EURASIA CONFERENCES

4th World Conference on

ADVANCED MATERIALS, NANOSCIENCE, AND NANOTECHNOLOGY

&

4th World Conference on

CHEMISTRY AND CHEMICAL ENGINEERING

NOVEMBER

13-14, 2023

BANGKOK, THAILAND

Hosting Organization:
Eurasia Conferences, 124 City Road, London, EC1V 2NX.

SCIENTIFIC PROGRAM

08:55-09:00 @ **Introduction, Welcome note and Conference Inauguration**
Conference Room: "Pailin 1"

DAY 1

November 13, 2023

Plenary Session

Title: Nanoengineering of plasma polymers for Medicine and Beyond

09:00-10:00

Krasimir Vasilev, College of Medicine and Public Health, Flinders University, Sturt Road, Bedford Park, South Australia 5042, Australia(Plenary Speaker)

Keynote Sessions

Title: Tailoring the Structure of Nanoporous Anodic Alumina

10:00-10:30

Abel Santos, School of Chemical Engineering, Institute for Photonics and Advanced Sensing, The University of Adelaide, South Australia, Australia

Title: Maximizing Solar Energy Captureto Tackle Climate Change by Enhancing Efficiency with Advanced Supercapacitors

10:30-11:00

Katsuhiko NAOI, Tokyo University of Agriculture and Technology and K & W Inc., Tokyo 184-8588, Japan

Tea and Refreshments Break 11:00-11:20

Title: Nanobubble Property and Utilization

11:20-11:50

Toyohisa Fujita, College of Resources, Environment and Materials, Guangxi University, Nanning, Guangxi, 530004 China

Title: The research progress of nanomaterials in oil and gas development

11:50-12:20

Mingwei Zhao, National Key Laboratory of Deep Oil and Gas, School of Petroleum Engineering, China Universityof Petroleum (East China), Qingdao 266580, P. R. China

Speaker Sessions

Chair: Prof. Toyohisa Fujita, Professor of Guangxi University, College of Resources, Environment and Materials, China , Emeritus Professor of the University of Tokyo, Japan
Co-Chair: Prof. Katsuhiko NAOI, Tokyo University of Agriculture and Technology and K & W Inc., Tokyo, Japan
Co-Chair: Krasimir Vasilev, College of Medicine and Public Health, Flinders University, Sturt Road, Bedford Park, South Australia 5042, Australia

12:20-12:40

Title: Neutron diffraction study of magnesium AZ31 plastic deformation mechanisms and phase stresses in Al/SiCp composite during thermal cycling and mechanical loading

Dr. Przemysław Kot, NOMATEN Centre of Excellence, National Centre of Nuclear Research, ul. Andrzeja Sołtana 7, 05-400 Otwock, Poland

12:40-13:00

Title: Microstructural, mechanical, and biophysical properties of ultra-fine grain titanium

Dr. Krzysztof Wierzbanowski, AGH University of Kraków, 30-059 Kraków, Poland

Session Wrap

Lunch Break 13:00-14:00

14:00-14:20

Title: Determination of residual stresses in thin layers using characteristic X-rays and synchrotron radiation

Dr. Andrzej Baczmanski, AGH-University of Krakow, WFiIS, al. Mickiewicza 30, 30-059 Kraków, Poland

14:20-14:40

Title: Nanotechnology-Powered Eradication of Bacterial Persister Cells: Exploiting Low Metabolic Activity with ATP-Coated Gold Nanoclusters

Laurent A. Bekale, Department of Otolaryngology, Head and Neck Surgery, Stanford University, 801 Welch Road Stanford, CA 94305-5739, USA

14:40-15:00

Title: The Cr-Ni stainless steels: surface issues

Christian Paglia, University of Applied Sciences of Southern Switzerland, DACD, V. Flora Ruchat 15, CH-6850 Mendrisio, Switzerland

Tea and Refreshments Break 15:00-15:20

15:20-15:40

Title: Preparation of Polycarprolactone/Polylactic acid (PCL/PLA) Solid Electrolyte with High Electrical Performances for Lithium-ion Battery

Dul Boriboon, Faculty of Science, Mahidol University, Rama 6 Road, Ratchathewi, Krung Thep Maha Nakhon, Thailand

Title: A Computational Approach: Substitution by Pyridine to Phenyl Carbonyl Isothiocyanates in Gas and Polar Aprotic Solvent

15:40-16:00

Keshab Kumar Adhikary, Center for Environmental and Energy Research (CEER) – Engineering of Materials via Catalysis and Characterization, Ghent University Global Campus, 119-5 Songdomunhwa-Ro, Yeonsu-Gu, Incheon, 406-840 South Korea.

Title: Hydrothermal synthesis process along with characterization of ZSM-5 nanoparticles for CO2 utilization

16:00-16:20

Sheikh Tareq Rahman, Center for Environmental and Energy Research (CEER), Ghent University Global Campus, 119-5 Songdomunhwa-ro, Yeonsu-Gu, Incheon, 21985, Republic of Korea. Department of Green Chemistry and Technology, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, Ghent, B-9000, Belgium.

Title: Iminophenolate based Titanium and Hafnium compounds for ROCOP of epoxides with anhydrides and epoxides with CO2

16:20-16:40

SRIPARNA SARKAR, Department of Chemistry, Indian Institute Of Technology, Madras, Chennai, Tamil Nadu, India

Poster Sessions

Title: Ionic Liquids capacity enhancement in the presence of nanoparticles. New media for fuels desulfurization purposes

Dr. Jean Charles Moïse, Université de Lorraine, CNRS, LRGP, F-54000 Nancy, France

Title: Separation of rare earths from Egyptian black sand using bis(2-ethylhexyl) phosphate based ionic liquids

Dr. Fabrice MUTELET, Université de Lorraine, CNRS, LRGP, F-54000 Nancy, France

Title: Research on the Performance Improvement of Co-CeO2 Catalyst for High-Temperature Water Gas Shift Reactions through the Addition of Transition Metal Oxide Promoters

Beom-SuCheon, Department EnvironmentalEngineering, ChangwonNationalUniversity, Changwon-si, Gyeongsangnam-do, SouthKorea

Title: A study on manufacturing method of Co-Nb-CeO2 catalyst for high-temperature water gas shift reaction for hydrogen production from waste-derived syngas

Jae-Min Song, Department Environmental Engineering, Changwon National University, Changwon, Greongsangnam-do, republic of Korea

Title: Study of heavy metal cleaning method for paper incineration ash recycling

Min-Gyeong Bae, Department Environmental Engineering, Changwon National University,Changwon-si,Greongsangnam-do, Republic of Korea

Title: Investigation of reaction condition of biogas reforming for the effective hydrogen production

Ji-Won Son, Department Environmental Engineering, Changwon National University, Changwon-si, Gyeongsangnam-do, Republic of Korea

Title: Research on the development of nano-green composites by novel process of reinforcing Cellulose Nano-Fibers

Dr. Jung-il Song and Ruiwen Yu
Department of Mechanical Engineering, Changwon National University, Changwon-51140, Republic of Korea
Department or Smart Manufacturing Engineering, Changwon National University, Changwon, Korea

Session Wrap and Conference Closing

DAY 2

November 14, 2023

(Virtual Session via Zoom) November 14, 2023 (London, UK Time)

Speaker Sessions

Title: Smart control and digitalization of modern energy storage systems

09:00-09:20

Pengfeng Lin, Assistant Professor, School of electronic information and electrical engineering, Shanghai Jiaotong University (QS50), Shanghai, China

Title: Driving Cycle Development and Prediction by using DC-TRAD

09:20-09:40

Dr. Salisa Abdul Rahman, Department of Electronics and Instrumentation, Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, Terengganu, Malaysia

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

09:40-10:00

Seiko Jose, School of Chemical Science, Mahatma Gandhi University, Kottayam, Kerala, India

Keynote Sessions

Title: Energy Storage and Energy Dissipation at Transformation Cycles in Shape Memory Alloys

10:00-10:30

Prof. Osman Adiguzel, Firat University,Turkey

Title: Swarm Intelligence as a Potential Solution for Internet of Things

10:30-11:00

Dr. Shreyas J, Department of Information Technology, Manipal Institute of Technology Bengaluru, Manipal. Academy of Higher Education, Manipal, Karnataka, 576104, India

Tea and Refreshments Break 11:00-11:20

Title: Is it possible to construct earthquake-resistant soil with a nanotechnological material?

11:20-11:50

Dr. Nazife Erarslan, Geotechnical Department, Civil Engineering, İzmir Demokrasi University, Turkey

Speaker Sessions

Title: Elimination of Rhodamine B using the UV254nm/H2O2 process

11:50-12:10

Hafida Gaffour, Department of Matter sciences, University of Ahmed Draia, Adrar 01000, Algeria

Title: Biofilm composition in Microbial Fuel Cells and Bioremediation potential with Bioelectricity production

12:10-12:30

Debajyoti Bose, School of Technology, Woxsen University, Hyderabad, Telangana, India

Title: Applications of Metal Organic Frameworks in Photodynamic Therapy

12:30-12:50

Sandile Phinda Songca, School of Chemistry and Physics, College of Agriculture Engineering and Science, University of KwaZulu-Natal, KwaZulu-Natal, South Africa

Session Wrap

Lunch Break 13:00-14:00

Speaker Sessions

Title: Sustainability Goals and Initiatives in Aviation Industry

14:00-14:20

Dr. Manish Yadav, Instructor – Aviation Management, Department of Aviation Operations Management (AOM), Qatar Aeronautical Academy, Doha – State of Qatar

Title: Energy Management of a Multi-Source Energy Production System

14:20-14:40

Bati Ernest Boya Bi, Magloire Paul Ekoun Koffi, Prosper GBAHA National Polytechnic Institute Houphouët Boigny, News Energies and Renewables Group, Laboratory of Mechanics and Materials Sciences, Yamoussoukro, Côte d'Ivoir

Title: Production of biofuel briquettes from carbonized sawdust

14:40-15:00

Nganko Junior Maimou, Félix HOUPHOUËT-BOIGNY National Polytechnic Institute (INP – HB) of Yamoussoukro, Ivory Coast

Title: Anti-Leishmanial and Anti-Trypanosomal Activities of Nigerian Indigenous Plants and Their Cytotoxicity Effects

15:00-15:20

Oaikhena E. Enime, Department of biotechnology, Nigerian Defense Academy, Nigeria

Tea and Refreshments Break 15:20-15:30

Title: The Motion Control and Assembly of Ultrasonically Propelled Nanomotors

15:30-15:50

Suzanne Ahmed, Department of Nanoscience, University of North Carolina, Greensboro in the Joint School of Nanoscience and Nanoengineering/Assistant Professor, Greensboro, North Carolina, USA

Title: A study on the renewable power generation capacity of microalgae microbial fuel cells for powering GIoT sensor nodes

15:50-16:10

Andrea Castillo Atoche, Chemistry and Biochemistry Department, Tecnológico Nacional de México/Instituto Tecnológico de Mérida, Yucatán 97120, Mexico

Title: Study of the Efficiency of an Indirect Solar Collector Equipped With a Sensible Heat Storage System: Application to Cocoa Beans Drying

16:10-16:30

Emmanuel N'Dri Abouanou, Laboratoire des Procedes Industriels, de Synthese, de l'Environnement et des Energies Nouvelles (LAPISEN), UMRI 18, Institut National Polytechnique Felix Houphouet Boigny (INPHB), B.P. 581, Yamoussoukro, Cote d'Ivoire

Title: Transition metal doped III-V semiconductors: In1-xMxSb

16:30-16:50

Dr. Naveen Agrawal, Department of Physical Sciences, Natubhai V Patel College of Pure and Applied Sciences, Charutar Vidya Mandal University, Vallabh Vidyanagar, Gujarat, India

Poster Sessions

Title: Albendazole chemical compound behaves as liquid crystal

Poster-1

Dr. Narinder Kumar, Department of Physics, Uttaranchal University, Dehradun, Uttarakhand 248 007, India

Title: Influence of Zn2+ Ions Doping on the Antibacterial Activity of Barium-Nickel Ferrite Nanoparticles

Poster-2

Sadiq. H. Khoreem, Physics Department/Faculty of Science, Sa'ada University, Sa'ada, Yemen

Session Wrap and Conference Day-2 Closing

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PLENARY PRESENTATION | DAY 1

Krasimir Vasilev
College of Medicine and Public Health, Flinders University, Sturt Road, Bedford Park, South Australia 5042, Australia

Nanoengineering of plasma polymers for Medicine and Beyond

In this plenary talk, I will give an overview of recent progress from my lab on development of plasma polymer facilitated nanoengineered surfaces that benefit many areas of application. Over the year, we developed a range plasma based methods which allows us to control that entire spectrum of surface properties, including chemical, physical, mechanical and topographical. The main focus of our research is the surface modification of medical devices and biomaterials for applications in areas such as cell therapies, tissue engineering, controlling inflammation and infections, and medical diagnostics. However, our technologies are not limited to medicine. We have demonstrated the utility of nanoengineered plasma polymers to solve problems in other areas such as environmental science, water treatment and wine making. In will present the engineering and chemical concepts underpinning “nanoengineering of plasma polymers” and give examples of applications in various fields.

Biography:

Professor Vasilev is currently a Matthew Flinders Professor and a Professor of Biomedical Nanotechnology in the College of Medicine and Public Health at Flinders University. Professor Vasilev has attracted in excess of 20M dollars in research funding from Government competitive grants and Industry, published more than 300 papers. He has been awarded several prestigious Research Fellowships from ARC, NHMRC and the Humboldt Foundation, and other awards such as the John A. Brodie Medal for achievements in Chemical Engineering. He is a Fellow of the Royal Society of Chemistry (FRSC) and a Fellow of the International Association of Advanced Materials in 2022. His publications have been cited more than 11,000 times and his H-index = 59 (M-index ~ 3).

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KEYNOTE PRESENTATIONS | DAY 1

Abel Santos[1]
[1]School of Chemical Engineering, The University of Adelaide, South Australia, Australia
[2]Institute for Photonics and Advanced Sensing, The University of Adelaide, South Australia, Australia

Tailoring the Structure of Nanoporous Anodic Alumina

Nanoporous anodic alumina (NAA) produced by electrochemical oxidation—anodisation—of aluminium is a highly versatile nanomaterial with broad transdisciplinary applicability because of its unique chemical and physical properties, and tailorable nanoporous structure. NAA is a matrix of anodic aluminium oxide featuring extended arrays of straight, cylindrical, nanometric pores homogeneously distributed across its surface in a honeycomb fashion. This characteristic self-organised porous structure results from an electric field-driven mechano-electrochemical growth mechanism. Our team has been pushing the boundaries of the fundamental mechanisms behind anodisation to further expand the applicability of this ideal platform material across photonic and iontronic technologies. In this presentation, I will introduce our recent advances in NAA technology—with a particular focus on the development of high-quality forms of NAA-based photonic crystals and their application in optical sensing, lasing, and photocatalysis—and our vision for future advances in this highly dynamic and exciting field of research.

Biography:

Abel Santos is associate professor at the School of Chemical Engineering of The University of Adelaide (Australia). His research focuses on electrochemical engineering of nanoporous anodic alumina structures and their integration in photonic and optoelectronic technologies such as sensors, lasers, photonic crystals, iontronics, and photocatalysts and photo-electrocatalysts. He has published 115 research articles in top international journals. Internationally, he has been recognised as one of world's 2% researchers by Stanford University (since 2018), and an emerging investigator by the editorials of Journal of Materials Chemistry C (2017) and ACS Applied Materials and Interfaces (2021).

Katsuhiko NAOI* and Wako NAOI
Tokyo University of Agriculture and Technology and K & W Inc., Tokyo 184-8588, Japan

Maximizing Solar Energy Capture to Tackle “Climate Change” by Enhancing Efficiency with Advanced Supercapacitors

In traditional solar power systems, the electric current generated by photovoltaic (PV) cells diminishes to insignificance during low-sunlight periods such as dawn, dusk, or cloudy weather. However, our research has unveiled a groundbreaking solution: by effectively storing these minuscule currents with advanced supercapacitors, we can significantly enhance the overall system efficiency. In this presentation, we introduce the fundamental concepts behind our innovative technique. We will showcase the impressive results obtained from a prototype study, which achieved a remarkable 15-20% improvement in power system efficiency. Our system design is strongly motivated by the urgent need to combat global climate change. By capitalizing on the magnitude of sunlight intensity variations observed over the past decade, our innovation has enabled substantial efficiency gains. Our research highlights the untapped potential of harnessing low-sunlight PV currents. Through a field trial of a 10-kW system, we demonstrate an impressive 33.5% improvement in net system output during bad weather conditions, such as rainy days. By harnessing these previously overlooked energy sources, we contribute to a more sustainable and resilient future.

Biography:

Katsuhiko NAOI, an esteemed Emeritus Professor at Tokyo University of Agriculture and Technology (TUAT), is renowned for his expertise in energy storage technologies. With a PhD from WASEDA University, post-doc at University of minnesota, and industry experience at BASF AG in Germany, his research and leadership have made him a world leader in the field. Since he joined TUAT in 1990, he established the world's first strategic center for "Supercapacitor" in 2012 and has played a pivotal role in driving innovation and collaboration in the field. His contributions to national projects on Zero Emission initiatives and his groundbreaking demonstration test of solar power generation using "NanoHybrid capacitors" have overcome the limitations of solar power systems. The center's innovative "All Weather, All Season, All Location" system combines solar cells, supercapacitors, and lithium-ion batteries to effectively store and utilize previously discarded weak photovoltaic power. His appointment as Vice President of TUAT further highlights his exceptional leadership and dedication to academic excellence.

Toyohisa Fujita & Chunlin He
College of Resources, Environment and Materials, Guangxi University, Nanning, Guangxi, 530004 China

Nanobubble Property and Utilization

In the nanobubble property, the long-term stability condition of nanobubble was investigated in the different kinds of gas nanobubbles in deionized and salt water by using extended DLVO theory. The prepared stable nanobubble size distribution was measured by interactive force apparatus by applying electric field and an effective water thin film layer covered with a gas nanobubble was estimated to be approximately 10 nm.

The prepared nanobubble was utilized following application. At first, the hydroxyl radical was scavenged and the superoxide anion diminished by mixing the carbon dioxide nanobubbles after hydrogen nanobubble blowing in water and alcohol aqueous solution. On the other hand, when H2 nanobubbles are brown after CO2 nanobubble blowing, the hydroxyl radical amount has increased. For the disinfection test, the increase of hydroxyl radicals is useful to reduce the bacteria by the observation in the agar medium.

Next, the free radicals produced were superoxide anions at collapsed 8%H2 in Ar nanobubbles and hydroxyl radicals at collapsed CO2 nanobubbles. On the other hand, the collapse of mixed CO2 and H2 in Ar nanobubble showed no free radicals. The possible presence of long-term stable nanobubbles and the absence of free radicals for mixed H2 and CO2 nanobubble would be useful to understand the beverage quality.

In others, the oxidation of As(III) by blowing out O2 nanobubbles, the effects of different nanobubbles on the growth and Cd accumulation of rice seedlings under hydroponic condition and the novel aid for the structure transition from vaterite to calcite would be introduced.

Biography:

Now he is professor of Guangxi University, College of Resources, Environment and Materials, China , emeritus Professor of the University of Tokyo, Japan and president of the research forum on the recycling technology of rare metals in Japan. From 2003 to 2019 he was professor of the University of Tokyo (Director of Research into Artifacts, Center for Engineering, the University of Tokyo). From 1995 to 2003 he was professor of Akita University (Chairman of Venture business laboratory in Akita University). Also, he was president of the Resources Society of Japan.

Mingwei Zhao

National Key Laboratory of Deep Oil and Gas, School of Petroleum Engineering, China University of Petroleum (East China), Qingdao 266580, P. R. China

The research progress of nanomaterials in oil and gas development

Nanomaterials are receiving more and more attention in oil and gas development, but their small size and large specific surface area lead to poor temperature and salt resistance, which limits their application in oil and gas development. We developed a series of silica-based and carbon-based nanomaterials, explored the stability regulation and interfacial adsorption characteristics of nanofluids under the conditions of high temperature and high salinity, clarified the percolation behaviors of nanofluids in the micro-nano pore throat, revealed the mechanism of efficient drag reduction and oil imbibition of nanomaterials. The research output has been industrialized through patent conversion. At present, nano-materials have been popularized and applied in Changqing Oilfield, Xinjiang Oilfield and Shengli Oilfield, showing good oil increasing production effect.

Biography:

Mingwei Zhao, Professor, National Key Laboratory of Deep Oil and Gas, School of Petroleum Engineering, China University of Petroleum (East China). Mingwei earned his PhD of colloid and interface chemistry from Shandong University in 2011 and being the visiting scholar in University of Alberta in 2020. He primarily works in the oil and gas field development engineering. His research involves the development of novel nanomaterials, polymers and surfactants for enhanced oil recovery, the preparation of efficient fracturing fluids, profile control and water shutoff chemicals.

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SPEAKER PRESENTATIONS | DAY 1

Neutron diffraction study of magnesium AZ31 plastic deformation mechanisms and phase stresses in Al/SiCp composite during thermal cycling and mechanical loading

P. Kot[1], A. Baczmanski[2], E. Gadalinska[3], M. Wronski[2], S. Wronski[2], G. Farkas[4], M. Wróbel[5], K. Wierzbanowski[2]

[1]NOMATEN Centre of Excellence, National Centre of Nuclear Research, ul. Andrzeja Sołtana 7, 05-400 Otwock, Poland
[2]AGH-University of Krakow, WFiIS, al. Mickiewicza 30, 30-059 Kraków, Poland
[3]Institute of Aviation, Materials & Structures Research Center, al. Krakowska 110/114, 02-256 Warsaw, Poland, elzbieta.
[4]Nuclear Physical Institute, ASCR, Hlavní 130, Czech Republic
[5]AGH-University of Krakow, WIMiIP, al. Mickiewicza 30, 30-059 Kraków, Poland

In the present work the mechanical behaviour of the Al/SiCp composite and AZ31 magnesium were studied using neutron diffraction. To do this, the time of flight (TOF) neutron diffraction was applied. The advantage of diffraction methods is that the mechanical behaviour of different peaks and phases of polycrystalline material, therefore different lattice strains and stresses can be independently studied during sample loading by measuring in several different directions of scattering vector.

The experimentally obtained phase stresses evolution in both constituents of the Al/SiCp composite during thermal processing and elastic-plastic deformation were explained with a proposed Developed Thermo-Mechanical Self-Consistent model (DTMSC). The advantage of the DTMSC model is a prediction of the thermal inter-phase stresses, and subsequently simulation of their relaxation during the elastic-plastic deformation.

Measurements of the highly textured AZ31 magnesium alloy during the compression and tension test were made for a load applied in different directions relative to the sample. Simultaneous measurement of many hkl reflections (TOF method) and measurement in 9 different directions allowed to determine stress tensors for selected groups of crystallites (including twins). These data and the developed method of crystallite groups allowed for the first time to determine the critical shear stresses for various slip and twinning systems directly from diffraction measurements (in previous works, the interpretation of the results required model assumptions regarding crystallite interactions). These results were used as model parameters, making the model less ambiguous. A very good agreement between model and experimental results was obtained.

Acknowledgements:

This work was partially supported by grants from the National Science Centre, Poland (NCN) No. UMO-2021/41/N/ST5/00394. P. Kot were personally supported in part by the European Union Horizon 2020 research and innovation program under Grant Agreement No. 857470 and from the European Regional Development Fund via Foundation for Polish Science International Research Agenda PLUS program Grant No. MAB PLUS/2018/8.

Biography:

Przemysław Kot is a doctor of physical sciences working at the NOMATEN Centre of Excellence at National Centre for Nuclear Research in Poland. His research work concerns experiments and the development of theoretical models for the study of elastic-plastic deformations. His interests include: neutron and X-ray diffraction, measurements of stresses in polycrystalline materials, interpretation and analysis of experimental results of elastic-plastic deformation.

Microstructural, mechanical, and biophysical properties of ultra-fine grain titanium

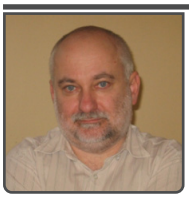
Krzysztof Wierzbanowski
AGH University of Kraków, 30-059 Kraków, Poland

Mechanical strength, hardness and fatigue resistance of metals can be strongly increased applying plastic severe plastic deformation (SPD). In the present work the properties of hydrostatically extruded pure titanium grade 2 (HE Cp-Ti) were studied and analyzed in aspect of its possible application for dental implants instead of titanium alloys alloy grade 5 (Ti-6Al-4V). Pure titanium (Cp-Ti) does not contain doping elements, which can be harmful for the organism. Mechanical testing, microstructure characterization, and biophysical response of the ultra-fine grain pure titanium were performed. Mechanical resistance was strongly increased, a reach of defects ultra-fine grain microstructure was obtained, and anisotropic biophysical material response was confirmed. Generally, it was found that most material characteristics are strongly anisotropic, i.e., one obtains different results for the transverse and longitudinal cross-sections of the deformed rods.

Concerning the biophysical response, cell-material interactions were studied. It was found that they depend principally on two factors: on local defect density and the type of crystallographic planes parallel to the examined material cross-section.

Biography:

I have expertise in the field of polycrystalline and ultra-fine grain materials, mechanical properties of metals, residual stresses, and crystallographic textures. I developed crystalline models for elastic-plastic deformation and for recrystallization of metallic materials. I performed analysis and experimental results in the domain of X-ray diffraction, electron backscattering diffraction (EBSD) and mechanical testing of metallic materials. I give lectures in the field of General Physics and Material Science. I amthe author of over 200 publications and of numerous presentations at conferences in the field of material science.



Determination of residual stresses in thin layers using characteristic X-rays and synchrotron radiation

A. Baczmanski[1], M. Marciszko-Winckowska[2], M. Klaus[3], Ch. Genzel[3]
[1]AGH-University of Krakow, WFiIS, al. Mickiewicza 30, 30-059 Kraków, Poland
[2]AGH-University of Krakow, ACMIN, al. Mickiewicza 30, 30-059 Kraków, Poland
[3]Helmholtz-Zentrum Berlin fürMaterialien und Energie, Albert-Einstein-Str. 15, Berlin 12489, Germany

One of the basic parameters characterizing polycrystalline material is the stress state. Stresses may exist even within a body free from external loads or temperature gradients, and such stresses are called the residual stresses (RS) or locked-in ones. The RS can result from previous plastic deformation (which is usually not homogeneous, at least on the micro-scale) induced during shaping, friction, heating or cooling (including phase transformations), heterogeneity in chemical composition, and/or crystal structure (e.g., carburizing and precipitation hardening) and various surface treatments (e.g., coating techniques such as PVD/CVD, enameling, electroplating, etc.). Residual stresses are summed with applied stress, so they can be beneficial or detrimental to the strength of the material, depending on whether they are tensile or compressive.

In this work the residual stress analysis was performed for a mechanically polished, elastically anisotropic, austenitic stainless steel and was carried out by different evaluation methods of X-ray diffraction. The multiple-reflection grazing incidence X-ray diffraction method with classical monochromatic X-rays was used to determine in-depth stress evolution in the shallow region. In comparison, the deeper volumes were investigated using energy dispersive X-ray diffraction with high-energy synchrotron radiation. These complementary methods allowed the determination of the depth-dependent stress profile and the evolution of the lattice strain-free parameter. An excellent continuation and overlapping of the results were obtained using different data analysis methodologies.

Biography:

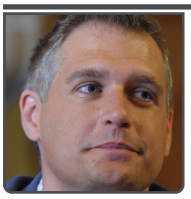
Andrzej Baczmanski is a professor of physical sciences working at the Faculty of Physics and Applied Computer Science, AGH-University of Krakow in Poland. His research work concerns both experiments and the development of theoretical models for the study of elastic-plastic deformations. His interests include: neutron and X-ray diffraction, measurements of crystallographic texture, elastic constants, stresses in polycrystalline materials, interpretation and analysis of experimental results, as well as self-consistent modeling of elastic-plastic deformation.

Nanotechnology-Powered Eradication of Bacterial Persister Cells: Exploiting Low Metabolic Activity with ATP-Coated Gold Nanoclusters

Laurent A. Bekale[1*] and Peter L. Santa Maria[1]
[1]Department of Otolaryngology, Head and Neck Surgery, Stanford University, 801 Welch Road Stanford, CA 94305-5739, USA

The emergence of antimicrobial resistance, fueled by multidrug-tolerant persister cells with low metabolic activity, poses a significant challenge in chronic bacterial infections and contributes to the broader antimicrobial crisis. Recently, nanotechnology, specifically non-antibiotic-modified gold nanoclusters (AuNCs) with inherent antimicrobial properties, has garnered attention as a potential solution for combating multidrug-resistant Gram-negative bacteria. Current AuNCs' reduced antimicrobial efficacy in cells with low metabolic activity is a limitation. This phenomenon occurs because bacterial cells must be in a high metabolic state to initiate the production of reactive oxygen species upon internalization of AuNCs, which typically leads to bacterial cell lysis.

We recently engineered an adenosine triphosphate coated-coated gold nanoclusters (AuNC@ATP) as a new antimicrobial agent to eliminate multidrug-tolerant persister cells. Unlike typical antibiotics that kill by targeting particular cell metabolism-dependent processes, AuNC@ATP fights bacteria by causing an accumulation of aberrant proteins in the periplasm. Furthermore, AuNC@ATP targets persister cells over actively proliferating exponential bacterial cells. The effectiveness of AuNC@ATP in eradicating the bacterial cells follows this order: persister cells > stationary growth phase > exponential growth bacterial cells. This finding challenges the prevailing notion that persister cells are more resilient to eradication than their metabolically active counterparts. Our findings uncover a previously unrecognized aspect of nanotechnology's potential in effectively eliminating bacterial persister cells.



The Cr-Ni stainless steels: surface issues

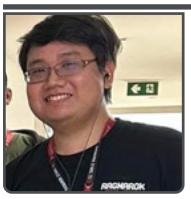
C. Paglia and C. Mosca
University of Applied Sciences of Southern Switzerland, DACD, V. Flora Ruchat 15, CH-6850 Mendrisio, Switzerland

The relatively low price of Cr-Ni stainless steels promotes a large use of such materials in industry plants, in the construction field, in buildings interiors and other applications. The most used Cr-Ni stainless steel are known to form a very thin oxide layer when in contact with the natural atmosphere. The Chrome oxide layer is responsible to protect the material from deterioration, in particular atmospheric corrosion. These alloyed steels exhibit a significant durability. Nonetheless, the life of the alloy is largely controlled by the surface protecting layer. Aggressive environments, such as halogenide-rich solutions are particularly detrimental for such alloys. In this work, Cr-Ni stainless is investigated with respect to the exposure condition, surface roughness, preparation works on sites, pollutants on the surface. It was found that, such type of Inox is still widely used in inadequate aggressive environments. Cyclic exposure, condensation phenomena, evaporation and chloride-enrichments as well as inappropriate weldment nitric acid treatment of the surface may cause serious corrosion phenomena. The contamination of Iron dust particles due to preparation work on site as well as the roughness of the surface or treatments with cleaning products may also cause degradation. An inhomogeneous distribution and concentration of the Chrome on the surface may also adversely influence the corrosion of outdoor exposed stainless steels elements.

Biography:

Ph. D in Material Science at the Swiss Federal Institute of Technology, with Sika AG in Zurich. Post-doc in the Corrosion of Aerospace Aluminum Alloys Friction Stir Welds at the Ohio State University USA, with the Wright Patterson Air Force Laboratories. Responsible of a branch office (Helbling Engineering Group, Zurich).

Director of the Institute of Materials and Constructions at Supsi. Member of the CENTC 51 WG 14 Hydraulic binders for road bases. Member of the Swiss standard committee SIA 215 on binders. Rilem TC member for organic coating degradation, concrete carbonation with SCM, chloride bonding, fire spalling and asphalt recycling.



Preparation of Polycarprolactone/Polylactic acid (PCL/PLA) Solid Electrolyte with High Electrical Performances for Lithium-ion Battery

Dul Boriboon[1], Pimpa Limthongkul[2] , and Thammasit Vongsetskul[1]

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Lithium-ion battery (LIB) has widely been used for various applications from small mobile devices to electric vehicles to energy storage system for grids. Lithium-ion batteries are composed of 3 main parts, negative electrode, positive electrode, and Li-ion ion-conducting electrolyte. Electrolyte of Li-ion batteries are currently made up of high vapor pressure organic carbonate solvents with lithium salt.Such high volatility also come with low flash point and therefore, reflect in concern on battery safety especially when under used. Development of lower vapor pressure with higher safety electrolytes if of interest as is a topic that has widely been explored. One pathway is to develop not a liquid but solid electrolyte. However, lithium-ion conductivity of the current solid polymer electrolytes are not yet comparable to that of the liquid counterpart and thus result in the high resistance and low efficiency batteries. In this work, we explore a combination of polymer, polycaprolactone (PCL)/polylactide (PLA), with an aim to alleviate the conductivity problem. PCL is expected to act as a mobile phase for lithium-ion movement because of its lower glass transition temperature (Tg), while PLA may help trap anions and enhance lithium-ion movement and thus resulting in the total high lithium-ion conduction. In this work PCL/PLA solid electrolyte were developed via a solution casting method. A PCL/PLA electrolyte blend with a ratio of 6:4 with 40%wt of lithium bis(trifluoromethanesulfonyl)imide (LiFSI) showed an ionic conductivity of 3.48mS/m at 50oC which is acceptableto be used in LIB. Furthermore, its lithium transference number was 0.86 which means that most of the lithium ions provided energy for storage and the prepared PCL/PLA electrolyte is a promising electrolyte forLIB.

Keyword: polycaprolactone, polylactide, solid polymer electrolyte, ionic conductivity, lithium transference number

Biography:

My name is DulBoriboon, a Ph.D. student from Mahidol University in material science and engineering department. My research is about electrolytes in lithium-ion battery which is an energy storage in many applications. I have been studying about lithium-ion battery since master degree and would like to contribute the part of my work in this conferences to broaden the horizon for everyone.

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A Computational Approach: Substitution by Pyridine to Phenyl Carbonyl Isothiocyanates in Gas and Polar Aprotic Solvent

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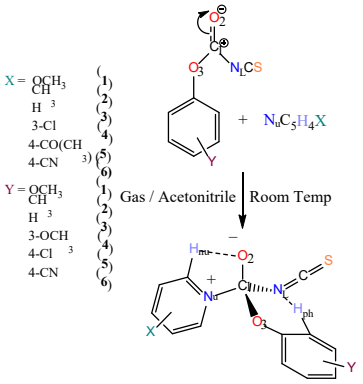
[b]Department of Green Chemistry and Technology, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, Ghent, B-9000, Belgium

This study focuses on the mutual interaction of substituents in the nucleophile and substrate – cross interaction constant, ρXY, in the uncatalyzed aminolysis by substituting pyridine with phenyl carbonyl isothiocyanate. The mechanism was found to be a stepwise process with a rate-limiting breakdown of the ρNCS leaving group. This stepwise reaction mechanism considers the Cross-Interaction Constant (CIC) with rate-limiting breakdown of tetrahedral intermediate in gas and solvent phases. The corresponding Hammett coefficients are related to the substituents associated with (1) the nucleophiles (X), ρX (–1.93 to –6.54 for the gas phase and 10.5 to 18.9 in the solvent model), and with (2) the substituents associated with the phenyl ring of the substrate (Y), ρY (0.41 – 3.48 for the gas phase and 1.83 ~ –10.70 for the solvent model). It also includes the Brönsted coefficient with X, ρX (0.11 – 1.52 for the gas phase and –2.57 – 3.96 for the solvent model), and CIC values, ρXY (0.69 for the gas phase and 0.87 for the solvent model). In this work, the NBO analysis, reaction potential, reaction electronic flux (REF), dual descriptor, and the structure-energy relationships were considered in interpreting the mechanistic criteria.



Biography:

B.Sc. (Hons.): University of Dhaka, Bangladesh, 1987

M.Sc. (Thesis): University of Dhaka, Bangladesh, 1989

Thesis Title: Aminolysis to the Phosphorus-Chlorine Compounds

Ph.D.: Inha University, Incheon, Korea, 2003

Thesis Title: Comparison to the Aminolysis of Kinetics and Mechanism of Phosphoryl and Carbonyl Transfer Reactions.

Post-Doctoral Fellow: Inha University, Incheon, Korea. 2003 – 2005.

Associate Professor (Nontenure-Track): Department of Biotechnology and Bioinformatics, University of Development Alternative, Dhaka, Bangladesh. 2005 – 2007.

Associate Professor (Tenure-Track): Department of Chemistry, Inha University, Incheon, Korea. 2008 – 2019.

Teaching Assistant and Lecturer (Tenure-Track): Ghent University Global Campus, Incheon, Korea. 2019 – Present.

Hydrothermal synthesis process along with characterization of ZSM-5 nanoparticles for CO2 utilization

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[b]Department of Green Chemistry and Technology, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, Ghent, B-9000, Belgium

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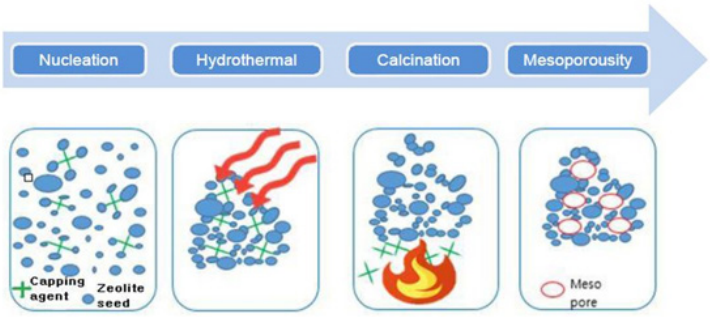
Carbon dioxide (CO2) is a critical greenhouse gas that is an unavoidable threat to our planet due to its liable global warming. CO2 is mainly released by the combustion of fossil fuels which are used in various kinds of production industries. In this study, we present a facile process of synthesizing ZSM-5 nanocrystals using the capping agent tartaric acid, instead of using surfactants, for the assembly of nanoparticles during the hydrothermal synthesis. This specific synthesis process creates mesoporous aggregations and high external surface area. The ZSM-5 nanoparticle samples were characterized by XRD, FTIR, UV-VIS analysis, SEM, TEM, and BET surface area analysis. It is believed that the presence of this mesoporosity within microporous zeolite structures increases the catalytic activity due to the possibility of overcoming diffusional limitation before heading to spread various metallic incorporated zeolite catalysts. Nevertheless, the hierarchical Cu-ZSM-5 catalyst shows a low conversion of benzene to phenol, it displays a very high phenol selectivity under our analysis conditions. This opens the possibility to investigate operation with recycling loops for high selectivity processes where carbon dioxide is utilized as reactant.

Key words: Nanoparticles, CO2 utilization, Hydrothermal, ZSM-5



Biography:

2002-2008: B.Sc.(Hons) (Chemistry, Jagannath University, Bangladesh)

2008- 2010 : M.S (Chemistry, Jagannath University, Bangladesh)

2010-2017 : Lecturer, Chemistry(Milestone college, Bangladesh)

2017-2019: M.Sc. (Chemical Engineering & Chemistry, Inha University, South Korea)

2019- Present : Ph.D. (Chemical Engineering & Chemistry, Inha University, South Korea+ Bioscience Engineering, Ghent University, Belgium)

Iminophenolate based Titanium and Hafnium compounds for ROCOP of epoxides with anhydrides and epoxides with CO_2

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The increase in global demand for plastics has led researchers to find alternatives for synthetic plastics derived from non-renewable petrochemical feedstock. In addition, these plastics are a severe threat to the environment as they do not degrade easily and thus add to landfill waste. The ring-opening copolymerization (ROCOP) of CO2 or anhydrides with epoxides that form polycarbonates and polyesters is one of the efficient ways to overcome the environmental challenges that arise from petroleum-based polymers, as these polymers are biodegradable.1

The field of homogeneous catalysis for ROCOP studies has been dominated by divalent or trivalent metal compounds such as Mg, Al, Zn, Cr, and Co.2 The tetravalent Group 4 metal compounds are seldom explored in the literature for ROCOP studies though Group 4 metal compounds have been widely used for ring-opening polymerization (ROP) reactions.3

In this study, we investigated the catalytic activities of Ti(IV) and Hf(IV) compounds supported by iminophenolate ligands containing a heterocycle ring attached to the imine sidearm and different substituents present at the phenolate core. The hafnium compounds showed superior catalytic activities in comparison to the titanium analogues for the ROCOP studies. The hafnium compounds gave polymers that were exclusively alternating in nature, while the titanium compounds showed significant polyether linkages in the polymer chain. The studies have been well correlated to the steric and electronic environment of the ligand backbone. The systematic studies have been performed by varying the epoxide and anhydride used for the copolymerization reaction.

Biography:

1. Song, B.; Qin, A.; Tang, B. Z. Syntheses, Properties, and Applications of CO2-based Functional Polymers. Cell Rep. Phys. Sci. 2022, 3, 100719.

2. Fazekas, E.; Lowy, P. A.; Rahman, M. A.; Lykkeberg, A.; Zhou, Y.; Chambenahalli, R.; Garden, J. A. Main group metal polymerisation catalysts. Chem. Soc. Rev. 2022, 51, 8793.

3. Laia, F. J.; Huang, T. W.; Chang, Y. L.; Chang, H. Y.; Lu, W. Y.; Ding, S.; Chen, H. Y.; Chiu, C. C.; Wu, K. H. Titanium complexes bearing 2,6-Bis(o-hydroxyalkyl)pyridine ligands in the ring-opening polymerization of L-Lactide and ρ-caprolactone. Polymer 2020, 204, 122860.

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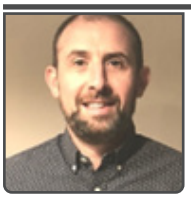
POSTER PRESENTATIONS | DAY 1



Ionic Liquids capacity enhancement in the presence of nanoparticles. New media for fuels desulfurization purposes.

Jean-Charles MOISE and Fabrice MUTELET
Université de Lorraine, CNRS, LRGP, F-54000 Nancy, France

Ionic liquids (ILs) are a class of environmentally friendly solvents which are applied for many industrial purposes due to their unique physical and chemical properties. ILs are non-volatile due to negligible vapor pressure, thermally stable and miscible with substances having very wide range of polarities. Moreover, it is possible to tune some of their properties by adjusting different cation-anion combinations. Comparing to classical solvents, ILs are capable of a wider range of intermolecular interactions than most classical solvents. This includes: dispersive, n-ρ, ρ-ρ, dipolar, hydrogen bonding, hydrophobic, and ionic interactions. All these features enable a lot of industrial applications such as liquid–liquid extraction, catalysis, organic/inorganic synthesis or electrochemistry.

Concerning ILs as solvents for extraction, the solute distribution coefficient and selectivity are two very important factors. They reflect the solvent capacity and number of stages necessary for fuel desulfurization, respectively. Some alkyl-imidazolium ILs with anions such as [SCN]-, [MP]-, [BF4]-, [PF6]-, [EtSO4]-, [NTf2]- have been established to have suitable properties for removal of thiophene from hydrocarbons. The results of extraction of sulfur containing compounds from gasoline or diesel oil using ILs indicate that such a process could be an attractive alternative to common (deep) desulfurization by hydrotreating. The aim of this study is to investigate the capacity factor enhancement of ionic liquids in the presence of nanoparticles for the separation problem which appears in deep desulfurization of fuels: {thiophene + aliphatic hydrocarbon}. Nanopowders suspensions in ILs were studied by spectroscopic techniques, particles size measurements and liquid-liquid equilibria measurements.

Biography:

Jean Charles Moïse is an associate professor in Chemical Engineering Thermodynamics at ENSIC-LRGP (Ecole Nationale Superieure des Industries Chimiques – University of Lorraine). He was born in 1974 in Dijon, France and he obtained his doctorate in 1999 from the University of Bourgogne (France). He was during the last ten years director of the preparatory class of the Université of Lorraine for access to the INP group's engineering schools. His research interests include: (1) the research of suitable sustainable solvents for chemical processes, (2) the reduction of CO2 emissions, (3) the use of porous materials for adsorption processes.

Separation of rare earths from Egyptian black sand using bis(2-ethylhexyl) phosphate based ionic liquids

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[1]Université de Lorraine, CNRS, LRGP, F-54000 Nancy, France

[2]Minerals Beneficiation and Agglomeration Department, Central Metallurgical R& D Institute (CMRDI), P.O. Box 87 Helwan, 11722 Cairo, Egypt.

Nowadays, the demand for rare earth elements has greatly raised due to their increasing usage in numerous high-technology applications such as renewable energy, petroleum refining, electronic displays, nuclear technologies, military and defence systems. Rare earth elements are never found as pure metals, instead they are found in a variety of minerals including silicates, oxides, carbonates and phosphates. These minerals may be beneficiated using gravity, magnetic, electrostatic and flotation separation techniques. In this study, the separation of rare earth elements from Egyptian black sand was evaluated using tetraethylammonium bis(2-ethylhexyl) phosphate and tetrabutylammonium bis(2-ethylhexyl) phosphate based ionic liquids as promising collectors. Two modified mini-columns flotation cells were designed to achieve the separation process. Many variables were studied inorder to optimize rare earths separation process such as flotation cell type, ionic liquid type, ionic liquid dose, pH, depressent type and dose, air flow rate, conditioning and separation time. The results obtained from this study displayed the high performance of studied ionic liquids compared to classical collectors in the separation of rare earth elements.

Biography:

Fabrice Mutelet is an associate professor in Chemical Engineering Thermodynamics at ENSIC-LRGP (Ecole Nationale Superieure des Industries Chimiques – University of Lorraine). He was born in 1972 in Mont-Saint-Martin, France and he received his doctorate in 2001 from the University of Lorraine (France). He is a reviewer for over 20 leading international journals and he has published more than 120 research papers. His research interests include: (1) the research of suitable sustainable solvents for chemical processes, (2) the reduction of CO2 emissions, (3) the measurement and correlation of phase diagrams for complex systems.

Research on the Performance Improvement of Co-CeO_2 Catalyst for High-Temperature Water Gas Shift Reactions through the Addition of Transition Metal Oxide Promoters

Beom-Su Cheon[1], Ji-WonSon[1], Min-GyeongBae[1], Jae-MinSong[1], and Dae-WoonJeong[2]

[1]Department EnvironmentalEngineering,ChangwonNationalUniversity, Changwon-si, Gyeongsangnam-do, SouthKorea

[2]Department ofSmartEnvironmental&EnergyEngineering, ChangwonNationalUniversity, Changwon-si, Gyeongsangnam-do, SouthKorea

Co-CeO2 catalyst shows high activity but lacks stability as a promising catalyst for hydrogen production from waste-derived syngas through high-temperature water gas shift reactions. In this study, various promoters were added to the Co-CeO2 catalyst to improve its activity and stability. In order to improve the activity and stability of CeO2 support-based catalysts, Co-CeO2 catalysts were manufactured using various trivalent and tetravalent transition metal oxides, Nb2O5, ZrO2, TiO2, and V2O5, as cocatalysts. Various analytical techniques, including N2 adsorption/desorption, CO-chemisorption, and H2-Temperature-Programmed Reduction, were employed to investigate the physicochemical properties of the catalysts. Reactivity experiments were conducted under reaction conditions of T = 350-550 °C and a gas space velocity of 637,320 h-1 to evaluate the catalyst activity. Among the prepared catalysts, the Co-Nb2O5-CeO2 catalyst exhibited the highest CO conversion rate of 78% at 500 °C. Furthermore, stability evaluation performed for over 40 hours at 500 °C demonstrated that the Co-Nb2O5-CeO2 catalyst exhibited the highest stability without deactivation. This can be attributed to the high Co dispersion facilitated by Nb2O5 addition, as well as improved interactions between oxygen vacancies, active species, and the support in the Co-CeO2 catalyst. Therefore, it can be concluded that the Co-Nb2O5-CeO2 catalyst is the optimal catalyst for hydrogen production from waste-derived syngas.

A study on manufacturing method of Co-Nb-CeO_2 catalyst for high-temperature water gas shift reaction for hydrogen production from waste-derived syngas

Jae-Min Song[1], Beom-Su Cheon[1], Ji-Won Son[1], Hak-Min Kim[2] and Dae-Woon Jeong[1,3†]

[1]Department Environmental Engineering , Changwon National University, Changwon, Greongsangnam-do, republic of Korea
[2]Industrial Technology Research Center, Changwon National University, Changwon, Greongsangnam-do, South Korea
[3]Department of Smart Environmental & Energy Engineering , Changwon National University, Changwon, Greongsangnam-do, South Korea

As the annual amount of waste generation gradually increases, the development of waste treatment technology is essential. Various waste treatment technologies have been proposed, among which waste-to-hydrogen technology can produce hydrogen that emits only water during combustion, through a water gas shift reaction.

In this study, it was investigated and screened for the preparation method of Co-Nb-CeO2 (Co-NC) catalyst in high-temperature water gas shift reaction for the hydrogen production from waste-derived syngas. Four kinds of synthesis methods, including coprecipitation, incipient wetness impregnation, sol-gel, and hydrothermal synthesis method, were used to prepare Co-NC catalyst. Among the preparation methods, coprecipitation method was the best way to prepare the Co-NC catalyst with high catalytic performance. The Co-NC catalyst, synthesized using coprecipitation method, maintained a high CO conversion under severe conditions (CO concentration : 38%, GHSV : 315,282 mL·g-1·h-1) and showed high activity without deactivation for 60 hours.

This excellent catalytic performance is due to the high oxygen storage capacity and intimate interaction between Co and Nb-CeO2 support. In addition, techno-economic analysis and environmental impact assessment were conducted to evaluate the developed catalyst considering the economic and environmental point of view. As a result of techno-economic analysis and environmental impact assessment, the developed catalyst was more economical and had a lower impact on the environment than commercial catalysts. Therefore, it was confirmed that the Co-NC catalyst prepared by the coprecipitation method is a promising catalyst for the high-temperature water gas shift reaction to produce hydrogen from waste-derived syngas.

Biography:

Jae-Min Song is currently M.S. student at Changwon National University in South Korea, and received a bachelor's degree in Environmental Energy Engineering from Changwon National University in August 2023. His current field is various catalyst manufacturing for reforming reactor for Hydrogen production. He is interested in waste Recycling, Hydrogen, Water gas shift, Environmental issues, Carbon neutrality.

Study of heavy metal cleaning method for paper incineration ash recycling

Min-Gyeong Bae[1], Beom-Su Cheon[1], Ji-Won Son[1], Jae-Min Song[1], and Dae-Woon Jeong[1.2]

[1]Department Environmental Engineering, Changwon National University, Changwon-si, Greongsangnam-do, Republic of Korea

[2]Department of Smart Environmental & Energy Engineering, Changwon National University, Changwon-si, Greonasangnam-do, Republic of Korea

Incineration method for the paper waste can remove organic matter in paper waste and reduce 97% and 82% of the volume and weight, respectively. The ash is generated when paper waste treated by incineration. It could be recycled and reused for various purposes, such as asphalt or concrete filling, construction materials, and so on; because this ash contains lime, silica, and alumina. But paper incineration ash is containing heavy metals and chlorine. To obtain the recyclable paper incineration ash, stabilization or removal of heavy metals is required. Among these methods, removal of heavy metals using a washing method can permanently remove the heavy metal in paper incineration ash. In this study, it was investigated the effect of washing solutions including ethylenediaminetetraacetic acid (EDTA), citric acid (CA), oxalic acid (OA), and HCl solutions on the removal efficiency of heavy metals in the paper incineration ash. In addition, an advanced removal method was tried to develop through mixed solution (MS) and step washing (S1, S2 mode) using EDTA and OA solutions. As a result, the mixed washing method showed the highest heavy metal removal efficiency (Pb 49.19%, Cu 31.29%, As 28.42%, Cd 11.90%) among the three methods. It was resulting from the synergistic action of EDTA and OA. The functional groups of EDTA remove the heavy metals that exist in their metallic phases. In contrast, OA extracts heavy metal oxides by reduction. It is expected that the recycling rate of paper incineration ash can be reduced through the results of this study.

Biography:

Min-Gyeong Bae is currently a M.S. student at Changwon National University in South Korea and received a bachelor's degree in Environmental Energy Engineering from Changwon National University in August 2023. Her current field is various catalyst manufacturing for reforming reactors for Hydrogen production. She is interested in chemistry reactions, environmental issues, recycling, carbon neutrality, and hydrogen production.

Investigation of reaction condition of biogas reforming for the effective hydrogen production

Ji-Won Son[1], Beom-Su Cheon[1], Min-Gyeong Bae[1], Jae-Min Song[1], Hak-Min Kim[2], Dae-Woon Jeong[1,3]

[1]Department Environmental Engineering, Changwon National University, Changwon-si, Gyeongsangnam-do, Republic of Korea
[2]Industrial Technology Research Center, Changwon National University, Changwon-si, Gyeongsangnam-do, Republic of Korea
[3]Department of Smart Environmental & Energy Engineering, Changwon National University, Changwon-si, Gyeongsangnam-do, Republic of Korea

Organic waste, which can cause groundwater, soil, and air pollution through natural decomposition, requires development of treatment technology, and among them, anaerobic digestion reduces greenhouse gas emissions and enables biogas production. The reforming of biogas can generate fuel or chemical products instead of direct combustion, and hydrogen can also be produced. The thermal efficiency of direct combustion of biogas is lower than natural gas because it contains 30~60 % of carbon dioxide. The hydrogen is a clean energy carrier because it emits only water with carbon dioxide. The reforming reaction is required to produce hydrogen from biogas. In the reforming reaction, reaction conditions including oxidant type, oxidant ratio, and reaction temperature are important to the hydrogen production yield, catalyst life, and energy efficiency. Therefore, the investigation and optimization of biogas reforming reaction were performed in this study. The reforming reactions were divided into steam reforming (SR), Carbon dioxide reforming (CDR), Combined steam and Carbon dioxide reforming (CSCDR) reactions based on oxidant type. To optimize the reaction conditions, thermodynamic analysis and experimental verification methods were carried out. The indicators for determining optimum reaction condition were hydrogen production and energy efficiency. As a result of thermodynamic analysis, CSCDR was the most energy-efficient, and the optimal conditions for CSCDR were 750°C of reaction temperature and an H2O/CH4 ratio of 1.5. Ni-MgO-CeZrO2 catalyst developed in the previous study was used to test the optimum condition. As a result, it was confirmed that the high catalyst performance was maintained for 30 hours.

Biography:

Ji-Won Son is currently studying for a master's degree at Changwon University in Republic of Korea, and received a bachelor's degree in environmental energy engineering from Changwon University in August 2023. Currently, her field of research is the manufacture and characterization of various catalysts used in reforming reactions for hydrogen production. She is interested in hydrogen production, chemical reactions, biogas, reforming reactions, carbon neutrality.

Research on the development of nano-green composites by novel process of reinforcing Cellulose Nano-Fibers

Ruiwen Yu[1], M. N. Prabhakar[2] and Jung-il Song[3]
[1]Department or Smart Manufacturing Engineering, Changwon National University, Changwon, Korea
[2]Research Institute of Mechatronics, Changwon National University, Changwon, Korea
[3]Department of Mechanical Engineering, Changwon National University, Changwon, Korea

For economic success and environmental persistence, the “Bioeconomy” model of the 21st century promotes the utilization of renewable resources instead of the mere use of nonrenewables. Cellulose is the most important source of renewable resources. In the annual production in nature, a significant source of people is 7.5 × 1010 tons, the most abundant natural composite material on earth. The mechanical properties of cellulose nanofibers (CNFs)-reinforced natural fiber composites have been the focus of researchers in recent years [1]. Due to its high elastic modulus, low density, high aspect ratio, bio compatibility and biodegradability, it is widely used in the reinforcement of polymer materials. Therefore, it is necessary to develop CNFs-reinforced natural fiber green composites, but few researchers focus on impregnating cellulose on the surface of natural fibers. However, they are limitations using CNFs in green composites. Such as, high cost, extraction process is complete. Property of CNFs is deference with different extraction process and source. Further the mixing homogeneously of CNFs with thermoplastic/thermoset polymer is also challenge task [2, 3].

Presently, natural fiber composite materials exist Problems such as sustainable application and poor mechanical properties, in our experiments, we extracted cellulose nanofibers (ECNFs) from a natural grass (Imperata), used flax fibers to impregnate them in a nanosolution, and fully exploited the adhesion mechanism to prepare ECNFs/tFF fibers and adding vinyl ester (VE), and preparing ECNFs-TFF/VE composite by vacuum-assisted resin transfer molding (VARTM).

Biography:

Mr. Ruiwen Yu, is presently studying Doctor of Philosophy as Changwon National University, South Korea . His research areas include the Bio composites, Natural fiber reinforced composites, Design and development of composites for engineering. He obtained Master degree in mechanical engineering from Changwon National University, South Korea. Bachelor's degree at the School of Materials, Shanghai University of Engineering Technology, China. He has published 5 international research publications to his credit. He also delivered and attended international and national conference in Korea and China.

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KEYNOTE PRESENTATIONS | DAY 2

Osman Adiguzel
Department of Physics, Firat University, Elazig, Turkey

Energy Storage and Energy Dissipation at Transformation Cycles in Shape Memory Alloys

A series of ally systems exhibit a peculiar property called shape memory effect with special chemical compositions in the ß-phase fields. This phenomenon is initiated with thermomechanical processes on cooling and deformation and performed thermally on heating and cooling, with which shape of the materials cycles between original and deformed shapes in reversible way. This is plastic deformation, due to the soft character in low temperature condition, they keep the deformed shape after releasing and recover the original shape on heating. Strain energy is stored with this deformation and release on heating by recovering the original shape by means of reverse endothermic austenitic transformation.

Shape memory effect is governed by crystallographic transformations, thermal, and stress induced martensitic transformations. Thermal induced transformations are exothermic reactions and occur on cooling with the cooperative movement of atoms in <110 > -type directions on {110}-type planes of austenite matrix along with the lattice twinning and ordered parent phase structures turn into twinned martensitic structure. Twinned structures turn into detwinned martensite by means of stress induced martensitic transformation with deformation. Forward martensitic and reverse austenitic transformations are solid state reactions; these reactions do not occur at the equilibrium temperature at Gibbs Free Energy Temperature Diagram and a driving force is necessary for the transformations.

These alloys exhibit another property, called superelasticity, which is performed by mechanically stressing and releasing at a constant temperature at the parent phase region, and material recovers the original shape upon releasing, by exhibiting elastic material behavior. Superelasticity is performed in non-linear way in stress-strain diagram, unlike normal elastic materials behavior, loading and releasing paths are different, and hysteresis loop (transformation cycle) refers to the energy dissipation.

Superelasticity is also result of stress induced martensitic transformation, and the ordered parent phase structures turn into the detwinned martensite structures by stressing. Therefore, twinning and detwinning reaction play important role in memory behavior of shape memory alloys.

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

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

Keywords: Shape memory effect, martensitic transformation, thermoelasticity, superelasticity, energy dissipation lattice twinning, detwinning.

Biography:

Dr. Osman Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and his studies focused on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University in 1980. He became professor in 1996, and he has been retired due to the age limit of 67, following academic life of 45 years. He published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as Plenary Speaker, Keynote Speaker, Invited Speaker, Oral Presentation or Poster presenter. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last six years (2014 - 2019) over 60 conferences as Speaker, Keynote Speaker and Conference Co-Chair organized by different companies in different countries. Additionally, he retired at the end of November 2019, and contributed with Keynote/Plenary Speeches over 120 Virtual/Webinar Conferences, due to the coronavirus outbreak in two year of his retirement, 2020 and 2022. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University in 1999-2004. He supervised 5 PhD- theses and 3 M. Sc theses. He is also technical committee member of many conferences. He received a certificate which is being 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.

Dr. Shreyas J
Department of Information Technology, Manipal Institute of Technology Bengaluru, Manipal Academy of Higher Education, Manipal, Karnataka, 576104, India.

Swarm Intelligence as a Potential Solution for Internet of Things

Advancement in technology is improving rapidly in recent years, the Internet of Things (IoT) aims to connect multiple devices for information sharing and intelligent decision making. The rapid increase in connected devices comes along with new challenges. Addressing these challenges using traditional algorithms may not be effective. Swarm intelligence algorithms are self-organized algorithms used to resolve complex and dynamic problems with incomplete information and limited computational capabilities. The aim of this exclusive survey is to provide a summarized brief study of all the existing research on application of swarm intelligence for IoT.

The results show that the Field of application of swarm intelligence in IoT is very huge and there is still room for further study. The study shows the benefits of applications of swarm intelligence on IoT in many real time situations. After the mapping study the different types of swarm intelligence algorithms used and their percentages (like Particle Swarm Optimization-25.220%, Ant Colony Optimization-13.040%, Hybrid Intelligence-13.910%, Grey Wolf Optimization-6.090%, Artificial Bee Colony-5.220%, Cuckoo Search-3.480% etc. The detailed study conducted is summarized into year published, problem solved, scope of the paper, benefits of the study, gap area, implementation tool used and the performance analysis.

The gap area in the papers shows that there is requirement of the further study is this field. Swarm algorithms in IoT have immense capability of further development and are prominent in building smart cities and artificial intelligence based connected society.

Biography:

Dr. Shreyas J received the B. E degree in M. Tech degree from Visvesvaraya Technological University. He has received full time Ph.D. degree from Bangalore University in 2021. All the three degrees are in Computer Science and Engineering discipline. He has completed Ph.D. in the area of Internet of Things and Artificial Intelligence in the Department of Computer Science and Engineering, University Visvesvaraya College of Engineering (UVCE, IIT Model College), Bangalore University, Bangalore. He is currently working as Assistant Professor, Dept. of Information Technology, Manipal Institute of Technology Bengaluru, Manipal Academy of Higher Education, Manipal, India. He is involved in research, and teaching B. E and M.Tech student of Computer Science and Engineering and he has more than 8 years of research, academia and industrial experience. He has published more than 50 papers in International Journals including Elsevier, Springer, Inderscience and International Conferences which are indexed by SCI and Scopus. He has received two best paper awards in Hong Kong and Dubai each during International Conferences. He has worked as a reviewer for various reputed journals including Nature, IEEE, Elsevier, Springer, Johnny Wiley, etc publishers and international conferences. He also served as Guest Editor, Editorial Member, Session Chair, Technical committee member etc. for various journals and conferences. He has filed, published and registered various patents. His current research lies in the area of Sensor Networks, Artificial Intelligence of Things, Swarm Intelligence and Machine Learning.

Nazife Erarslan
Geotechnical Department, Civil Engineering, Izmir Demokrasi University, Izmir; Turkey

Is it possible to construct earthquake-resistant soil with a nanotechnological material?

In the 1999 Kocaeli Earthquake and on February 6, 2023, the Kahramanmaraþ Earthquakes caused partial life losses, mostly economic losses. In recent years, earthquakes close to residential areas have shown soil liquefaction fact again. For example, the 2011 Christchurch, New Zealand, and 2023 Kahramanmaras earthquakes have caused great damage to both human life and the economy. Colloidal silica (CS) is a material that can be an alternative to cement grout, which is the most frequently used injection material around the world. Since the particle size of CS is between 2 and 100 nanometers, it fills the voids where water can enter. It was determined in the literature that the bearing capacity of the soils increased with CS, and the dynamic behavior parameters of the soils, such as Gmax shear modulus and cyclic strength, were found to increase. Although the dynamic behavior and strength parameters of CS-injected soils have been extensively studied in the literature through laboratory studies, research studies on shear fracturing of the stabilized soil. CS injection obviously increases the liquefaction resistance of liquefiable soil. Especially the shear modulus and cyclic strength of CS-grouted soil are found to be greater than those of the plain soil specimens. When the seismic waves generated in an earthquake exceed the shear strength of the soil, they cause destruction in infrastructure and superstructures. For this reason, it is important to determine the fracture toughness of reinforced soils against shearing.

Biography:

Assoc. Dr. Nazife (Dogan) Erarslan completed her PhD in Geotechnical Engineering at The University of Queensland (UQ) in Australia in 2011. She worked as a post-doc researcher for one year and then as a lecturer in the same department for three years. Dr. Erarslan has been working as a senior lecturer at the Department of Civil Engineering at Izmir Democracy University in Turkey for four years.

Dr. Erarslan has been studying rock mechanics, soil mechanics, and fracture mechanics since 2011. Dr. Erarslan has received some important awards for her studies. Some of these include the 2008 Australian Government Ph.D. scholarship, the 2011 UQ Deans Award for the best Ph.D. engineering thesis, the 2012 UQ ResTeach award, the 2014 Turkey Scientific Research Institution Award, and most recently the Stanford-Elsevier Ranking of Top 2% Top-cited Researchers award.

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SPEAKER PRESENTATIONS | DAY 2

Smart control and digitalization of modern energy storage systems

Pengfeng Lin
Assistant Professor, School of electronic information and electrical engineering, Shanghai Jiaotong University (QS50), Shanghai, China

Energy storage systems (ESSs) play an important role in modern smart grids. On one hand, a large amount integration of renewable power generations poses serious challenges to stable operation of power systems due to their high uncertainties and intermittency. To mitigate the adverse effects of the renewables on power system, ESSs can be employed to absorb surplus power generation in the system or release power to meet demand in the case of renewable shortage. In this way, the various renewable power injecting into power grid can be significantly smoothed and this practice allows power system operators to better dispatch available power plants. On other hand, the strong global trend of electricity market deregulation has encouraged an increasing number of private owners of renewable assets to participate in electricity market clearing. Moreover, there are currently plenty of limitation among inter-governments over the installations of new fossil fuel-based power plants in order to advance decarbonization progressively. As to this situation, flexible resources which are capable of corresponding and responding to system operation are pivotally in need. Thanks to the nature of easily storing and releasing power, ESSs could substantially escalate the intrinsic flexibility of power system and ensure the balance of generation and consumption. Iin this talk, an advanced control scheme for modern ESSs is presented. The scheme helps to optimally allocate transient power requests from load center. Specifically, the energy storages with high power density and low energy density are responsible for the high frequency components of load power, whereas the energy storages with high energy density but low power density are to handle the low frequency components of load power. By doing this, the overall lifespan of the entire ESS is expected to be longer than those ESSs without the proposed control scheme. Note that multiple ESSs would be deployed to large scale distribution system to build up high system flexibility. To better manage the power and energy exchange between ESSs and power grid, a digital cyber network would be utilized over the physical ESS configuration. A semi-consensus digitization control framework is developed to realize multiple functions in an ESS-enabled low voltage DC power grid, i.e., autonomous bus voltage restoration, spontaneous transient power allocation, and autonomous state of charge balancing among batteries, etc. The digitalized ESS equipped with smart control scheme has shown promising features to support the reliable operations of future power grid in complicated context.

Biography:

Pengfeng Lin received the B.S. and M.S. degree in electrical engineering from Southwest Jiaotong University, China, in 2013 and 2015 respectively, and the Ph.D. degree in Interdisciplinary Graduate Programme from Nanyang Technological Universty, Singapore, in 2020. He was with Energy Research Institute @ NTU as a Research Fellow and with Électricité de France (EDF) as a Smart Grid Energy Expert / Research Scientist. He is in the global top 2% of Scientists released by Standard University. He is currently an Assistant Professor at Shanghai Jiao Tong University. His research interests include power system stability / reliability analyses, smart grid cyber-physical security, and artificial intelligence analytics.

Driving Cycle Development and Prediction by using DC-TRAD

Assoc. Prof. Ts. Dr. Salisa Abdul Rahman
Department of Electronics and Instrumentation, Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia

The driving cycle is a series of driving behaviors, such as acceleration, braking, and cruising, that occur over a set length of time. The driving cycle is essential in the manufacture and evaluation of the vehicle's performance. Predicting the driving cycle can help to improve vehicle performance or anticipate the range of an electric car. Based on prior data, long short-term memory (LSTM) networks by Recurrent Neural Network (RNN) can be used to forecast a vehicle's driving cycle. This article proposes and creates a driving cycle for Ipoh, Perak, Malaysia. The route for collecting driving cycle data was chosen based on the most typical route travelled by drivers to get to work according to 2019. In each run, the parameters for the driving data are collected using driving cycle tracking device (DC-TRAD) and calculated. The objectives of this paper are; to develop an Ipoh Driving Cycle (IDC) using k-means clustering method, to develop a prediction of future IDC using LSTM and to analyze the prediction of IDC. Firstly, the driving data is collected in three different routes in Ipoh city at back-from-work times. Then the data is divided into micro-trips and the driving features are extracted. The features are used to develop a driving cycle using k-means clustering approach. The prediction is developed after the training of neural networks by using LSTM network approach with RSME of 6.2252%.

Biography:

AP. Ts. Dr. Salisa Abdul Rahman received the B.E. and M.E. in Electrical & Electronics Engineering from University of Technology Petronas, Perak, Malaysia in 2004 and 2006, respectively while Ph.D. in Optimal Energy Management Strategy for the University of Technology Sydney Plug-In Hybrid Electric Vehicles from University of Technology Sydney (UTS), Australia. She is currently working as a senior lecturer at University Malaysia Terengganu, Malaysia. Her research interests are in hybrid electric vehicles, innovation powertrain, simulation and modeling, energy management strategy, driving cycles, driver behaviors, fuel economy, emissions, and optimization.

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

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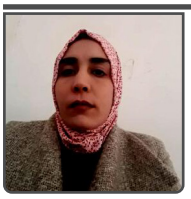
[1]School of Chemical Science, Mahatma Gandhi University, Kottayam, Kerala, India, 686560
[2]School of Energy Materials, Mahatma Gandhi University, Kottayam, Kerala, India, 686560
[3]Textile Manufacture and Textile Chemistry Division, ICAR – Central Sheep and Wool Research Institute, Avikanagar, Rajasthan, India, 304501

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

Biography:

Seiko Jose is a scientist, working at Central Sheep and Wool Research Institute, Avikanagar, Rajasthan, India. He is specialized in Textile Chemistry and having more than 17 years of experience in textiles. He is having seven years of experience in the cotton, silk, and linen processing industry. In the past nine years of his research, he has handled many natural fibres like, jute, pineapple leaf fibre, coconut fibre, flax, silk, wool, ramie, etc. He contributed to 51 research articles and 18 book chapters. His major research areas are extraction and characterization of natural fibre, utilization of agro residues, textile dyeing and finishing, eco-friendly textile processing, nano technology and fibre composites. His Google citations are more than 1200. He published 5 books and another 2 books are in progress in the field of textiles, and composites with reputed publishers namely Wiley and Elsevier. He managed 22 research projects including 10 industrial consultancy works in the national and international level. Currently is holding the position of Editor in 8 Journals.



Elimination of Rhodamine B using the UV254nm/H2O2 process

Hafida Gaffour[1,2*], Abderrahmane Hiri[3], Khedidja Bouali[1], Saida Mahfoudi[1]

[1]Department of Matter sciences, University of Ahmed Draia, Adrar 01000, Algeria
[2]Laboratory of Inorganic chemistry and environment, Tlemcen University, PB 119, Tlemcen 1300, Algeria
[3]Laboratory of Environment, University of M'sila, Algeria

The textile industry becomes more and more a big danger for the environment form where their water discharges are enriched with dye molecules. Within These substances dissolved in waste waters, Rhodamine B (RB) can be found as main dye. It is recalcitrant product which resists to the old techniques of treatment.

So, it must be important to find another efficiency mode able to degrade this dye. Hence, A kind of advanced oxidation processes was chosen to destroy this pollutant; it means the photolysis using UV254nm lamp.

A parametric study was achieved by varying the hydrogen peroxide/ RB ratio (R), the concentration of Rhodamine and the initial pH of the medium.

The found results showed that the good efficiency degradation of the RB molecules was reached by working under operating conditions of pH=3, [Rhodamine B], R= 112.

Biography:

Hafida Gaffour has completed her PhD at the age of 30 years from Tlemcen University, Algeria. she is a lecturer in Adrar University, Algeria. She has four publications that have been cited over 60 times, and his/her publication H-index is 2.

Biofilm composition in Microbial Fuel Cells and Bioremediation potential with Bioelectricity production

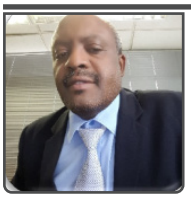
Debajyoti Bose
School of Technology, Woxsen University, Hyderabad, Telangana, India

Sewage treatment requires an extensive amount of energy since it processes such a large volume of wastewater. This wastewater can be treated using microbial fuel cells or MFCs, which also produce energy. Oxygen reducing cathodes have traditionally made use of Platinum catalyst on Carbon Cloth. In the present work, we analyzed the cathode performance, operational stability, and cost of activated carbon generated from biomass as a cost-effective cathode material. Open circuit voltage of 580 ± 30 mV was obtained for activated carbon cathode between fed-batch cycles. Peak current density was 0.67 mA/m2 and peak power density was 587.45 mW/m2 when subjected to a constant external load. After two weeks of operation, the COD in the wastewater decreased from 770 ± 30 mg/l to 210 ± 20 mg/l, achieving a removal efficiency of around 64%, while the BOD content decreased from 520 ± 20 mg/l to 223 ± 25 mg/l. This study also found six different species of exo-electrogenic bacteria, all of which breakdown organic materials in sewage effluent while also releasing electrons from their cell surface onto electrodes. Power generation was stable in MFCs, and 16S rDNA PCR showed that the wastewater's electricity-generating microbes were primarily from the Firmicutes phylum, along with Proteobacteria and Actinobacteria. This suggests that biofilm communities in mixed cultures don't engage in colony competition, which works well for colonization, contamination removal, and bioelectricity production.

Keywords: MFCs; wastewater; bioremediation; bioelectricity; bacteria.

Biography:

Debajyoti Bose has more than 7 years of teaching and research experience. He completed his graduation in Chemical Engineering from the West Bengal University of Technology, and post-graduation in Renewable Energy with specialisation in Bioenergy with PhD in Chemical Engineering on Microbial Fuel Cells for Wastewater Treatment from the University of Petroleum & Energy Studies, Dehradun. He received a postdoctoral fellowship from Department of Biotechnology, Government of India (DBT-RA). He is a member of the American Chemical Society and Society for Chemical Industry and is an active researcher in Bioenergy. He has 76 research publications to his credit in well-reputed international journals, with several book chapters and conference publications.



Applications of Metal Organic Frameworks in Photodynamic Therapy

Sandile Phinda Songca[1]

[1]School of Chemistry and Physics, College of Agriculture Engineering and Science, University of KwaZulu-Natal, KwaZulu-Natal, South Africa

Photodynamic therapy (PDT) is a novel treatment for cancer and other diseases. Metal organic frameworks (MOFs) are novel mesoporous materials with tunable pore sizes. PDT has been improved by combination with other non-invasive therapies, by utilizing nanomaterial sized MOFs (nMOFs) as carrier and delivery systems. Many nMOFs are synthesized using photosensitizers (PS) such as porphyrins and phthalocyanines as organic linkers in the MOF structure.Thisenablesthese nMOFsto act as PSs for PDT.Depending on theirpore sizes, nMOFs can absorb PSs on their surface, or inside their pores. The poresalso enable nMOFsto absorb large quantities of agents for chemotherapy, immunotherapy, photothermal therapy, magnetic hyperthermia, tumor microenvironment (TME)hypoxia amelioration, and imaging. This paper describes the synthesis and applications of nMOFs, as carrier and delivery agents for PSsand agents for therapies used in noninvasive PDT combination therapies. It focuses on solvothermal, hydrothermal, microwave, ultrasound assisted, electrochemical, templated,vapor phase, and electrospinning methods. PDT applications includenMOFs in which PSs are absorbed,and those in which PSs are linkers in the MOF structure. Seven non-invasive combinations therapies with PDT, as well as combinations forthe amelioration of TME hypoxia, and combinations for disease targeting are discussed. It concludes that nMOFs have enhancedthe efficacy against cancer throughtheir biocompatibility, combinations with PDT that enable TME hypoxia amelioration, and disease cell targeting, thus making deep metastasis therapy a real possibility as demonstrated by a few recent research reports. The paper also points out some challenges and future research.

Biography:

Prof Songca is the deputy Vice-Chancellor (DVC) for Teaching and Learning at University of KwaZulu-Natal. Served as DVC at the University of Zululand, and Walter Sisulu University. A member of the National Standards and Reviews Committee of the Higher Education Quality Committee of the Council on Higher Education. A representative of two Provincial Skills Development Forums. A board member of University and private boards. Holds a Ph.D. from the University of London (QMW), in medicinal organic chemistry. Research grants>R70 million, >90 conference papers >110 articles. Supervised>25 studentswith 4 current PhDs.

Sustainability Goals and Initiatives in Aviation Industry

Dr. Manish Yadav
Instructor – Aviation Management, Department of Aviation Operations Management (AOM), Qatar Aeronautical Academy, Doha – State of Qatar

Aviation industry is an operations intensive industry with multi stakeholders' involvement mainly airports, airlines, civil aviation authorities, ground handling agencies and aircraft manufacturing companies. The impact of operating yearly 47 million flights, transporting 4.5 billion passengers with 8.6 trillion revenue passenger kilometers through 48044 plus routes is dreamliner so as environmental hazards in term of producing 914 million tonnes of Co2 annually. To create the balance, UN agency International Civil Aviation Organization (ICAO) establish environmental goals towards sustainability of aviation industry by 2050. This paper attempts to throw light on the edifice of aviation sustainability goals and air transport industry initiatives through compilation of industry cases. The paper also establishes the need of collaborative decision making, policy formation and alternate energy sources through practicable initiatives by aviation players as recommendations.

Key Words: Aviation, Sustainability Goals, Policy Formation, Environmental Goals

Biography:

Dr. Manish Yadav, core domain faculty with esteemed Qatar Aeronautical Academy (Government Establishment), has diversified work experience of more than 15 years as renowned aviation educationist and industry professional with premier organizations across India, Oman and Qatar. He is also very active in aviation research and part of various industry events across globe including Dubai Aeroshow 2018, Singapore Aviation Festival 2019, Gulf Aviation Training Event-2018 etc. Along with aviation teaching and research, he has avid experience in academic consultancy, program management and curriculum development. He has earned his doctorate in airline strategic management, master's in aviation management and graduation in electronics as major.

Energy Management of a Multi-Source Energy Production System

Bati Ernest Boya Bi, Magloire Paul Ekoun Koffi, Prosper GBAHA
National Polytechnic Institute Houphouët Boigny, News Energies and Renewables Group, Laboratory of Mechanics and Materials Sciences, Yamoussoukro, Côte d'Ivoire

Renewable Energies (RE) allow decentralized production of electricity, thus helping to offer a palliative solution to the problem of electrification of isolated sites.

The objective of this article is to size and propose an energy management method for a multi-source system. This method of energy management is an algorithm that allows the sharing of energy between the various components of the system at all times. The sizing makes it possible to obtain good overall operation and to limit the cost of the installation.

Our power management strategy is an optimized power management technique of drastically limiting conversion losses within the system. It consists in reducing the size of the components of the system as well as the production costs.

Keywords: Sizing – Multi-source system – Management strategy – Algorithm – Energy – Optimized management.

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Production of biofuel briquettes from carbonized sawdust

Nganko Junior Maimou[*1,2]; Koffi Ekoun Paul Magloire[1]; Gbaha Prosper[1]; Toure Ousmane Alpha[2]; Yao Kouassi Benjamin[1]

[1]Félix HOUPHOUËT-BOIGNY National Polytechnic Institute (INP – HB) of Yamoussoukro, Ivory Coast
[2]Higher Polytechnic School of Cheik Anta Diop University, Dakar, Senegal

The Africa's energy crisis is one cause of deforestation. However, ongoing logging and wood processing activities generate sawdust, an undervalued bioresource. This study aims to valorize carbonized sawdust to produce biofuel briquettes for domestic use. The Binder percentage, compaction pressure and retention time are studied using Box-Behnken Response Surface Methodology (RSM). ANOVA determined their significance on higher heating value (HHV), ash content and Impact Resistance Index (IRI). The Briquettes are characterized in accordance with ASTM D-(5865 and 3172). The IRI is determined by the drop test. Based on 17 Box-Behnken design experiments, HHV varies between 23074 and 26050 kJ/kg. Ash content ranged from 2.86 to 5.24%. IRI ranges from 136.36 to 500%. Binder significantly affects all responses (P-value < 0.05). After optimization, the ideal conditions for producing quality briquettes in quantity are: binder percentage 10%, compaction pressure 75kPa, retention time 7.49 min. The values for HHV, ash content and IRI under these conditions are 25596 kJ/kg, 3.01% and 375% respectively. By correlating these results with the absence of certain heavy metals, the study confirms that the briquettes produced are suitable for domestic use.

Keywords: sawdust; biofuel briquettes; response surface methodology; optimization.

Biography:

Nganko Junior Maimou: is a Cameroonian doctoral student at the Félix HOUPHOUËT-BOIGNY National Polytechnic Institute; PhD student; CEA-VALOPRO in Yamoussoukro, Ivory Coast. His determination and involvement in scientific activities have enabled him to take part in several national and international communications, winning prizes for the best papers. He is working on the production of biofuel briquettes from biomass.

Anti-Leishmanial and Anti-Trypanosomal Activities of Nigerian Indigenous Plants and Their Cytotoxicity Effects

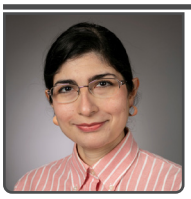
Oaikhena E. Enime
Department of biotechnology, Nigerian Defence Academy, Nigeria

Leishmaniasis and Trypanosomiasis are neglected tropical diseases of man, caused by a protozoan parasite of the genus Leishmania and Trypanosomes. Neglected tropical diseases (NTDs) are a group of sub-tropical and tropical infections common in low-income populations. Africa has been regarded as a major reservoir of most natural plant products that have medicinal and nutritional values. Treatment of most NTDs relies on the use of synthetic drugs which are sometimes toxic and have many side effects. Nigeria indigenous plants purported to have some antiparasitic activities were extracted using hexane, ethyl acetate and methanol as solvents in a Soxhlet apparatus. Appropriate chromatographic techniques, 1D/2D Nuclear Magnetic Resonance spectroscopy and Mass spectrometry were used to isolate and ascertain the structure of the bioactive compounds. Effect of biomolecules activity of isolated compounds against L. major promastigotes and trypomastigotes were determined while biomolecule toxicity to mammalian cells were tested. Biomeluclar target that determined the mode of action was evaluated by image cytometry and flourescene microscopy. Seven compounds and a mixture were isolated from Hyptis suaveolens, Momordica charantia and Siphonochilus aetiopicus. Suaveelol, Siphonochilone and SSA, a mixture of Suaveolol and Suaveolic acid in a ratio of 70:30 were trypanocidal against Trypanosomes brucei, T. evansi, and T. equiperdium. Out of the Seven only siphonochilone displays promising activity against Leishmania major and Trypanosoma congolenses. Siphonochilone displayed no toxicity toward HFF cells at concentrations up to 100 µg/mL while Suaveolol and SSA were both toxic with SI values <10 for Leishmania major and Trypanosoma congolenses. Suaveelol, Siphonochilone and SSA compounds with bioactivity obtained from the research will be considered by pharmacological industries as safe and efficacious for incorporation into the regimen for these diseases.

Key Words: Plants, Compounds, Treatment, and parasite

Biography:

Oaikhena E. Enime holds a bachelor's degree in biochemistry , a master's and a doctorate in biotechnology. An academic staff with the department of biotechnology, Nigerian Defence academy. My research area is pharmaceutical chemistry, drug discovery from natural products (plants) and their use for treatment against infectious diseases caused by microorganisms such as parasites, bacteria, fungi, and viruses. Health is paramount to living organisms, therefore there is an urgent need to identify compounds with minimal side effects based on their sources (natural products) that can be used as drugs is of necessity.



The Motion Control and Assembly of Ultrasonically Propelled Nanomotors

Suzanne Ahmed, Ph.D.
Department of Nanoscience, University of North Carolina, Greensboro in the Joint School of Nanoscience and Nanoengineering/ Assistant Professor, Greensboro, North Carolina, USA

Nanomotors, also known as nanomachines or nanorobots, can convert diverse forms of energy to mechanical motion. Nanomotors have captured the attention of researchers in several fields due to their wide-ranging applications in drug delivery, sensing, diagnostics, environmental remediation, and oil recovery. Nanomotors powered by magnetic fields, electrical fields, electromagnetic waves, and chemical fuel have been developed. In 2012, ultrasonically powered nanomotors were first introduced. Due to the prevalent use of ultrasound within medicine, the introduction of ultrasonically propelled nanomotors holds significant potential for biomedical applications. In this talk, I will present findings on the control, assembly and material dependent motion of ultrasonically propelled nanomotors.

Metallic nanorod motors are synthesized using electrochemical deposition within porous alumina templates. Nanomotors are 300nm in diameter and 2-3μm in length. Nanorods are placed within an acoustic chamber utilizing a bulk mode piezoelectric transducer with a resonant frequency in the ultrasonic range. A standing wave is established within the chamber and nanorods are propelled in the levitation plane, also known as the nodal plane, of the standing wave. The behavior and assembly of nanomotors with varying material distributions and varying acoustic signals are explored. Additionally, to expand the range of motion of ultrasonically propelled nanorod motors, magnetic metals are incorporated within them, and biocompatible magnetic fields are used to add an additional lever of control over their motion.

Biography:

Dr. Suzanne Ahmed is an Assistant Professor in the Department of Nanoscience at the University of North Carolina, Greensboro. Prior to joining the Joint School of Nanoscience and Nanoengineering, Suzanne was a Postdoctoral Research Fellow at Harvard University. She received her Ph.D. in Chemistry from Penn State University, her M.S. from the University of California, Berkeley, and her B.Sc. from the University of California, Riverside. Her research focuses on the study of propulsion, control, and applications of nanomotors and micromotors.

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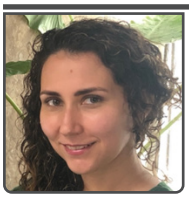

A study on the renewable power generation capacity of microalgae microbial fuel cells for powering GIoT sensor nodes

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Microalgae-Microbial Fuel Cells (mMFCs) are a novel and promising green renewable energy source for bioelectricity generation. Their capacity to generate energy is of particular interest for the design of sustainable green internet of things (GIoT) sensor networks. However, this capacity needs to be assessed due to critical limitations in their low-level output voltage and possible bioelectrochemical disturbances. This study investigated the renewable energy generation capacity of an mMFC-harvester system for powering low-power wireless sensor nodes. A two-chamber mMFC prototype was designed and tested as a proof of concept. The prototype used the CMI7000 membrane and the BQ25570 circuit to harvest energy from the mMFC. A sensor node based on the Nordic nRF52840 ultra-low-power microcontroller was used to implement a uniform power management strategy and to measure the energy capacity of the system. The experimental results showed that the mMFC-harvester system was able to store 3.26 J of energy in a 0.1 F supercapacitor in 6.25 hours. This represents a maximum power density of 80.10 mW/m2. The energy harvested was sufficient to power the sensor node for up to 9 continuous transmissions using Bluetooth Low Energy (BLE). These results demonstrate the potential of mMFCs to be a reliable and sustainable source of energy for GIoT sensor networks. However, further research is needed to improve the energy efficiency of mMFCs and to address the challenges of low-level output voltage and bioelectrochemical disturbances.

HIGHLIGHTS

• A 80.10 mW/m2 power generation capacity of the mMFC for powering IoT sensor nodes. • The harvester circuit stores the energy in a 0.1 F supercapacitor for 6.25 h.

• The sensor node is able to perform up to 9 continuous transmissions using BLE protocol. • A mMFC's design is constructed with carbon electrodes and a CMI-7000 membrane.

Biography:

ANDREA CASTILLO ATOCHE received her Ph.D. (2016) and M.Sc. (2011) degrees in Physical Chemistry from the Center for Research and Advanced Studies of the National Polytechnic Institute (CINVESTAV) Mérida unit, Mexico. Currently she is a professor in the Department of Chemistry at Instituto Tecnológico de Mérida. Her research area includes electrochemical applications, corrosión science, renewable energy and biofuels.

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STUDY OF THE EFFICIENCY OF AN INDIRECT SOLAR COLLECTOR EQUIPPED WITH A SENSIBLE HEAT STORAGE SYSTEM: APPLICATION TO COCOA BEANS DRYING

Emmanuel N'Dri Abouanou[1], Paul Magloire Ekoun Koffi[1], Blaise Kamenan Koua[2], and Prosper Gbaha

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The effect of a storage system on the drying time and the estimation of the drying parameters of cocoa beans using an indirect solar dryer equipped with a sensible heat storage system are the main subject of this communication.

This dryer, which uses river stones as storage material and made with wood and plywood, was used to dry a quantity of 5 kg of fermented cocoa beans. Drying parameters relating to the drying curves and the drying efficiency of cocoa beans were established and studied. Drying curves were modelled from semi-empirical models. The results showed that the water content of cocoa beans decreased from 60% to 7% in wet basis. The solar collector and the drying efficiencies are respectively to 40% and 34% and the maximum average difference temperature between the drying air and the ambient temperature is 13.25°C, during day and night. The models of Hii, Jena and Das, Demir et al and Alibas give the best concordances with the values of R2, respectively of 0.9983, 0.9843, 0.9813 and 0.9837.

Keywords: cocoa beans, indirect solar dryer, heat storage, drying curve, solar energy.

Transition metal doped III-V semiconductors: In1-xMxSb

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The dilute magnetic semiconductor (DMS) materials are conventional semiconductors in which an appropriate fraction of the original atoms are substituted by elements capable of introducing the localized magnetic moment. Due to this substitution, these materials retain the semiconducting properties and can also possess magnetic properties. The control doping of transition metals (TM) in semiconductors band gap, and lattice parameter can be tune. The structural, electrical, surface morphological, and magnetic study results on TM (Fe, Co, Mn) doped InSb film is compared and will be discussed in detail. The film is grown on Silicon substrate. The controlled doping of TM in InSb semiconductor shows anomaly behavior, this incongruity nature is validaed by theoritical interactios. The DMS materials can be used in futuristic electronic devices, may results in higher data storage and superfast data processing i.e. spintronics.

Biography:

I work as an Assistant Professor in Physics at Charutar Vidya Mandal University, India.

Experience:

Teaching and research: Thirteen years (undergraduates and graduates).

Research Publications: 17.

Book: edited one

Field of interest: structural, electrical, surface morphology and magnetic properties of dilute magnetic semiconductors.

Seminar/ Conferences: Presented research work in more than 30 National/ international conferences.

Articles reviewed: more than fifteen.

PhD students: 03

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POSTER PRESENTATION | DAY 2

Albendazole chemical compound behaves as liquid crystal

Dr. Narinder Kumar
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In the present work, we have investigated the Albendazole (ABZ) molecule which behaves as a liquid crystal or mesophase under the impact of temperature as well as the external effect of the electric field. Under the electric field's impact, the ABZ molecule demonstrates the mesophase phase stability in order parameter, birefringence, director angle and refractive index. At the higher temperature, the ABZ molecule shifted to the mesophase. Theoretical IR spectrosctrum of the ABZ molecule has been correlated with the experimental evidence. The XRD pattern of ABZ at 250 °C exhibits crystalline nature and at higher temperatures (300 °C and 400 °C) it reveal the amorphous nature. Tauc plots indicate optical bandgaps 4.73, 1.38, 6.02 and 5.80 eV at room temperature, 250 °C, 300 °C and 400 °C, respectively. Such variations in bandgap indicate self-organizing characteristic of the nematic liquid crystalline phase in the sample. FESEM images at higher temperatures exhibit pores with various structures in the ABZ.

Biography:

Dr. Narinder Kumar is an Assistant Professor of Physics at Uttaranchal University Dehradun in Uttrakhand. He has almost 8 years of teaching experience. Kurukshetra University awarded him a B.Sc. and M.Sc. degree in Physics. He received his Ph.D. in theoretical Physics from Babasaheb Bhimrao Ambedkar University (A Central University) in Lucknow, Uttar Pradesh. He has over 50 research publications published in national and international journals. He has participated in over 40 national and international conferences and workshops. He wrote the two international book chapters. He is a member of the Indian Association of Physics Teachers (IAPT) and the American Chemical Society (ACS) for life. He has guided more than eight students of M.Tech and Ph.D in various fields of Theoretical Physics. Dr. Kumar's research interests include theoretical physics, molecular modelling, computational chemistry, liquid crystals, and material science.

Presentation Title [Sentence Case; Bold; Garamond 14] Influence of Zn2+ Ions Doping on the Antibacterial Activity of Barium-Nickel Ferrite Nanoparticles]

Sadiq. H. Khoreem[1*], A. H. AL-Hammadi[2]
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[2]Physics Department/Faculty of Science, Sana'a University, Sana'a, Yemen.,

Symposiums: Future Biomaterials-Biomedical, Medicine and Other Applications The nanoparticle ferrites (NPFs) materials have recently attracted more attention. Due to their intriguing characteristics and wide variety of medical applications as an anticancer, antifungal, and antibacterial activity. Aims: In the current work, Zn doped barium-nickel ferrite with composition BaNi2-xZnxFe16O27 (x=0.0, 0.4, 0.8, 1.2, 1.6, and 2) was synthesized for antibacterial activity using a ceramic technique. Methods: BNZF powder ferrite was characterized by X-ray diffraction. The Debye-Scherer formula has been used to calculate the average crystallite size from 43 to 56 nm. Results: The small crystallite size and the higher surface area of nanoparticles ferrite can enhance antimicrobial activity, causing an improvement in surface reactivity. Also, a higher ROS value generally depends on a larger surface area, and crystallite size. The sample prepared were investigated for their antibacterial activity against gram-negative bacterium Escherichia coli, and gram-positive bacteria Staphylococcus aurous using the agar well diffusion method. The antibacterial activity of the zinc doped barium nickel nanoferrites powder on both gram-negative bacteria and gram-positive bacteria was acceptable. The antibacterial results of the barium-nickel ferrites doped zinc nanoparticle on bacteria activity showed that the nanoparticles shows an inhibitory growth on gram-positive Staphylococcus aurous and gram - negative Escherichia coli with high antibacterial effect on Staphylococcus aurous of 21mm diameter of inhibition zone. Hence, the developed barium nickel ferrites doped by zinc nanoparticle shows high antibacterial effect on (Staphylococcus aurous) and Escherichia coli which makes it a potential material for biomedical application. This research shows that barium nickel ferrite PFNs may be a suitable material for biomedical applications and an effective antibacterial candidate.

Biography:

Deputy Editorial Director: Nanotechnology Journal of the Malaysian Institute [01/03/2023 – Current]

City: Sanaa Country: Yemen

Higher education research : Ph.D. in Materials science.

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