil. They are well known and relatively inexpensive. The conducted studies show that there are ways to increase the efficiency of the use of spicy-aromatic raw materials. The use of spices, ground to a state of fine powders, is more effective than conventional, coarse grinding. Finely dispersed systems include systems with a particle size of less than 10 microns. During fine grinding, biopolymer complexes that bind biologically active and nutrient substances in raw materials are destroyed, due to which the final product is enriched. The resulting fine powders are absorbed 2-3 times better than conventional ones, and allow more efficient use of raw materials. Also, the finely dispersed powder makes it possible to introduce all available chemical compounds of the spice into the product, unlike extracts obtained by various methods, due to the selective solubility of solvents. The use of fine powders from spices in the production of sauces makes it possible to reduce their prescription amount due to a more complete disclosure of taste and aroma. Studies have shown the possibility of reducing the prescription amount of spices used in the production of sauces due to finer grinding by 66%.

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Video Presentations

QUINTERNARY ALLOY FOR OPTOELECTRONIC APPLICATIONS

Yarub Al-Douri
American University of Iraq, Iraq

Abstract:

The $Cu_2Zn_{1-x}Cd_xSnS_4$ quinternary alloy nanofibres with different Cd concentrations were grown on glass substrate using the electrospinning technique. The structural properties of $Cu_2Zn_{1-x}Cd_xSnS_4$ quinternary alloy nanofibres were investigated by X-ray Diffraction (XRD), Field Emission-Scanning Electron Microscopy (FE-SEM) and Atomic Force Microscopy (AFM). Optical properties were analysed through UV-visible Spectrophotometry (UV-Vis) and Photoluminescence Spectroscopy (PL), which revealed that there is a decrease in band gap from 1.75 eV to 1.61 eV, with the increasing Cd concentration from x = 0 to x =1. The current–voltage measurements exhibited a power conversion efficiency of 3% under the solar illumination with intensity of 100 mW/cm^2. Electrical properties supported that the $Cu_2Zn_{1-x}Cd_xSnS_4$ quinternary alloy can be used as an absorber in solar cells. The bulk modulus, refractive index and dielectric constant, were also investigated.

Biography

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

NIO NANPARTICLES AS AN ELECTROCATALYST FOR UREA ELECTRO-OXIDATION IN ALKALINE MEDIUM

Shymaa S Medany
Cairo University, Egypt

Abstract:

Recently, wastewater is utilized for producing useful fuel. Urea represents the main constituent of wastewater. Nickel oxide nanoparticles were successfully prepared and utilized in the electro-oxidation of urea in NaOH solution. Different support materials, calcination temperatures and different loads were used in the preparation step of the electrocatalyst during preparation process. The formed electrocatalysts were characterized using X-ray diffraction (XRD) and Transmission electron microscopy (TEM). The electrocatalytic activity of prepared electrocatalysts was examined toward urea electro-oxidation in NaOH solution using cyclic voltammetry, chronoamperometry and electrochemical impedance spectroscopy. The urea oxidation peak current density was found to be strongly dependent on the support material, calcination temperature and the loading percent of NiO. NiO/Gt-15 showed the highest urea oxidation peak current density. The lower Tafel slope, charge transfer resistance and the higher exchange current density and diffusion coefficient values of urea molecules at NiO/Gt-15 surface elect its application as a promising electrocatalyst material during urea oxidation reaction in fuel cells and the best calcinated temperature used was 200°C.

Biography

Shymaa S. Medany (1980) received her Ph.D. (2010) in Physical Chemistry (specially Electrochemistry). She got Cairo University Encouragement Award in Chemical Science (2018) and Cairo University Awards for international publishing (2017-2021). She has worked in three national projects, were on synthesis of nanoparticles for different applications e.g. fighting obesity, biosensing and energy conversion. The newest project is on bio-camera to be used for blind people. She has published her research papers in different ISI Thomson Reuters journals e.g. Electrochimica Acta, Journal of Colloid and Interface Science, International Journal of Hydrogen Energy, Biosensors, Nanotechnology, Applied Surface Science, Journal of Alloys and Compounds, Ceramics International, Microchemical journal, Metals, Synthetic Metals and Journal of Advanced Research and many others. She is a reviewer in many journals e.g. Applied Catalysis B: Environmental, Journal of Colloid and Interface Science, Fuel, Talanta, J. of Applied Polymer Science, J. of Environmental Chemical Engineering, etc. She participated in international conferences in France, Italy and Egypt. She participated as Session Chair at international conference on nanotechnology and nanomaterials at Rome, Italy.

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Accepted Abstracts

TOWARDS THE SUSTAINABILITY OF CARBON NANOTUBE-BASED COMPOSITES *via* INNOVATIVE ECO-STANDARDS

Brahim Attaf
Ibn Khaldoun's Science & Technology Team, Education Nationale, France

Abstract:

In the global composites market, carbon-based nanomaterials (CBNs) such as carbon nanotubes (CNTs) are attracting considerable interest for multiple revolutionary and promising high-performance applications ranging from engineering and chemistry to medicine and biology. However, perspective measures are still needed to guarantee their use without adverse effects on the environment and human health throughout their life cycle. To assess the probability of risks and respond positively to sustainability requirements and eco-design standards, a new and balanced approach, in the form of a key performance indicator (KPI), taking into account the environmental, health and quality aspects in all design stages of a new development will be carried out in this conference; this would make future CNT-reinforced composites more competitive in the worldwide nanotechnology market through clear regulations, specific safety standards and legal predictability. With this idea as an objective, our techno-scientific approach could become a normative tool for qualification and certification of future eco-products based on CNT materials, which may be of interest to the following target groups: renewable energy, aeronautics & space, shipbuilding, automotive, medicine, green building, mechanical engineering, etc.

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EFFECT OF LASER SURFACE REMELTING ON MICROSTRUCTURE, MECHANICAL, TRIBOLOGICAL AND CORROSION PROPERTIES OF $Ti_{40}Nb_{25}Zr_{25}Ta_{10}$ (WITH 0.5 AT. % O) MEDIUM ENTROPY ALLOY (MEA) FOR ORTHOPAEDIC APPLICATIONS

L Mustafi, A Jones, V T Nguyen, Q Deng, T Song, X Chen, D M Fabijanic, M Qian
RMIT University, Australia

Abstract:

Medium/high-entropy alloys (MEAs/HEAs) provide a significant breakthrough alloy design concept for metallic biomaterials. A non-equiatomic bio-applicable as-cast $Ti_{40}Nb_{25}Zr_{25}Ta_{10}$ (with 0.5 at. % O) MEA surface was remelted by laser. The effect of laser remelting on the phase, microstructure, mechanical properties, tribological behaviour and corrosion resistance properties was investigated in detail and compared with the as-cast MEA. The alloy exhibited a stable BCC phase after surface modification by laser. The results also showed that the microstructure of the alloy in the remelting region was greatly refined compared with that the as-cast MEA because of the rapid remelting and resolidifying. The laser remelting process resulted in a significant decrease of grain size from about 106 μm to 12 μm and an increase of hardness from 4.44 ± 0.29 GPa to 7.58 ± 0.15 GPa from its as fabricated one, which attributed to the increased yield strength of the MEA following the Hall-Petch relationship. Moreover, the wear rate of laser surface remelted MEA remarkably decreased by 22.5% (maximum) than the as-cast MEA at a load of 200-600 μN. The corrosion resistance property of the laser surface remelted sample was also investigated and compared with the as-cast MEA. The corrosion current density of the laser surface remelted MEA (0.013 ± 0.06 μA/cm^2) was reduced than that of the as-cast MEA (0.034 ± 0.08 μA/cm^2) in Hank's solution. Its better corrosion resistance property attributed to the reduced grain sizes caused by rapid solidification after laser remelting. This laser surface remelted MEA offers a potentiality to use as a feedstock for the additively manufactured lattice-structured implant materials.

PHOTO-INDUCED ISOMERIZATION DYNAMICS STUDY OF RU-SULFOXIDE COMPLEX *via* ULTRAFAST TIME-RESOLVED X-RAY SPECTROSCOPY WITH TD-DFT CALCULATION

Seong Hyeon Jeong, Junho Lee, Tae Gyun Woo and Tae Kyu Kim
Yonsei University, South Korea

Abstract:

Tracking molecular dynamics with ultrafast time scale help to design many chemical systems and molecular materials. One of the ultrafast spectroscopy methods, the time-resolved x-ray absorption spectroscopy is a useful tool to understand the molecular reaction dynamics with an elemental-specific level. First, we analyzed transient x-ray absorption studies of photo-induced linkage isomerization of polypyridyl ruthenium sulfoxide complex performed at the time-resolved beamline 6.0.1 of Advanced Light Source (ALS) facility. Ru L-edge x-ray spectra give the information about the spin and a valence electronic structure and provide clear evidence that metal-centered excited states mediate the isomerization of the Ru sulfoxide complex with non-adiabatic process. Furthermore, complementary x-ray spectra of S K-edge probe the nuclear structural arrangement around the ligand S atom. Such information helps to track the change of metal-ligand bond length. Thus, two different metal centered excited states can be distinguishable based on the experimental results, which are dark to be observed in optical spectroscopy. Finally, XFEL experiment results at PAL-XFEL give us ultrafast femtosecond dynamics, which show fast conversion from MLCT excited state to MC excited state. For theoretical base, we conducted TD-DFT (time-dependent density functional theory) to simulate X-ray spectroscopy results. TD-DFT can give us the excited state information so that we can analyze the X-ray absorption difference spectra which is the subtraction from pumped an excited absorption signal to a unpumped ground state signal. The analytical methods for Matching and fitting the simulated X-ray spectra with experimental results show the photo-induced isomerization of Ru complex dynamics mechanism.

Preparation of Efficient Cu-based Photocathodes for Improving Photoelectrochemical Water Splitting

Haeyoung You, Madhusudana Gopannagari, Arun Joshi Reddy Kethireddy, Hyungsuk Bae, and Tae Kyu Kim
Yonsei University, South Korea

Abstract:

In recent years, the population and use of fossil fuels have been steadily increasing despite limited resources. Solar energy is one of the most promising eco-friendly energy sources as a replacement for fossil fuels. One of the most promising photo-to-chemical energy conversion processes is hydrogen evolution from solar water splitting as H_2 can be burned directly as fuel without producing pollutants or greenhouse gases. Photoelectrochemical (PEC) water splitting has been studied as a promising technology for solar energy conversion to chemical energy, proving a clean and sustainable strategy for future energy demands among various solar-to-energy fuel conversions. Generally, Photoexcited holes drift to the electrode-electrolyte interface in photocathodes for reduction reactions where water reduction occurs, whereas photoexcited holes are transported to the semiconductor back interface and contribute to water oxidation. As so, adding the interface between the semiconductor and the substrate is another effective way to improve the PEC behavior of the electrode, which can constrain photogenerated charge carrier recombination at the back interface. In short, the synergistic effect of CuO layer on $CuFe_2O_4$ photocathode enhanced photoelectrochemical performance. Modifying CFO with CuO as the hole extraction layer ($CuO/CuFe_2O_4$), the photocurrent density of -0.21 $mAcm^{-2}$ at 0.4 V *vs.* RHE under 1 sun irradiation. This is approximately 2.3 times higher than $CuFe_2O_4$. Overall, the CuO hole extraction layer decreased the recombination rate of $CuFe_2O_4$, enhanced the charge separation and transfer for PEC water reduction. Currently, we are focusing on photocathode optimization, modifying the over layers (such as buffer layers, protecting layer) and characterization for further to improve the charge transfer and stability studies. Following the optimization of this electrode, a thin TiO_2 layer will be utilized as a protective layer to improve the cathode's stability. This research suggested the possibility of constructing the efficient and improvement photocathodes used for PEC water splitting.

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HEAT EXCHANGER TECHNOLOGY AND APPLICATIONS: GROUND-SOURCE HEAT PUMP SYSTEM FOR BUILDINGS HEATING AND COOLING

Abdeen M Omer
Energy Research Institute, UK

Abstract:

Over the years, all parts of a commercial refrigerator, such as the compressor, heat exchangers, refrigerant, and packaging, have been improved considerably due to the extensive research and development efforts carried out by academia and industry. However, the achieved and anticipated improvement in conventional refrigeration technology are incremental since this technology is already nearing its fundamentals limit of energy efficiency is described is 'magnetic refrigeration' which is an evolving cooling technology. The word 'green' designates more than a colour. It is a way of life, one that is becoming more and more common throughout the world. An interesting topic on 'sustainable technologies for a greener world' details about what each technology is and how it achieves green goals. Recently, conventional chillers using absorption technology consume energy for hot water generator but absorption chillers carry no energy saving. With the aim of providing a single point solution for this dual purpose application, a product is launched but can provide simultaneous chilling and heating using its vapour absorption technology with 40% saving in heating energy. Using energy efficiency and managing customer energy use has become an integral and valuable exercise. The reason for this is green technology helps to sustain life on earth. This not only applies to humans but to plants, animals and the rest of the ecosystem. Energy prices and consumption will always be on an upward trajectory. In fact, energy costs have steadily risen over last decade and are expected to carry on doing so as consumption grows. Refrigerants such as hydrochloroflurocarbons (HCFCs) are present in the ground source heat pump (GSHP) systems and can pose a threat to the environment through being toxic, flammable or having a high global warming potential.

However, new types and blends of refrigerant with minimal negative impacts are being developed. A correctly fitted system will also greatly reduce the potential for leakage, which is why using a professional installer is highly recommended. Significant CO_2 savings can be gained by displacing fossil fuels. Even compared to the most efficient gas or oil condensing boilers, a well-designed heat pump with COP of 3-4 will reduce emissions by 30-35%. Further carbon savings can be made if the electricity used to power the pump comes from a renewable energy source such as photovoltaic or a renewable electricity tariff. Also, measures can be taken to reduce the impact of pollution from using grid electricity generated through fossil fuel. For example, one can purchase dual tariff green electricity from a number of suppliers. However, even if ordinary grid electricity is used to run the compressor, the system will still produce less CO_2 emissions than even the most efficient condensing gas or oil boiler with the same output. The term "vapour compression refrigeration" is somewhat of a misnomer, it would be more accurately described as 'vapour suction refrigeration'. Vapour compression is used to reclaim the refrigerant and is more aptly applied to heat pumps. Vapour compression refrigeration exploits the fact that the boiling temperature of a liquid is intimately tied to its pressure. Generally, when the pressure on a liquid is raised its boiling (and condensing) temperature rises, and vice-versa. This is known as the saturation pressure-temperature relationship.

NANOPATTERN TRANSFERRED OXIDE AND UV CURABLE POLYMER HYBRID FILMS FOR LIQUID CRYSTAL SYSTEMS

Dabin Yang, Dong Hyun Kim and Dae-Shik Seo
Yonsei University, South Korea

Abstract:

In the present study, nanopatterns were transferred using the UV-NIL method; in this method, the patterns are cured with UV radiation to produce the LC alignment layers. For high-quality LC alignment layers, transparent conducting oxides (TCOs) with excellent transmittances are mixed with a UV-cured polymer to prepare a hybrid solution. In this study, we assessed whether high-quality nanopattern transitions can be obtained while reducing the steps of the NIL process by mixing these inorganic materials and polymers. The hybrid solution was coated on a glass substrate and cured by UV irradiation to prepare the nanopattern, and the nanopattern and LC alignment characteristics were analyzed by varying the UV curing time. The film surface was analyzed through X-ray photoelectron spectroscopy (XPS) and atomic force microscopy (AFM) analyses. The LC alignment characteristics were confirmed via polarized optical microscopy (POM) and pretilt angle measurements. This research was supported by the Brain Korea 21 FOUR Project for Medical Science, Yonsei University.

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LIFECYCLE ANALYSIS OF PHOSPHORUS BASED NANOMATERIALS IN MARINE ENVIRONMENT

Anurag Nath[1,2], Luis O B Afonso[1], Aaron G Schultz[1], Himadri Bihari Bohidar[2] and Pushplata Prasad Singh[2]

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[2]TERI-Deakin Nanobiotechnology Centre, Australia

Abstract:

The extensive use of nanomaterials in the form of nano-fertilizers and pesticides has increased in the past decade especially in farming practices. This increased use of nanomaterial has raised concerns regarding their impact on environment and human health. Nanomaterial released directly or incidentally, travel through various modes to eventually reach the aquatic environment. These nanomaterials enter and stays dispersed in the environment and subsequently undergo transformation eventually leading to their accumulation in the flora and fauna inhabiting that environment. Several abiotic and biotic factors influence the behavioral properties of theses nanomaterials leading to their structural transformations which play a crucial role in deciding their fate and bioavailability. In this report, transformative studies of biologically synthesized Phosphorous based nanomaterials - nanohydroxyapatite (nHAP) and nano phosphorous (nanoP) have been extensively studied and compared with chemically synthesized counterparts. The size distribution histograms of these nanoparticles suspended in sea water were mapped over a time period of 28 days and compared with deionized water. This data clearly reflected the behavioral changes in the suspended particles due to the influence of abiotic and biotic factors present in sea water on their lifecycle. The effect on bacterial population was also analyzed to note impact on the growth of biological species. Biologically synthesized nHAP and nanoP were observed to show promising results with lower levels of ecotoxicity.

USE OF BIOPOLYMERIC COATINGS ON MAGNETIC NANOPARTICLES FOR MAGNETIC HYPERTHERMIA APPLICATIONS

Dulce Guzmán
Universidad De Guanajuato, México

Abstract:

In this work, was done an exhaustive characterization of the physical and chemical properties of gum arabic (GA)-coated Fe_3O_4 magnetic nanoparticles. Which were obtained via the *in-situ* coprecipitation method (a fast single-step method) in two GA:Fe ratios, 20:1 and 10:1, respectively. Several experimental techniques were applied in the characterization process, all of them described ahead. Using Transmission Electron Microcopy images, it was shown the spherical-like morphology with 11 nm diameter. A high specific absorption rate and superparamagnetic properties were determined using alternant and static magnetic fields respectively. The GA-coated MNP was non-cytotoxic, according to tests on HT-29 human intestine cells. Additionally, HT-29 cells were exposed to magnetic fluid hyperthermia at 530 kHz and it was shown the induction of cell death by the magnetic field, due to the heating of GA-coated MNP. Cytotoxicity is the effect that nanoparticles will have on the cell. Therefore, new materials with biomedical applications must be evaluated in vitro to ensure success before their use in the clinic. In this work, the cytotoxic effect of the iron oxide hybrid with gum arabic MNP-GA on the HT-29 colon cancer cell line was studied using concentrations ranging from 0.5 to 3 mg/ml of the ferrofluid of the hybrid.

To determine the metabolic activity, quantitative (WST-1) and qualitative (neutral red uptake) analyses were performed.

X-RAY COMPUTATIONAL TOMOGRAPHY: A 3D NONDESTRUCTIVE TESTING METHOD TO INSPECT CFRP-BASED COMPOSITES

Elena Dilonardo
Institute of Nanotechnology, CNR-NANOTEC, Università degli Studi di Bari, Italy

Abstract:

Nowadays, the use of carbon fibre-reinforced polymer (CFRP) composites for manufacturing components is becoming widespread significantly in aeronautical field to reduce the structural weight and to improve the fuel efficiency, thanks to their high specific properties, such as low density and corrosion resistance, that make these composites competitive respect to the commonly used materials. Up to now, to certify aircraft components the standard ASTM D 3171-15 test method has been adopted, based on destructive acid digestion, permitting to evaluate the components content and, indirectly their porosity. In this context, the present study reports X-ray computed tomography (CT) as a versatile, effective and reliable nondestructive inspection method to evaluate CFRP-based aircraft components, permitting at a microscale dimension the individuation and identification in the reconstructed 3D analysed material of different components (e.g. pores, carbon fibres and polymer matrix), and also the quantification of each detected element.

UNVEILING IRREGULARITY OF NANO CAPILLARY LITHOGRAPHY USING HYBRID INTELLIGENCE

In Ho Cho, Myung-Gi Ji, and Jaeyoun Kim
Iowa State University, USA

Abstract:

Diverse nano-scale capillary lithography sheds promising light on many scientific and engineering innovations. However, many fundamental principles are poorly understood about the underlying mechanisms. Typical black-box machine learning may not be directly applicable due to the lack of large data and unknown first principles. We leveraged "hybrid" intelligence that combines scientists' basic knowledge and "transparent" machine learning methods to unravel hidden rules behind the nano-scale capillary behaviors and their intriguing irregularity. This presentation will show the complex irregularity of nano capillary tests of ultraviolet light-cured Noa73 in PDMS nano-scale pillars and how we can tackle them with hybrid intelligence.

IMPACT OF MECHATRONICS ON INDUSTRIAL BIOTECHNOLOGY

Juan José Encinas C
Ricardo Palma University, Peru

Abstract:

This research was carried out to determine the impact of mechatronics in the health sector, since currently mechatronics has an impact in multiple areas of the industry, but lately especially in biotechnology. Its development was valued, from the perspective of different researchers, which has allowed its insertion in this sector. This development benefits both patients and physicians, as they have revolutionized the field of medical equipment and devices. Biotechnology has applications in important industrial areas such as: health care, the development of new approaches for the treatment of diseases; agriculture with the development of improved crops and food. Robotics and digital image and signal processing were also found to have a greater impact on medicine. Likewise, an analysis of the mechatronics applied to this science was made, which showed that the surgical and therapeutic areas are the most favored and are nourished by innovative techniques, which are more reliable and less invasive for the patient.

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THERMOPHYSICAL PROPERTIES OF $CoFe_2O_4$ HYBRID NANOFLUIDS: EXPERIMENTAL AND ARTIFICIAL NEURAL NETWORK ANALYSIS

Lingala Syam Sundar, Feroz Shaik and E Venkata Ramana
Prince Mohammad Bin Fahd University, Saudi Arabia

Abstract:

In this paper, experiments were conducted on the thermal conductivity, viscosity, density, and specific heat of water-based $CoFe_2O_4$ hybrid nanofluids. After being created using the chemical coprecipitation method, $CoFe_2O_4$ hybrid nanoparticles were characterized using the XRD, TEM and VSM. The properties analyses were considered in temperatures ranging from 20°C to 60°C and particle volume loadings of 0.25% to 1.25%, respectively. Thermal conductivity is raised by 27.56% for 1.25% water-based $CoFe_2O_4$ hybrid nanofluids at 60°C. Additionally, at the same particle loading of 1.25%, the viscosity was increased by 49.36% at 20°C compared to the water data. On the other hand, when $CoFe_2O_4$ nanoparticles are mixed with water, the density rises and the specific heat falls. An intelligent model, adaptive neuro-fuzzy inference system (ANFIS) approach was used to predict the thermophysical features of effective hybrid nanofluids. According to experimental data, the ANFIS model's prediction of the thermal conductivity has an error of 0.002158 root mean square (RMSE) and an R^2 correction coefficient of 0.9985. In contrast, the ANFIS model's predictions for viscosity show a root mean square error (RMSE) of 0.02698 and a correlation coefficient R^2 of 0.9998 when compared to experimental data. These figures showed that the results of the artificial neural network construction and correlation were entirely congruent with the experimental data.

STRUCTURAL AND ANTIBACTERIAL PROPERTIES OF SE-SUBSTITUTED CuS POWDERS

Nayoung Lee, Jung Young Cho, Sohyeon Ryu, Nguyen Vu Binh, Minji Kang, Munhwi Lee and Woohyun Nam

Korea Institute of Ceramic Engineering and Technology, South Korea

Abstract:

Se-substituted CuS powders ($CuS_{1-x}Se_x$, x = 0, 0.02, 0.04, 0.06, 0.08, 0.1) have been synthesized by a simple and inexpensive high energy ball milling process. Morphological and structural changes were evaluated for the substituted samples by FE-SEM (Field Emission Scanning Electron Microscopy) and PXRD (Powder X-ray Diffraction). It was observed that a flower-like morphology on Se-substituted samples become more pronounced with increasing Se amount without changing the structure. Antibacterial test was performed to evaluate the antibacterial ability and mechanism depending on Se substitution for CuS system. It was confirmed that the antibacterial properties maintain regardless of Se substitution. In this presentation, more details about structural, morphological, and antibacterial properties depending on Se substitution will be discussed.

SYNTHESIS, STRUCTURE, AND PHYSICAL PROPERTIES OF BULK MOS2 BY THE FLUX METHOD

Nguyen Vu Binh, Jung Young Cho, Nayoung Lee, Munhwi Lee, Minji Kang, So Hyeon Yu, Woo Hyun Nam and Jong-wook Roh

Korea Institute of Ceramic Engineering & Technology, South Korea

Abstract:

Two-dimensional (2D) materials are layered substances with a thickness of a few atom levels or less. The most famous 2D material is graphene which is stronger than steel, electrical conductivity better than copper, and flexible. Beyond graphene, there exists a host of 2D materials with a wide range of different properties. Transition Metal Dichalcogenides (TMDCs) is one of those, which having the thinness like graphene's with exceptional semiconductor properties. MoS_2, one of the TMDCs which have been attracting a wide range of research interests in graphene-like two-dimensional materials. It can be changed from indirect bandgap for the bulk structure to direct bandgap (~1.8 eV) for the monolayer making it more important in the electronics industry. In this study, the bulk MoS_2 is aimed to synthesize by using the flux method in which potassium chloride (KCl) was used as a solvent (flux) at relatively low temperatures compared to the conventional solid state synthetic routes with a variety of ratios between MoS_2 and KCl. The PXRD results show that the crystal planes of MoS_2 prefer to grow with (00l) direction. The hexagonal shape and different sizes of bulk are observed by FE-SEM (Field Emission Scanning Electron Microscopy). The PSA (Particle Size Analysis) results also show the attendant of particles with nano-size (200-400 nm) and micro-size (1-6 μm). In Raman spectroscopy, the peaks of E_{2g}^{1} and A_{1g} are located at the wavenumbers of 383 cm^{-1} and 410 cm^{-1}, indicating that the same wavenumber will remain although the KCl ratio varies.

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BAYESIAN REGULARIZATION OPTIMIZATION ALGORITHM FOR THE EXPERIMENTAL THERMOPHYSICAL PROPERTY FOR 80:20% WATER AND ETHYLENE GLYCOL BASED ZrO_2 NANOFLUIDS

Shaik Feroz and L. Syam Sundar
Prince Mohammad Bin Fahd University, Saudi Arabia

Abstract:

In the current study, water and ethylene glycol (W/EG 80:20%) are used as the base fluid, and sodium dodecyl benzene sulfonate is used as a surfactant to create nanofluids using ZrO_2 nanoparticles prepared using the sol-gel technique. For temperatures ranging from 20°C to 60°C and various volume loadings of nanoparticles, 0.2, 0.4, 0.6, 0.8, and 1.0%, respectively, the thermal conductivity, dynamic viscosity, density, and viscosity of these ZrO_2 nanofluids are experimentally evaluated. Artificial neural network based Bayesian regularization algorithm was used to find the correlation coefficient R^2 and root-mean square error. New correlations were also suggested for each of the thermophysical properties. Experiments show that temperatures and concentrations of nanoparticles have a significant impact on the thermophysical properties of nanofluids. In fact, it is shown that, at 20°C and 60°C, respectively, increasing the thermal conductivity of nanofluids by 1.0 vol% leads to increases of almost 10.16% and 24.53%. Additionally, at 1.0 vol and 20°C to 60°C, the dynamic viscosity is reduced from 61.94% to 50.79%. The correlations and outcomes of the developed artificial neural network are in perfect agreement with the experimental data.

COMMERCIAL ACTIVITIES IN THE FIELD OF ORGANIC PHOTOVOLTAICS AND UNDERLAYING FUNDAMENTAL PHYSICAL PHENOMENA OF CHARGE TRANSPORT

Vaidotas Kažukauskas
Vilnius University, Lithuania

Abstract:

The situation and tendencies of organic nano-photovoltaics will be reviewed, starting from the underlying physics up to the current achievements and perspectives of commercialization. The noticeable advances in the efficiency of the organic PV took place recently. However, the first commercialization attempts failed because of the poor business strategy. Nowadays several institutions are competing in the field, exploring physical and engineering solutions. The prototype devices were already announced. Nevertheless, the commercial success will depend also on their popularity among end-users, and the commercial management.

Microscopic charge transport is of primary importance in organic material and device engineering, as it determines macroscopic material parameters, conditioning device efficiency. Due to the hoping nature carrier mobility is one of the main factors limiting charge transport in disordered organic materials. Thus, understanding of the fundamental transport properties is a must for the device engineering.

We will demonstrate that in materials and structures promising for organic and hybrid photovoltaics carrier transport is influenced in a complex way by the light-, electric field- and thermally- stimulated mobility and trapping, depending on the excitation. These complicated phenomena can be discriminated by sophisticated analysis and complementary experimental methods. To correctly address these issues, distribution of the density of transport states has to be taken into account. We will also demonstrate that device degradation is closely related to modification of the microscopic charge transport.

EVALUATION OF THE CYTOTOXIC EFFECTS OF HIERARCHICAL NANOSTRUCTURED SYSTEMS

Verónica Alexandra Quilumba Dutan
Instituto Potosino de Investigación Científica y Tecnológica , México

Abstract:

Cancer is a global disease with the highest mortality rate. Particularly, breast and cervical cancers are the most diagnosed cancers and the major cause of cancer deaths in women. Traditional treatments such as chemotherapy and radiotherapy have limited therapeutic effects against cancer and are associated with severe side effects. Therefore, they require optimization in terms of how to maximize specificity to eliminate undesired side effects in healthy tissues. An alternative solution to face this challenge in cancer treatment includes targeted therapy. Conjugation of nanoparticles with peptides has been demonstrated to be a potential tool to improve anticancer therapy by enhancing the distribution within tissues at the side action through targeted thermal ablation and drug delivery. In this work, we report on the therapeutic ability of peptide-covered core-shell nanoparticles carried for multimodal cancer therapy; photothermal ablation, and drug delivery. We have functionalized peptides with high affinity to the breast (AMD-MB-231) and cervical (HeLa) cancer cell lines onto the surface of magnetic core-shell nanoparticles to evaluate their cytotoxic effect. The core-shell NPs combine the superparamagnetic properties of magnetite nanoparticles (Fe_3O_4 NPs), the biocompatible and protective properties of silica (SiO_2), and the optical properties of multibranched gold nanoparticles (MBAuNPs). Preliminary results indicate that the conjugated peptide-nanoparticle system possesses potential properties to improve current cancer treatments.

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Note

Forthcoming Events

International Conference on **Biomaterials and Biodevices**
September 25-26, 2023 | Paris, France

2nd International Conference on **Neurology and Brain Disorders**
November 2-3, 2023 | London, UK

Internarional Conference on **Hematology and Blood Disorders**
November 6-7, 2023 | Paris, France

European Conference on **Human Genetics**
November 6-7, 2023 | Paris, France

International Conference on **Gynecology and Obstetrics**
November 6-7, 2023 | Dubai, UAE

International Conference on **Biomedical Science and Engineering**
November 6-8, 2023 | Dubai, UAE

International Confernce on **Clinical Case Reports**
November 8-9, 2023 | Dubai, UAE

2nd International Conference on **Materials Science & Engineering**
November 8-9, 2023 | Dubai, UAE

2nd European Congress on **Chemistry and Applied Sciences**
November 9-10, 2023 | Paris, France

2nd International Conference on **Catalysis & Chemical Engineering**
November 9-10, 2023 | Paris, France

European Congress on **Renewable Energy and Sustainable Development**
November 16-17, 2023 | Rome, Italy

European Congress on **Biopolymers and Bioplastics**
November 16-17, 2023 | Rome, Italy

2nd International Conference on **Nanomaterials and Nanotechnology**
November 20-21, 2023 | Vienna, Austria

2nd European Congress on **Microbiology**
November 20-21, 2023 | Vienna, Austria

2nd International Conference on **Infectious Diseases**
November 20-21, 2023 | Vienna, Austria

2nd International Conference on **Addiction & Psychiatry**
November 20-21, 2023 | Vienna, Austria