2nd Edition of Strenuous World Congress on

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

16-17 April 2024 | London, UK

Hosted By:
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Scientific Program

Day 1 | April 16, 2024
Virtual | GMT

09:00-09:15 Opening Ceremony

Keynote Forum

09:30-10:00

Paulo C. De Morais
Catholic University of Brasilia, Brazil

Title: Modeling nanoparticle growth in hydrothermal chemical process

Biography: Paulo César De Morais, PhD, was Professor of Physics at the University of Brasilia (UnB) – Brazil up to 2013, Appointed as: UnB's Emeritus Professor (2014); Professor at the Huazhong University of Science and Technology (HUST) – China (2012-2015); Professor at the Anhui University (AHU) – China (2016-2019); Professor at Catholic University of Brasília (CUB) – Brazil (2018); CNPq-1A Research Fellow; 2007 Master Research Prize from UnB.

10:00-10:30

Peixuan Guo
The Ohio State University, USA

Title: Motile, deformative, and catalytic activities of RNA nanoparticles and their application in nanotechnology, medicine, and material science

Biography: Peixuan Guo, a pioneer of RNA nanotechnology, has held three endowed chair positions at three different prestigious universities, and currently is the Sylvan G. Frank Endowed Chair in Pharmaceutics and Drug Delivery and the director of the Center for RNA Nanobiotechnology and Nanomedicine at The Ohio State University.

10:30-11:00

Boris Asmatulayev
Kazakh Automobile and Road Institute, Kazakhstan

Title: Laser Research on Nanostructured Concrete with Colloidal Structure for Long-term Strengthening in Highway Operation

Biography: Graduated from the Ust-Kamenogorsk Institute of Civil Engineering and Road Construction with a specialization in Automotive Roads, Transportation Engineering, in 1966. Doctor of Technical Sciences, specializing in Road and Construction Machinery (05.05.04) and Road and Airport Construction (05.23.11).

Speakers

Speaker Sessions: Session Chair: Jiangling He, Wuhan Polytechnic University, China

11:00-11:30

Anuj Kumar
GLA University, Mathura-281406, India

Title: Intelligence of porphyry-type electrocatalysts towards oxygen reduction reaction

Biography: Anuj Kumar is working as an Assistant Professor at department of chemistry, GLA University, Mathura-281406, India. He received PhD degree in 2017 from Gurukula Kangri University, Haridwar, India.

11:30-12:00

P. V. Rajeswari
Gayatri Vidya Parishad College of Engineering, India

Title: Bio-derived Carbon and its composites for water pollution control

Biography: P. V Rajeswari is currently working as assistant professor in the department of physics, Gayatri Vidya Parishad College of Engineering, Andhra Pradesh, India. She completed post-graduation in Solid State Physics, Berhampur University, Odissa, India and in Materials Technology, Banaras Hindu University, Uttar Pradesh, India.

12:00-12:30

Nida Qutub
EM Technology Solutions Pvt.Ltd, India

Title: Nanocomposite Photocatalysts as an effective tool for future environment remediation

Biography: Nida Qutub currently works at the Department of Chemistry, Jamia Millia Islamia. Nida does research in Nanotechnology. Their most recent publication is 'Synthesis, characterization and visible-light driven photocatalysis by differently structured CdS/ZnS sandwich and core–shell nanocomposites.

Networking and Refreshments Break: 12:30-13:00

13:00-13:30

Houda Attjioui
Abdelmalek Essaadi University, Morocco

Title: The role of drug design and structure-activity relationships in identifying molecules for therapeutic use and improving drug profiles

Biography: A pharmacist with a doctorate in pharmacy and a specialization in industrial pharmacy, as well as experience as head of the cosmetics department at the Moroccan Ministry of Health, currently assistant professor in therapeutic chemistry and involved in research projects focused on the discovery of new drugs. In collaboration with other researchers we work on the design and optimization of molecules with high therapeutic potential.

13:30-14:00

Deepa Lakshmi Chandrasekaran
Government Electrical utility,
Tamilnadu Transmission Corporation, India

Title: Maxwell equations and its applications based on new implications in material science.

Biography: Deepalakshmi Chandrasekaran, Asst Electrical Engineer, Tamilnadu Electricity Board. Her research Published in nanohub-NCN of Purdue University. Provided as the number of users in the nanohub publication link.

Plenary Speaker

14:00-14:30

Jiangling He
Wuhan Polytechnic University, China

Title: Investigations on Starch-Based Nanofibers in Enhancing Food Safety

Biography: A.P./Jiangling He, She Received the Ph.D degree from Science School, National University of Singapore. She is mainly engaged in the modulation of optical properties of nanoparticles and their research in antimicrobial mechanisms, metal-enhanced fluorescence. Her works mainly contain the preparation of these nanoparticles, the analysis of linear/nonlinear optical properties, and the applications in food and biology

14:30-15:00

N. Timoudan
Mohammed V University in Rabat, Morocco

Title: A newly synthesized pyrazole derivative as corrosion inhibitor for carbon steel in 1 M HCl medium: Characterization (SEM, AFM), experimental and theoretical approach

Biography: TIMOUDAN Nadia is preparing her Ph.D. in the Laboratory of Materials, Nanotechnology and Environment, Faculty of Sciences, Mohammed V University, P.O. Box. 1014, Rabat, Morocco, His main research interests are in the field of corrosion and corrosion inhibition of metals and alloys using chemical and electrochemical techniques (PDP, EIS), characterization techniques (SEM, AFM, Contact angle, FT-IR, XDR, XPS, and UV-visible) and quantum chemical methods DFT/MDS.

15:00-15:30

George Kakhniashvili
Georgian Technical University, Georgia

Title: Using oxygen enriched with the isotope

Biography: Giorgi Kakhniashvili Born on August 13, 1955 in Tbilisi. In 1972-1977 he studied at the Faculty of Chemistry of Ivane Javakhishvili Tbilisi State University In 1978-1983 he studied at the graduate school of the Faculty of Chemistry of Tbilisi State University, majoring in physical chemistry. In 1978-1983 he worked at the Moscow Karpov Institute of Physics and Chemistry.

15:30-16:00

Irakli Nakhutsrishvili
Georgian Technical University, Georgia

Title: High-temperature catalytic decomposition of hydrazine on the surface of monocrystalline germanium

Biography: Irakli Nakhutsrishvili was born in Tbilisi, Georgia in 20.04.1952. In 1969, he graduated from the Physics and Mathematics School named after V. Komarov. In 1970-75, he studied at Tbilisi State University, Faculty of Physics. Specialty - Solid State Physics. In 1990, he defended his PhD thesis in the field of physical chemistry.

16:00-16:30

Vijay Devra
Janki Devi Bajaj Govt. Girls College, Kota (Raj.)

Title: Applications of Green Nanomaterials as Catalyst in degradation of Organic Pollutants for sustainable environment

Biography: Vijay Devra, Associate Professor, Department of Chemistry, J.D.B. Govt. P. G. GirlsCollege, Kota (Raj.). 24 Years teaching experience. Certificate of Appreciation for special achievement on District LevelCeremony, World Research and Development Excellence Award 2021" awarded by International Benevolent Research Foundation Kolkata

16:30-17:00

Jose Luis Contreras
Universidad Autónoma Metropolitana, Mexico

Title: Catalytic Pyrolysis Process to Produce Styrene from Waste Expanded Polystyrene Using a Semi-Batch Rotary Reactor

Biography: Jose Luis Contreras Larios Chemical Engineer and Master of Science in Chemical Engineering from the ESIQIE of the National Polytechnic Institute. He obtained his PhD and works at the Universidad Autonoma Metropolitana. He is a member of the National System of Researchers SNI Level I (Mexico) 2010-2022.

17:00-17:30

Donatella Canistro
University of Bologna, Italy

Title: Potential Harm of IQOS Smoke to Rat Liver

Biography: Researcher at the University of Bologna since 2006. She focuses her research in Toxicology. In particular, her research topics are directed to the in vivo modulation of xenobiotic metabolism (toxicity, chemical cancerogenesis and chemoprotection) and to the in vivo oxidative stress detection.

17:30-18:00

Cesar Abraham Torrico Chavez
Universidad Catolica Boliviana "San Pablo" Regional Tarija, Bolovia

Title: Multistability in a Quantum Dot Semiconductor Laser with Optical Injection due to simple Shil'nikov bifurcations

Biography: Bachelor in Physics - Universidad Mayor de San Simon (2004). Master (2008) and PhD (2016) in Theoretical Physics - Federal University of Rio Grande do Sul - UFRGS. He has experience teaching at pre- and postgraduate level at several public and private universities in Brazil and Bolivia.

Closing Cermony

09:00-09:45 Registrations
09:45-10:00 Opening Ceremony

Keynote Forum

10:00-10:40

Angelos M Efstathiou
University Of Cyprus, Cyprus

Title: Transient and Isotopic Techniques for Enhancing the Design of Industrial Dry Reforming of Methane (DRM) Catalysts

Biography: Angelos M. Efstathiou, Ph.D. in Chemical Engineering, is a distinguished Professor at the Chemistry Department of the University of Cyprus. His research is focused mainly on environmental and energy related catalysis, including NO_x-control (H_2-SCR, NH_3-SCR), three-way catalysis, dry reforming of methane, Fischer-Tropsch synthesis, water-gas shift, and CO_2 hydrogenation to syn-CH_4 and alcohols reactions.

10:40-11:20

Anne Henrottin
LASEA, Belgium

Title: Beam shaping, a solution for the industry?

Biography: Anne Henrottin works as innovative project manager at LASEA. She has done its studies at the University of Liège in Physics Engineering with a specialization in Microfluidics and Electronics physics. At LASEA for 10 years now, she is responsible for different internal and R&D projects (European and regional ones) in the field of hybrid laser joining.

Networking and Refreshments Break @ 11:20-11:40

Group Photo

11:40-12:20

Fanelwa Ngece Ajayi
University of the Western Cape, South Africa

Title: Green Method Synthesised Graphene-Silver Electrochemical Nanobiosensors for Ethambutol and Pyrazinamide

Biography: In addition to serving as the acting Deputy Dean for Research in the Faculty of Natural Sciences, at the University of the Western Cape (UWC), Fanelwa Ngece Ajayi is an Associate Professor of Physical Chemistry. Additionally, she works as a lead researcher in the SensorLab laboratories at the Chemistry Department, UWC.

12:20-12:50

Alaa Jabbar Ghazai
Al-Nahrain University, Iraq

Title: III-Nitride Optoelectronic Materials and Devices: Molecular Beam Epitaxy, Bottom-up approach to fabricate nanomaterial

Biography: He was born in Baghdad in 1974. I get BSC from Almustansiria University, Baghdad, Iraq In 1997 and I get MSC from same University – Education College In 2001. In July 2012 He get a PhD degree from School of Physics, University Science Malaysia (USM).

Speaker Sessions: Session Chair: Angelos M Efstathiou University of Cyprus, Cyprus

Speakers

12:50-13:20

Siang-Piao Chai
Monash University Malaysia

Title: Realizing unassisted photocatalytic overall pure water splitting for green hydrogen production

Biography: Siang-Piao Chai is a Professor in Chemical Engineering, and the Deputy Head of School (Research) for the School of Engineering, Monash University Malaysia campus. Prof Chai is an active researcher in the areas of heterogeneous catalysis, photocatalysis, reaction engineering and advanced functional materials.

Lunch Break: 13:20-14:00

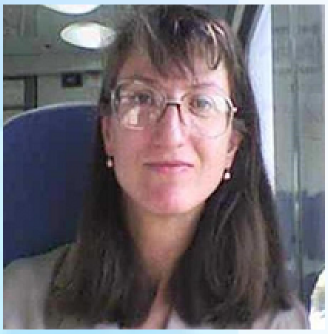
14:00-14:30

Chih-Wei Luo
National Yang Ming Chiao Tung University, Taiwan

Title: In situ visualization of ultrafast electrocatalyst on MoS_2 during hydrogen evolution reaction

Biography: Chih-Wei LUO is a professor and a Vice Chairman in the Department of Electrophysics, National Yang Ming Chiao Tung University (NYCU), TAIWAN. After receiving his Ph.D. degree at National Chiao Tung University (NCTU), he joined NCTU in 2006 and started independent research.

14:30-15:00



Ioana Stanciu
University of Bucharest, Romania

Title: Rheology of Gums Used in the Food and Flour Industry for "Tortillas"

Biography: Ioana Stanciu working at the University of Bucharest, Faculty of Chemistry has a 20 years experience in teaching and conducting research on the study of polymers used as additives for lubricating oils, the rheological behavior of vegetable oils and mineral oils added to polymers. Ioana Stanciu is the author of 26 books and has the recognition of publishing 115 works in the field of physical chemistry.

15:00-15:30

Marcelo Maciel Pereira
Federal University of Rio de janerio, Brazil

Title: From Biomass to Fuels: a Novo Carbon-Efficient Route Controlled by Catalysis

Biography: Marcelo Maciel Pereira is the head of Laces (laboratory for catalysis and sustainable energy), which has around 15 people developing their works among students and researchers, teaching at the Chemical Institute of UFRJ since 1994. The main research objective is to use applied catalysis and fundamental understanding.

15:30-16:00

Cristiane Cardoso
Federal University of Rio de Janerio, Brazil

Title: Catalytic Cracking of Model Compound of Bio-Petroleum (sugar di-ketals) using Beta zeolite and Beta catalyst

Biography: Cristiane Cardoso concluded in 2022 sandwich doctorate in Chemistry from the Federal University of Rio de Janeiro (UFRJ) and the Paul Scherrer Institute. Her research studied the conversion of the model compound obtained from sugarcane bagasse into biohydrocarbons through catalytic cracking with Beta zeolite.

Networking and Refreshments Break @ 16:00-16:10

16:10-16:40

NoorAshrina A Hamid
Universiti Sains Malaysia, Malaysia

Title: LSCF as Potential Cathode Material for Intermediate Temperature Solid Oxide Fuel Cell

Biography: Noor Ashrina A. Hamid completed her Ph.D in 2013 at the University of Duisburg-Essen, Germany with a thesis entitled "Cathode Materials Produced from Spray Flame Synthesis for Li-Ion Batteries".

16:40-17:10

Debora N. dos Santos
Federal University of Rio de Janerio, Brazil

Title: Production of renewable hydrocarbons using the strategy of ketalization

Biography: Graduated in Chemistry (Bachelor's degree) from the Federal Institute of Education, Science and Technology of Rio de Janeiro (2015), Master's degree in Chemistry from the Federal University of Rio de Janeiro (2017) and PhD in Chemistry from the Federal University of Rio de Janeiro (2023). Has experience in the catalysis area, working mainly with biomass conversion processes.

17:10-17:40

Mohamed Hassan Dadoura
F & D Engineering, Egypt

Title: The properties of aluminum closed-cell foam blocks shielded by Aluminium tubes and blocks patterns designed for applications

Biography: M.Sc. from Mechanical Design Dept., Helwan university. (2023). -Tribology Lab Supervisor, Cairo university. (2012-2015). R&D Mechanical Design Engineer, MCS OIL Co. (2017). CEO, Professional Engineers Company. (2017-2018). Mechanical Engineering Consultant, F&D Engineering Co. (2023 - Current).

Panel Discussions | Closing Ceremony

STRENUOUS GROUPS
CONFERENCES

Strenuous World Congress on

CATALYSIS, CHEMICAL ENGINEERING & TECHNOLOGY

16-17 Apr 2024 | London, UK

KEYNOTE SPEAKERS Day 1

Modeling nanoparticle growth in hydrothermal chemical process

Paulo C. De Morais
Georgian Technical University, Georgia

Abstract:
This presentation aims to discuss the coarsening of freshly precipitated metal oxide nanoparticles (NPs) via short time (1-2 hours) hydrothermal treatment in mild temperature (T) range (100 to 300 oC). Transmission electron microscopy data can be used to assess the average particle diameter (DT) of both the as-precipitated NPs and the hydrothermally treated samples at increasing temperatures. Surprisingly, the DT versus T trend can follow a sub-linear, a linear or a super-linear behavior, depending upon the condition the diffusion is set to take place during coarsening and the characteristics of the species diffusing in the medium. Experimental data showing different DT versus T trends (sub-linear, linear, or super-linear) will be presented and discussed based on a physical model picture for the underlying coarsening process, which takes into account diffusion of species in and out of the NP. Moreover, the model picture predicts the limits for the sub-linear as well as the super-linear DT versus T behavior; the former sets in as long as the thermal activated diffusion process is dominant whereas the latter may be observed for higher diffusivity values. The linear trend can be observed either in a competitive scenario involving the two above-mentioned limits (dominant thermal activated diffusion process and at higher diffusivity values) or in the absence of them. Within the limits of the model picture a linear relationship between DT and t (coarsening time) was found, accounting for both Lifshitz and Slyozov and Wagner coarsening models (introduced in early 60’s) at relatively short times.

Biography

Paulo César De Morais, PhD, was Professor of Physics at the University of Brasilia (UnB) – Brazil up to 2013, Appointed as: UnB’s Emeritus Professor (2014); Professor at the Huazhong University of Science and Technology (HUST) – China (2012-2015); Professor at the Anhui University (AHU) – China (2016-2019); Professor at Catholic University of Brasília (CUB) – Brazil (2018); CNPq-1A Research Fellow; 2007 Master Research Prize from UnB. He held two-years (1987-1988) position with Bell Communications Research, New Jersey – USA and received his Doctoral degree in Solid State Physics (1986) from the Federal University of Minas Gerais – Brazil. He has published 500 papers (Web of Science).

Motile, deformative, and catalytic activities of RNA nanoparticles and their application in nanotechnology, medicine, and material science

Peixuan Guo
The Ohio State University, USA

Abstract:

RNA is versatile and controllable in terms of shape, size, and stoichiometry. The 2'-modified RNA is thermodynamically, chemically, and enzymatically stable with a long shelf life, and can be spontaneously assembled. RNA is a polycyclic and produced polymer. RNA can be designed and manipulated as simply as DNA while displaying the multifunctional structure and catalytic activity of protein enzymes. We have reported that its thermally stable property makes it suitable for logic gates, resistive memories, sensor setups, and NEM devices.We showed that RNA nanoparticles exhibit rubber-like properties and can be stretched and contracted over multiple repetitions, resulting in enhanced tumor suppressive properties and rapid renal excretion, thereby reducing toxicity. We will present RNA's application in nanotechnology, medicine, and materials science.

Biography

Peixuan Guo, a pioneer of RNA nanotechnology, has held three endowed chair positions at three different prestigious universities, and currently is the Sylvan G. Frank Endowed Chair in Pharmaceutics and Drug Delivery and the director of the Center for RNA Nanobiotechnology and Nanomedicine at The Ohio State University. He is the president of the International Society of RNA Nanotechnology and Nanomedicine. He received his Ph.D. from U Minnesota in 1987 and conducted his postdoc at NIH under Bernard Moss. He joined Purdue University in 1990, tenured in 1993 and became a full professor in 1997, honored as a Purdue Distinguished Faculty Scholar in 1998. He served as the Director of the NIH Nanomedcine Develoment Center (NDC) from 2006-2011, was the Director of NCI Cancer Nanotech Platform Partnership Program from 2012-2017. To date, Dr. Guo invented 70 patents (13 granted and 57 in Provisional and PCT). He received the 2021 Innovator of the Year Award at The Ohio State University and was elected as a NAI Fellow in 2022.

Laser Research on Nanostructured Concrete with Colloidal Structure for Long-term Strengthening in Highway Operation

Boris Asmatulayev
Kazakh Automobile and Road Institute, Kazakhstan

Abstract:
The speech presents the outcomes of fundamental laser studies, experimental research, and long-term monitoring of highways constructed using concretes based on belite road cements. Belite cements, primarily composed of two calcium silicates (with over 50% C2S-belite content), ensure ease of construction and durability of road concretes for up to 50 years. Laser studies reveal the structure of belite cement stone, formed by nano-sized colloidal formations known as calcium hydrosilicates C-S-H, facilitating nearly complete hydration of cement grains. Fundamental laser and experimental studies indicate that colloidal structures possess properties such as long-term thixotropy (self-recovery upon destruction) and long-term rheopexy (strengthening from traffic loads and seasonal temperature changes), particularly in the context of highway construction and long-term use. Monitoring of roads made with belite cement concretes confirms ongoing concrete strengthening over 35–46 years of road operation. This study in Kazakhstan confirms the scientific novelty and effectiveness of V. Michaelis' theory of mineral binders' solidification, which emphasizes colloidal structures, proposed 180 years ago, previously unapplied. The novelty is supported by several patents, potentially revealing the secrets of ancient Roman concretes' durability.
From domestic and international road construction experience, it has been established that cement concrete road pavements based on fast-hardening alite Portland cements with a crystalline structure have limited inter-repair service life, up to 25–30 years. This is due to the physicochemical processes of hardening, primarily of the main mineral of Portland cement - tricalcium silicate C3S (alite), which is doomed to disintegrate within 20 years. For the first time in global road construction practice, it has been established in Kazakhstan that it is more efficient to use belite cements with a colloidal structure of long-term strengthening for road construction. The durability of belite cement structures is ensured by nano-sized colloidal calcium hydrosilicates C-S-H, due to the complete hydration of cement grains, unlike the crystalline structure of alite cements, with limited hydration of C3S up to 60%, resulting in the formation of more than 40% "Young's microconcrete" - unhydrated cement. This has provided unique knowledge novelty - for the first time in the world road construction practice, in Kazakhstan, the effectiveness and fairness of applying the theory of colloidal structure of mineral binders proposed by the prominent French scientist V. Michaelis, exactly 180 years ago, which until now has had no practical application. The long-term strengthening of belite cements and road concretes based on them, possessing colloidal properties; long-term thixotropy (self-recovery from damage) and rheopexy (long-term strengthening from cyclical action of traffic loads, seasonal changes in temperature and humidity), is manifested exclusively under conditions of long-term operation of highways. The reliability of fundamental and experimental research is confirmed by road construction technology and long-term road monitoring results, including tests on concrete specimens cured at various temperatures in laboratory conditions and cores drilled from nanostructured concrete roads in operation for more than 35–46 years without repairs.

Biography
Graduated from the Ust-Kamenogorsk Institute of Civil Engineering and Road Construction with a specialization in Automotive Roads, Transportation Engineering, in 1966. Doctor of Technical Sciences, specializing in Road and Construction Machinery (05.05.04) and Road and Airport Construction (05.23.11), awarded in 2004 and 2011 correspondingly. Professor in the field of Transportation, appointed in 2000.Research Focus: Technological regulations for the production of materials for the road industry. Educational Programs and Disciplines: Design of automotive roads, Maintenance and repair of bridges and pipes.
Publications and Awards: Scientific publications - 116; Educational materials - 16. Developed 55 regulatory and technical documents, including over 10 for CIS countries, and holds more than 65 patents for inventions used in the design and construction of roads in Kazakhstan. Awards: Honorary Professor of MADI (Moscow Automobile and Road Construction Institute), awarded in 2000.

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SPEAKERS
Day 1

Intelligence of porphyry-type electrocatalysts towards oxygen reduction reaction.

Anuj Kumar
GLA University, India

Abstract:
Electrocatalytic rupturing of hydrogen and oxygen molecules is a green method of producing clean energy, but it requires effective catalysts. Due to the redox-rich chemistry of molecular models, particularly porphyry-type ones, they can act intelligently towards the extremely sluggish oxygen reduction reaction (ORR). Researchers have tried to find a link between the ORR intermediates and how fast they form and to simplify the multi-H+/e- stages that happen on active sites of electrocatalysts during the ORR process. This has led to the creation of several volcano plots between catalytic Tafel data, turnover frequencies, and overpotentials. However, a quantitative analysis of these investigations is still required in order to rationalize the data that is already available and develop effective catalysts. In this talk, we critically assessed the relationships between volcano plots of current vs. thermodynamic parameters and the Sabatier principle to explain the intelligence of porphyry-type electrocatalysts and approaches for their creation.

Biography

Dr. Anuj Kumar is working as an Assistant Professor at department of chemistry, GLA University, Mathura-281406, India. He received PhD degree in 2017 from Gurukula Kangri University, Haridwar, India. He moved to Beijing University of Chemical Technology, China for his Postdoctoral research in the research group of Prof. Xiaoming Sun. His research focus is on molecular/M-N-C electrocatalysts for O2-catalysis. He is authored and co-authored in more than 125 articles published in reputed peer-reviewed journals (like Energy and Environmental Sciences, Applied Catalysis B: Environmental, Chemical Engineering Journal, Journal of Materials Chemistry A, Coordination Chemistry Reviews, Chemistry of Materials, Applied Energy etc), and more than 40 book chapters. He has been editor in 5 edited books. He has been included in Top 2% Scientists Worldwide 2022 by Stanford University. He has been awarded with “Best Young Scientist Award 2021” from TAIF. “Young Researcher Award 2020/2021/2022” by InSc and by CEGR. He is serving as Section Editor, Guest editor, editorial board member, and advisory member for various journals.

Bio-derived Carbon and its composites for water pollution control

P. V. Rajeswari
Gayatri vidya Parishad College of Engineering, India

Abstract:
Drinking water is a major issue posing challenges to human race in terms of health and sustainability of future generations. A recent study by world health organization, United Nations International Children's Emergency Fund and World Bank in Sustainable development goal six reports on how the water, health, and development are linked and recommends for low budget green activities for safe drinking water. The increasing water pollutants, depleting aquatic ecosytem, and stringent pollution prevention regulations demand for development of sustainable materials for pollution control and preservation of our green nature. In the current scenario it is highly essential to adapt a green, carbon neutral approach for water pollution control. Carbon-based materials have been playing an increasingly prime role in many technological applications spanning energy to environment, catalysis to chromatographic separations, biomedical to agronomy to name a few. In the family of nanocarbons, graphene and its derivatives have been dominantly exploited in wastewater treatment and purificationowing to their excellent physical and chemical properties. Despite this they suffer from synthetic protocols which are multistep, complex, expensive, low yielding, and/or produce harmful byproducts.

On the other hand, biomass/biowaste derived carbonaceous structures are the alternative candidates that follow circular economy and provide societal and economic benefits. They have unique features of renewable feedstock, hierarchical porosity, a rich surface chemistry with the inherently linked functional groups and so on. Moreover, the biospecies (precursor) can extend its structural features to the carbon which sometimes make it outperform the chemically synthesized nanocarbons. Bio-derived carbonaceous materials are well explored as pollutant adsorbents and a base for other photocatalysts. Recently in the last few years, bio-derived carbon and its composites have acquired huge attention as photocatalysts in treating various water pollutants. In this context the present talk focuses on the development of biomass/biowaste derived carbon and its composite photocatalysts and their applications in treating various organic and heavy metals in water.

Biography

Dr. P. V Rajeswari is currently working as assistant professor in the department of physics, Gayatri Vidya Parishad College of Engineering, Andhra Pradesh, India. She completed post-graduation in Solid State Physics, Berhampur University, Odissa, India and in Materials Technology, Banaras Hindu University, Uttar Pradesh, India. She worked on preparation of TiO_2/sp2-carbon nanohybrids using green chili as a carbon precursor and studied on their photoluminescence and photocatalytic properties for energy and environmental applications. She is currently pursuing her research on biomass/biowaste derived carbon and its composites for treating emerging water pollutants.

Semiconductor Nanocatalysts for Photodegradation of organic dyes in contaminated water

Nida Qutub
EM Technology Solutions Pvt. Ltd, India

Abstract:
Various inorganic-polymer nanocomposites composed of different combinations of two or more components have attracted progressive attention in today's world due to their interesting physical properties and potential applications. The embedding or encapsulation of nanoparticles in polymer, may lead to termination of the growth of the nanoparticles by controlling of their nucleation by the polymer. Polyaniline (PANI) being a conducting polymer with an extended π-conjugated electron system, proved to be a promising candidate due to its high absorption coefficients in visible-light range and high mobility of charge carriers. Thus, the combination of PANI with inorganic materials specially semiconductor (SC) nanomaterials is gaining importance because PANI has good processibility, ease of preparation, environmental stability, photoelectric property, cost effectiveness and potential in the field of catalysis, biosensors, batteries, electronics, opto-electronics and electronic technology and enable control of particle size and lead to uniform distribution of nanoparticles (NPs). Considering these good properties, potential applications of PANI and ability to support positive as well as negative charge carriers due to the presence of conjugated π-electrons along the backbone, it can be used in synthesis of heterostructure nanocomposites (NCs).

The large surface to volume ratio in nanocomposites enables an efficient separation of photoinduced charges, which is important for photo voltaic and photocatalytic applications. As the size and extent of aggregation of the particles play a significant role in the optical and catalytic properties, stabilization of the particles in suitable matrix is essential. There have been several reports describing the synthesis of photoactive nanocomposites of polyaniline (PANI) with semiconductors such as PANI/TiO_2, PANI/$BiVO_4$, PANI/SiO_2, PANI/SnO_2, PANI/CdS, PANI/V_2O_5 and PANI/Fe_3O_4/SiO_2/TiO_2. In our previous work, though successful enhancement in the photocatalytic activity of CdS could be done by combining it with TiO_2 and ZnS, forming CdS-TiO_2 and CdS-ZnS sandwich type nanocomposites, but they showed poor stability after few repetitive cycles, which might be due to the photocorrosion of CdS. Thus, in an attempt to prevent Cd^{2+} ion leaching, in the present work, CdS and its nanocomposite systems (CdS-ZnS and CdS-TiO_2) were supported onto stable support of polyaniline. Hence, In the present work, CdS, CdS-ZnS and CdS-TiO_2 nanomaterials were added to PANI in order to study the effect of PANI over the stability, structural, physical, thermal, optical and photocatalytic properties of these nanomaterials. Overall, this work would provide new insights into the fabrication of conducting polymer/semiconductor nanocomposites with desired nanostructure as high performance photocatalysts and would facilitate their applications in environmental purification and solar energy conversion.

Biography

Nida Qutub currently works at the Department of Chemistry, Jamia Millia Islamia. Nida does research in Nanotechnology. Their most recent publication is 'Synthesis, characterization and visible-light driven photocatalysis by differently structured CdS/ZnS sandwich and core–shell nanocomposites.

The role of drug design and structure-activity relationships in identifying molecules for therapeutic use and improving drug profiles

Houda Attjioui
Abdelmalek Essaadi University, Morocco

Abstract:
Drug design and structure-activity relationships (SAR) play a crucial role in identifying molecules for therapeutic use and improving drug profiles. This approach combines an understanding of molecular interactions with modeling and experimental tools to design more effective compounds. Through case studies, we highlight the successes achieved with this approach. Here are examples of some molecules:

1.Tamiflu (Oseltamivir): Used to treat influenza, Tamiflu was developed using a drug design approach based on the structure-activity relationship. By analyzing the structure of the influenza virus, we were able to design a molecule that binds specifically to an enzyme essential to viral replication, thereby inhibiting its activity.

2.HIV protease inhibitors: The development of protease inhibitors for the treatment of HIV has been a major example of the use of drug design and structure-activity relationships. By studying the structure of the HIV enzyme, researchers designed molecules capable of binding specifically to the enzyme and blocking its activity, thus slowing the progression of the disease.

1.Tyrosine kinase inhibitors in cancer: Tyrosine kinase inhibitors have revolutionized the treatment of certain types of cancer. Using drug design and RSA, researchers have been able to design molecules that specifically target the proteins responsible for tumor growth, thereby inhibiting their activity and slowing disease progression.
These examples demonstrate the success of drug design and structure-activity relationships in identifying molecules for therapeutic use. These approaches have made it possible to design specific, effective and safe compounds, improving drug profiles and contributing to medical advances. By using drug design and structure-activity relationship approaches, researchers can also address issues such as toxicity and adverse drug reactions. By understanding these approaches, researchers can design more effective, selective and safe compounds, contributing to the advancement of medical therapies and the improvement of human health.

Drug design uses structure-activity relationships to design effective molecules.
Drug design helps identify new molecules and optimize existing compounds.
Structure-activity relationships help address drug toxicity and adverse effects.
Drug design and structure-activity relationships are essential for improving drug profiles.

Biography

A pharmacist with a doctorate in pharmacy and a specialization in industrial pharmacy, as well as experience as head of the cosmetics department at the Moroccan Ministry of Health, currently assistant professor in therapeutic chemistry and involved in research projects focused on the discovery of new drugs. In collaboration with other researchers we work on the design and optimization of molecules with high therapeutic potential. our aim is to contribute to the improvement of existing medical treatments and discover new approaches to fighting disease.

Maxwell equations and its applications based on new implications in material science.

Deepa Lakshmi Chandrasekaran
Government Electrical utility, Tamilnadu Transmission Corporation

Abstract:
This presentation briefs about the changes in the fundamental nature of Maxwell equations based on the upcoming discoveries and inventions in material science. Especially, regarding the curl nature of electric field(E) not equal to zero in the case of negative permittivity which results in local DC voltage amplification. Similarly, the curl of magnetic flux density(B) equates to negative current in the case of negative permeability which can be exploited to achieve Room-Temperature Superconductivity based on Ferromagnetic Resonance.

Negative Pemittivity:
Design Consideration for Further Experimentation:
Electric field are applied to the ferroelectric core to switch polarization in order to step-up and step-down the voltage.
Ref: https://doi.org/10.22214/ijraset.2023.57568
Negative Permeability:
Design Consideration for further Experimentation
1.Taking the Cylindrical inductor with coil wound around the ferrite core and applying Microwave frequency Power source to the coil wound around the ferrite core
2.DC electric field is applied to the ferrite core.
Both of these conditions are required to achieve ferromagnetic resonance.
The ferrite will achieve its superconductivity.
Further insight into the divergence of magnetic field will be given based on work done by B and magnetic monopoles.

Biography

Deepalakshmi Chandrasekaran, Asst Electrical Engineer, Tamilnadu Electricity Board. Her research Published in nanohub-NCN of Purdue University. Provided as the number of users in the nanohub publication link.

A newly synthesized pyrazole derivative as corrosion inhibitor for carbon steel in 1 M HCl medium: Characterization (SEM, AFM), experimental and theoretical approach

N. Timoudan
Mohammed V University in Rabat, Morocco

Abstract:
The inhibition of carbon steel corrosion in normal hydrochloric acid solution at 303K by pyrazole derivative (PRPD) was studied using electrochemical techniques (polarization and impedance). Experimental results showed that PRPD acted as an effective inhibitor against corrosion of carbon steel in 1 M HCl, and that its inhibition efficiency increased with inhibitor concentration, reaching a value of 97.2% at 10-3M. Polarization studies showed PRPD to be a mixed-type inhibitor. Adsorption of this pyrazole derivative onto the surface of carbon steel in 1 M HCl solution followed the Langmuir adsorption isotherm, and the corresponding value of the standard Gibbs free energy of adsorption (ΔG°ads) is associated with a chemisorption mechanism. Using Scanning electron microscopy (SEM) and atomic force microscopy (AFM) examinations shows that the PRPD may connect to the metal surface by producing a barrier layer. Theoretical computation (DFT) and molecular dynamics simulation (MD) are utilized to understand the mechanism of inhibition.
Keywords: Pyrazole derivative, Carbon steel, HCl, AFM, Corrosion inhibition, Adsorption

Biography

TIMOUDAN Nadia is preparing her Ph.D. in the Laboratory of Materials, Nanotechnology and Environment, Faculty of Sciences, Mohammed V University, P.O. Box. 1014, Rabat, Morocco, His main research interests are in the field of corrosion and corrosion inhibition of metals and alloys using chemical and electrochemical techniques (PDP, EIS), characterization techniques (SEM, AFM, Contact angle, FT-IR, XDR, XPS, and UV-visible) and quantum chemical methods DFT/MDS.

Using oxygen enriched with the isotope

George Kakhniashvili
Georgian Technical University, Georgia

Abstract:
Using oxygen enriched with the isotope, the contribution of various forms of catalyst oxygen to the oxidation process was studied. It turned out that the content of the isotopic label in the formed is significantly lower than expected and at the initial stage of the reaction is close to the natural content of Taking into account that the pretreatment of the catalyst excluded the existence of any noticeable amount of adsorbed oxygen on the surface of both palladium and the support, it was concluded that is oxidized due to oxygen of . The study of the SIMS spectra showed that oxygen of the hydroxyl cover of is involved in the process of oxidation.

Biography

Giorgi Kakhniashvili Born on August 13, 1955 in Tbilisi. In 1972-1977 he studied at the Faculty of Chemistry of Ivane Javakhishvili Tbilisi State University In 1978-1983 he studied at the graduate school of the Faculty of Chemistry of Tbilisi State University, majoring in physical chemistry. In 1978-1983 he worked at the Moscow Karpov Institute of Physics and Chemistry. In 1988 he defended his PhD thesis in physical chemistry. In 1983 - 93 he worked at the Institute of Inorganic Chemistry and Electrochemistry of the Georgian Academy of Sciences. In 1993 - 2011 worked at LEPL Levan Samkharauli National Forensics Bureau. Since 2019 works at Vladimer Chavchanidze Institute of Cybernetics of the Georgian Technical University.

High-temperaturecatalytic decomposition of hydrazine on the surface of monocrystalline germanium

Irakli Nakhutsrishvili
Georgian Technical University, Georgia

The decomposition of hydrazine vapors on the surface of single-crystalline germanium at 650oC is studied. This catalytic reaction proceeds according to the scheme $3N_2H_4 \rightarrow 4NH_3+N_2$. Ammonia corresponds to an equimolar amount of chemisorbed hydrazine ($nN_2H_4(g) \rightarrow nNH_3(g)+(NH)n(ads)$). In temperature range (650-850)°C, germanium nitride is formed: $3Ge+4NH_3 \rightarrow Ge_3N_4+6H_2$.

Keywords: Hydrazine, Germanium, Catalytic decomposition

Abstract:
Hydrazine is one of the most chemically active substances - a strong reducing agent. He has wide application in various fields of industry, technology, medicine, etc. and has been intensively studied both previously and currently [1-12]. Liquid N_2H_4 is very hygroscopic and has a noticeable ability to absorb oxygen and carbon dioxide from the air. It is called "high purity" when the water content does not exceed 1 wt.% and "ultra-pure" - with a maximum of 0.5 wt.% H_2O. The concentration of water in hydrazine is estimated by the density, melting point, or refractive index of the mixture. However, literature data on these parameters are different, due to the difficulty of accurately determining the physical characteristics of pure hydrazine.(*)
Hydrazine is easily decomposed by heat and radiation, especially in the presence of catalysts [13-17]. The general form of this reaction is given by the equation:$3N_2H_4 \rightarrow 4(1-x)NH_3+(1+2x)N_2+6xH_2$.

Depending on external conditions (temperature, pressure, catalyst, electromagnetic radiation, electric discharge, etc.) 0x1. (**)The catalytic decomposition of hydrazine on the surface of germanium has been studied relatively little and there is data when carrying out the reaction up to 80°C. In early work [18], powders of Ge of n- and p-type conductivity were used.
It was found that the decomposition products were ammonia and nitrogen. The type of conductivity did not affect the catalytic properties. The paper presented here examines the decomposition of hydrazine on the surface of single-crystalline germanium at 650oC.

REAGENTS:

Commertial hydrazine-hydrate containing 50 mol.% (36 wt.%) water was distilled using the Raschig's method with improvement. In particular, before distillation, it was boiled with NaOH in an inert atmosphere of nitrogen at a temperature of 120°C for two hours. Hydrazine purified in this way had a density of 1.0024 g/cm3 and a refractive index of 1.4705. According to the literature, 1.471 corresponds to 100% N_2H_4. However, this can be considered not entirely correct (see appendix). Plates of single-crystalline germanium doped with antimony (charge carrier concentration 21014cm-3) had a resistivity of 35 Ohmcm. The crystallographic orientation of Ge plates are (111) or (100). They were previously degreased in boiling toluene, etched in liquid etchant CP-4A ($HF:HNO_3:CH_3COOH$=1:15:1) for 4-5 minutes and washed in running distilled water.

RESULTS:

As mentioned above, hydrazine decomposes on germanium according to the scheme:$3N_2H_4 \rightarrow NH_3+N_2$
(2)
according to data of work [18].
Dissociative chemisorption of N_2H_4 without nitride formation can be represented as:$nN_2H_4(g) \rightarrow nNH_3(g)+(NH)n(ads)$.

(3)
The resulting ammonia corresponds to an equimolar amount of chemisorbed hydrazine. As a result, the total change of pressure is determined only by the decomposition reaction. Figure 1 shows the kinetic curves of the accumulation of hydrogen and ammonia at 650°C. It can be seen that the amount of ammonia is constant in the absence of germanium, and in its presence gradually decreases. The hydrogen content in the presence of Ge increases sharply, and in its absence it first increases and then decreases. (Total change of pressure of gaseous products is shown in Fig.2.)Thermodynamic calculation of the change of free energy showed that reaction (1) at $x = 0.25$ has almost the same probability as reaction (2).(***) However, the discovered fact of hydrogen evolution gives preference to reaction
(1): $2N_2H_4 \rightarrow 2NH_3+N_2+H_2$.

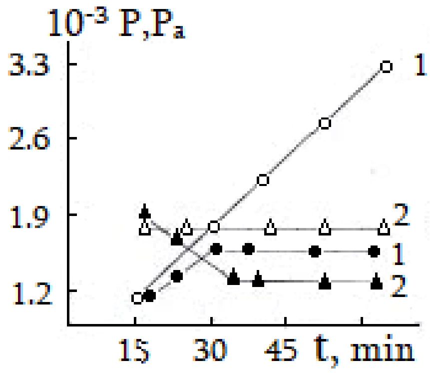
(4)
A sharp increase of the amount of hydrogen and a decrease of the amount of ammonia in the presence of germanium can be associated with a heterogeneous reaction: (****) $3Ge+4NH_3 \rightarrow Ge_3N_4+6H_2$.
The study of high-temperature decomposition of hydrazine was also carried out using IR absorption spectra. Figure 3 shows the IR spectra of N_2H_4 vapor, demonstrating the dynamics of its decomposition at 650°C. Curve 1 corresponds to hydrazine vapor, curves 2 and 3 to hydrazine heated for 15 and 30 minutes, and curve 4 to pure ammonia. These spectra indicate that the decomposition of hydrazine at 650°C occurs mainly during the first 15 minutes and is completely completed within 30 minutes.
Footnote belows:
(*)According to various authors, the density of liquid hydrazine at 25oC is 1.0045, 1.0036 and 1.0024, 1.008 g/cm3 at 23oC. The melting point of the system N_2H_4/H_2O: 1, 1.4, 1.53, 1.6-1.7, 1.8, 1.85 and 2oC.
(**)On alkaline catalysts x=1, on some semiconductor catalysts (Ga, Ga_2Se_3 and others), as well as on some metals (Te, Pt) x=0, on some other semiconductors (V_2O_5, Ga_2Te_3 and others), as well as on acid catalysts 0x1, during decomposition using a spark x = 0.38, and during bombardment with α-particles x = 0.12-0.22. (***)For reaction (2) ΔG220.5 kJ/mol and for reaction (4) ΔG222.6 kJ/mol.
(****)This reaction is the main method for producing of germanium nitride, which has applications in micro- and nanoelectronics, photoluminescence, energy storage, photocatalysis and others [21-26].

APPENDIX

At temperatures above 650°C, nitride Ge_3N_4 is formed in hydrazine vapor on the surface of germanium, and by registration mass change of the sample using the microgravimetric method, the following processes are observed [19]: first, an increase of mass occurs due to the accumulation of hydrazine and its decomposition products on the surface, then the mass of the sample decreases due to etching of Ge with contained in hydrazine water vapors, and then observes its gradual increase due to formation of Ge_3N_4 (Fig.4a).

Biography

Irakli Nakhutsrishvili was born in Tbilisi, Georgia in 20.04.1952. In 1969, he graduated from the Physics and Mathematics School named after V. Komarov. In 1970-75, he studied at Tbilisi State University, Faculty of Physics. Specialty - Solid State Physics. In 1990, he defended his PhD thesis in the field of physical chemistry. Since 2006, he has been a senior researcher at the Institute of Cybernetics named after V.Chavchanidze of the Technical University of Georgia. Has published 90 articles and 4 monographs. These monographs are printed in “BP International” (“Current Topics on Chemistry and Biochemistry”, 2023, vol.9, “Fundamental Research and Application of Physical Science”. 2023, vol.3, “Progress in Chemical Science Research”. 2023, vol. 9 and “Recent Progress in Science and Technology”. 2023, vol. 9). Her research interests are: the study of the kinetics of the interaction of active gases with metals and alloys, the study of theoretical aspects of thermoelectricity, the use of grapheme and its oxide as an element of the capacitor lining in order to increase the capacity, preparation of nitrides as an dielectric layer in Metal Dielectric-Semiconductor systems.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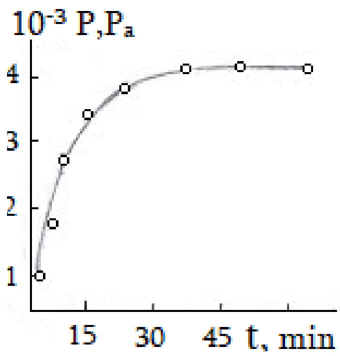
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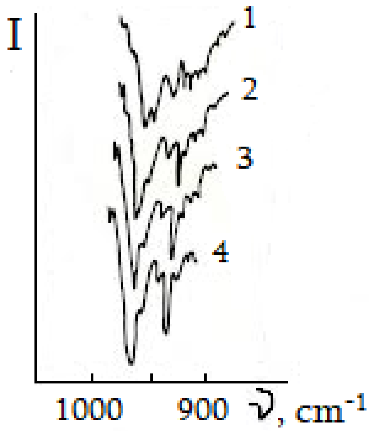
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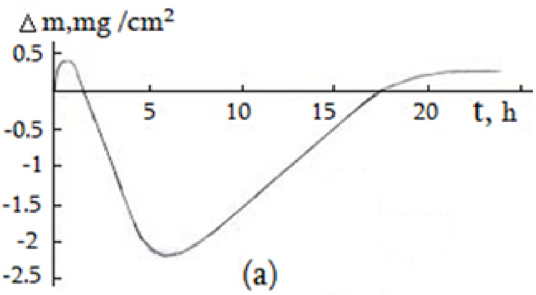
Δm,mg /cm2
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-2
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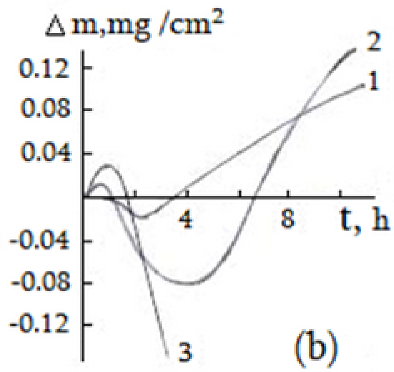
10
15
20
t, h
(a)


Δm,mg /cm2
0.12
0.08
0.04
-0.04
-0.08
-0.12
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2
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(b)

Investigations on Starch-Based Nanofibers in Enhancing Food Safety

Jiangling He
Wuhan Polytechnic University, China

Abstract:
Polymers synthesized from green resources have many advantages in food packaging and hence their development is very important. Herein, starch/polyvinyl alcohol (PVA) nanofibrous composite films were fabricated by electrospinning technology. Steam-induced cross-linking reaction with glutaraldehyde (GTA) and silver sodium zirconium phosphate (Ag-ZrP) was employed to improve the hydrophobic and antibacterial properties of the constructed nanofibrous films, respectively. The effects of starch/PVA ratio on the micro-morphology and mechanical properties of the binary composite film were investigated. The composite film showed optimal uniformity, bead-free electrospun nanofibers, with enhanced mechanical strength for the 60/40 (v/v) starch/PVA composite. Moreover, the crystallinity of PVA was reduced during the electrospinning process, whereas the introduction of PVA strengthened the hydrogen interactions and improved the thermal stability of the composite films. After the cross-linking with GTA, the starch/PVA films became more hydrophobic. Furthermore, the starch/PVA films embedded with Ag-ZrP had outstanding antibacterial property against both Gram-negative and Gram-positive bacteria. This work demonstrated the potential prospects of electrospun starch nanofibrous films in the food packaging field.

Biography

A.P./Jiangling He, She Received the Ph.D degree from Science School, National University of Singapore. She is mainly engaged in the modulation of optical properties of nanoparticles and their research in antimicrobial mechanisms, metal-enhanced fluorescence. Her works mainly contain the preparation of these nanoparticles, the analysis of linear/nonlinear optical properties, and the applications in food and biology. She has published 20 SCI papers as the first or corresponding author (e.g. Small, Chemical Engineering Journal, Biosensors & Bioelectronics, International ournal of Biological Macromolecules, LWT-Food Science and Technology, Food Research International...), with a cumulative impact factor of ~150. She has also authorized 2 invention patents. She was awarded the title of “Evergreen scholar ——Top Talented Younger” in Wuhan Polytechnic University, and she was also awarded the title of “Wuhan Talents——Top Talented Younger” in Wuhan City.

Applications of Green Nanomaterials as Catalyst in degradation of Organic Pollutants for sustainable environment

Vijay Devra
Janki Devi Bajaj Govt. Girls College, Kota (Raj.)

Abstract:
Green chemistry has proven to be an effective way to synthesize metal nanoparticles. Nanoparticles are very important for the development of sustainable technology for the future, for humans and the environment. The synthesis of nanoparticles from plants is a green chemical approach that combines nanotechnology and plant biotechnology. The plant extract is used for the bio-reduction of metal ion to produce nanoparticles. The ecology is increasingly being seriously threatened by water contamination. Organic pollutants, among other types of pollutants, play a significant role in water contamination. Toxic dyes, medicinal substances, industrial chemicals, organic solvents, and others are examples of these pollutants. To remove or degrade these contaminants, a variety of methods are used. Due to the unique characteristics of nanosized particles, the area of nanotechnology is flourishing and is being thoroughly researched for the removal of pollutants. The nanoparticles have received a lot of consideration for environmental remediation because of their high surface area to volume ratio and noticeably higher reactivity.

TThe present investigation reports the oxidative degradation of Acid Orange 10 (AO10) by Peroxomonosulphate (PMS) in the presence of green synthesized Nickel nanoparticles (NiNPs) as catalyst. The results of the UV-Visible spectrophotometer used to analyse the produced NiNPs revealed outstanding catalytic activity. It was shown that the synthetic nano-catalyst could efficiently degraded dye molecules into less harmful products through an Advanced oxidation process (AOP). In the disciplines of catalysis and environmental remediation, NiNPs are anticipated to be a good substitute and play a significant role.

Key Word: Nanotechnology, Green synthesis, Metal Nanoparticles, Degradation, Catalytic applications

Biography

Vijay Devra, Associate Professor, Department of Chemistry, J.D.B. Govt. P. G. GirlsCollege, Kota (Raj.). 24 Years teaching experience. Certificate of Appreciation for special achievement on District LevelCeremony, World Research and Development Excellence Award 2021" awarded by International Benevolent Research Foundation Kolkata. Certificate of appreciation awarded for commendable contribution in the field of Science and Technology 15 March 2022 and "IRSD International Preeminent Educator Award 2022" at international conference on Interdisciplinary research for Sustainable Research on 30 September 2022.
2)Coordinator of FIST Project (sanctioned by Department of Science and Technology, New Delhi).
2)Three Minor ResearchProject (sanctioned by UGC)
3)Publications- National& International Journals- 75 Books- 12
4)Paper presentation in Seminar/ Conferences (National &International)- 70
5)Ph.D. awarded students under my supervision/ co-supervision- 09
6)Ph.D. registered students under my supervision- 05
7)Life Member of Indian ChemicalSociety, Indian Council of Chemists, Rajasthan science Congress, fellow Membership (FICCE) awarded by International Congress of chemistry & Environment and International Scientific research organization for science,Engineering and technology.

Catalytic Pyrolysis Process to Produce Styrene from Waste Expanded Polystyrene Using a Semi-Batch Rotary Reactor

Jose Luis Contreras
Universidad Autonoma Metropolitana, Mexico

Abstract:
Thermal and catalytic pyrolysis of waste expanded polystyrene (WEPS) was studied to obtain mainly styrene monomer, which can be recycled in the polystyrene industry. Initially, preliminary experiments were carried out in a static semi-batch glass reactor with basic catalysts and without catalysts, using toluene as solvent at 250 °C, determining their styrene yields to select the best catalyst. MgO turned out to be the best catalyst due to its stability and cost. This catalyst was characterized by XRD, BET area, SEM-EDS, Raman spectroscopy, UV–VIS, and TGA. The kinetic equation for WEPS pyrolysis in the glass reactor was determined as a first-order reaction. The heat of reaction, the Gibbs free energy change, and the entropy change were calculated. Finally, WEPS pyrolysis experiments were carried out using a rotating semi-batch steel reactor, at higher temperatures and without using solvents, evaluating the styrene yield and its performance for its possible industrial application. In this reaction, the activity remained almost constant after four catalyst regenerations. The best styrene yield was 94 wt%, which could be one of the highest reported in the literature. This result may be associated with the back-mixing obtained in the rotary reactor, in contrast to the performance observed in the static glass reactor.

Biography

Jose Luis Contreras Larios Chemical Engineer and Master of Science in Chemical Engineering from the ESIQIE of the National Polytechnic Institute. He obtained his PhD and works at the Universidad Autonoma Metropolitana. He is a member of the National System of Researchers SNI Level I (Mexico) 2010-202. Professor-Researcher with a desirable Profile PROMED 2018-2026, he has directed bachelor's, master's and doctoral theses in Chemical Engineering for 40 years. He has worked in 5 chemical companies and the Mexican Petroleum Institute (15 years).
He has participated in 65 scientific conferences, author of 52 international research articles on: Catalysis applied to environmental, industrial, oil refining and petrochemical processes. He has 3 patents. He studies: Catalysis applied to environmental, industrial, petroleum processes and new processes to produce Hydrogen from biomass and water.

Potential Harm of IQOS Smoke to Rat Liver

Donatella Canistro
University of Bologna, Italy

Abstract:
The Food and Drug Administration has recently classified the IQOS electronic cigarette as a modified-risk tobacco product. However, IQOS cigarettes still release various harmful constituents typical of conventional cigarettes (CCs), although the concentrations are markedly lower. Here, we investigated the damaging effects of IQOS smoking on the liver. Male Sprague Dawley rats were exposed, whole body, 5 days/week for 4 weeks to IQOS smoke (4 sticks/day), and hepatic xenobiotic metabolism, redox homeostasis and lipidomic profile were investigated. IQOS boosted reactive radicals and generated oxidative stress. Exposure decreased cellular reserves of total glutathione (GSH) but not GSH-dependent antioxidant enzymes. Catalase and xanthine oxidase were greater in the exposed group, as were various hepatic CYP-dependent monooxygenases (CYP2B1/2, CYP1A1, CYP2A1, CYP2E1-linked). Respiratory chain activity was unaltered, while the number of liver mitochondria was increased. IQOS exposure had an impact on the hepatic lipid profile. With regard to the expression of some MAP kinases commonly activated by CC smoking, IQOS increased the p-p38/p38 ratio, while erythroid nuclear transcription factor 2 (Nrf2) was negatively affected. Our data suggest that IQOS significantly impairs liver function, supporting the precautionary stance taken by the WHO toward the use of these devices, especially by young people and pregnant women.

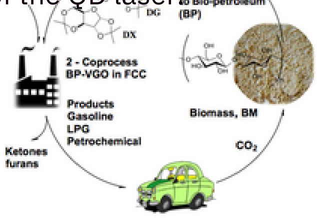
Biography

Researcher at the University of Bologna since 2006. She focuses her research in Toxicology. In particular, her research topics are directed to the in vivo modulation of xenobiotic metabolism (toxicity, chemical cancerogenesis and chemoprotection) and to the in vivo oxidative stress detection. Involved in national and international research projects, she collaborates with several Institutes. Author of numerous publications.

Multistability in a Quantum Dot Semiconductor Laser with Optical Injection due to simple Shil'nikov bifurcations

Cesar Abraham Torrico Chavez
Universidad Catolica Boliviana "San Pablo" Regional Tarija, Boivia

Abstract:
A comprehensive analysis of multistable behaviour in a quantum dot (QD) semiconductor laser with optical injection model is carried out. There are a large number of stable periodic phases in the plane of injection strength and the frequency detuning, that are born along a saddle-node bifurcation curve and invade the QD laser locking region as the linewidth enhancement factor is varied. These regions of bi- and multi-stability appear inside the so-called homoclinic teeth associated to simple Shil'nikov bifurcations of homoclinic orbits. We study such bifurcations over a wide range of parameters, through the computation of phase diagrams, basins and high resolution videos of the parameter space (based on the spectrum of the Lyapunov exponents) in order to illustrate codimension-3 phenomena. In this way, we provide quantitative information on volume of the basins of coexistence of periodic and chaotic attractors with the stationary solution of the background locking region of the QD laser.



We hope that the numerical evidence of these stable periodic structures and multistability presented herein motivates a more comprehensive study of their ordering and mathematical conditions for their genesis, as well as we also encourage their experimental verification. Our results also open new possibilities for new applications, for example switching between a periodic orbit and a chaotic attractor may be interesting for optical communication combined with chaotic encryption.

Biography

Bachelor in Physics - Universidad Mayor de San Simon (2004). Master (2008) and PhD (2016) in Theoretical Physics - Federal University of Rio Grande do Sul - UFRGS. He has experience in the area of Computational Physics, with an emphasis on computing phase diagrams of nonlinear dynamic systems based on the spectrum of Lyapunov exponents. He also has expertise in control of spatiotemporal chaos in networks of coupled nonlinear chaotic oscillators using complex topologies, nonlinear waves, solar UV radiation, solar water disinfection-SODIS, noise measurement and atmospheric contamination. He has experience teaching at pre- and postgraduate level at several public and private universities in Brazil and Bolivia.

Strenuous Groups Conferences

Strenuous World Congress on

CATALYSIS, CHEMICAL ENGINEERING & TECHNOLOGY

17-18 Apr 2024 | London, UK

KENOTE SPEAKERS Day 2

Transient and Isotopic Techniques for Enhancing the Design of Industrial Dry Reforming of Methane (DRM) Catalysts

Angelos M. Efstathiou
University of Cyprus, Cyprus

Abstract:
This Keynote Lecture will illustrate how the use of the transient method in combination with isotope gases (18O2, 13CO2 and 13CH4) allows to gather important kinetic information under both steady-state and dynamic conditions (transient kinetics) aiming to advance the design of industrially relevant supported metal catalysts towards the Dry Reforming of Methane (DRM) reaction (CH4 + CO2 ↔ 2 CO + 2 H2). Since one of the main problems encountered in developing industrially relevant DRM catalytic systems is the control of the rate of carbon accumulation with time-on-stream, the design of carbon-free DRM catalysts requires deep fundamental understanding as to which are the key structural parameters of supported metal catalysts and how these influence the rates of reaction steps associated with carbon deposition and removal under DRM reaction conditions. To properly address these important issues for the design of DRM catalysts, appropriate experimental methodologies must be developed and validated.

In this lecture, examples of the effects of: (i) ceria-based support chemical composition (doped ceria), (ii) ceria morphology (nanorods vs nanopolyhedra), and (iii) Ni metal particle size (ceria-based supported Ni) on the origin of carbon accumulation (CH4 vs CO2 activation route), contribution of the lattice oxygen of reducible ceria-based support in the rate of carbon removal (via oxidation to CO), and carbon deposition via CH4 and CO decomposition reaction steps will be presented and discussed.

Biography

Angelos M. Efstathiou, Ph.D. in Chemical Engineering, is a distinguished Professor at the Chemistry Department of the University of Cyprus. His research is focused mainly on environmental and energy related catalysis, including NOx-control (H2-SCR, NH3-SCR), three-way catalysis, dry reforming of methane, Fischer-Tropsch synthesis, water-gas shift, and CO2 hydrogenation to syn-CH4 and alcohols reactions. Prof. Efstathiou’s research pioneers the use of advanced transient kinetic and isotopic methodologies for in situ catalyst characterization and mechanistic studies of heterogeneous catalytic reactions. He is the author of more than 175 peer-reviewed scientific publications and 4 book chapters with over 9800 citations and an h-index of 60 (Google Scholar).

Beam shaping, a solution for the industry?

Anne Henrottin
LASEA, Belgium

Abstract:
Nowadays the technologies have to be more efficient, propose cutting edge processes, be more versatile while being environmental friendly. In this presentation, LASEA will introduce how the beam-shaping can improve the laser processes in particular in microfluidics, aeronautics, photovoltaic applications but also how the beam shaping is expected to increase the productivity of the machine in roller applications, roll-to-roll or batch-to-batch applications. Different technologies can be used to shape the laser beam as spatial light modulator (SLM), double SLM, diffractive optical element (DOE) or as well multi-plane light conversion (MPLC) to produce versatile shaped beam (square, round, triangular, specific shape...) or multiple beams (line of beams, matrix of beams,...). The direct laser interference patterning (DLIP) is also a technology shaping the beam that produces different scales processes; micrometric and sub-micrometric structures. Consequently, LASEA will present these different possibilities, their expected impacts and how to integrate them in a laser machine to achieve high throughputs processes. Moreover, the beam-shaping leading to multiple beams introduces many challenges in terms of laser machine design and laser development. Indeed, when the number of beams increases the laser has to be more powerful. During this presentation, LASEA will also expose the challenges to manage multiple beams and powerful laser sources. Finally, the impacts and improvements expected by these types of technologies will also present.

Biography

Anne Henrottin works as innovative project manager at LASEA. She has done its studies at the University of Liège in Physics Engineering with a specialization in Microfluidics and Electronics physics. At LASEA for 10 years now, she is responsible for different internal and R&D projects (European and regional ones) in the field of hybrid laser joining, closed loop control systems, machines for the future with kW laser or R2R system. She was elected in the Photonics 100 list 2024 that celebrates the people who are pushing the photonics industry forward.

Green Method Synthesised Graphene-Silver Electrochemical Nanobiosensors for Ethambutol and Pyrazinamide

Fanelwa Ngece Ajayi
University of the Western Cape, South Africa

Abstract:
A novel nanobiosensor was constructed with graphene oxide (GO) sheets coupled to pear extract-based green-synthesised silver nanoparticles (Ag-NPs) to which cytochrome P450-2D6 (CYP2D6) enzyme was attached. The biosensor was applied in the electrochemical detection of the tuberculosis (TB) treatment drugs, ethambutol (EMB) and pyrazinamide (PZA). The surface morphology of the green-synthesised nanocomposites was studied by performing High-Resolution Transmission Electron Microscopy (HR-TEM) and High-Resolution Scanning Electron Microscopy (HR-SEM). Fourier Transform Infrared Spectroscopy (FTIR) and Raman Spectroscopy were used for structural analysis, while Ultraviolet Visible (UV-Vis) Spectroscopy was used in the optical characterisation of the nanocomposite material. Electrochemical studies on glassy carbon electrode (GCE), which were done by Cyclic Voltammetry (CV), showed that the GO|Ag-NPs||GCE electrode was highly conductive, and thereby indicating its suitability as a platform for nanobiosensor development. The non-toxic and low-cost green GO|Ag-NPs|CYP2D6||GCE nanobiosensor was used to determine EMB and PZA. The very low limit of detection (LOD) values of the biosensor for EMB (0.2962×10^{-2} nM, S/N = 3) and PZA (0.897×10^{-2} nM, S/N = 3) demonstrate that the green nanobiosensor reported for EMB and PZA. Novel Methods of Green Synthesis: The phrase "Green Method Synthesised" suggests that the graphene-silver nanocomposites were created in an eco-friendly manner. To lessen their impact on the environment, researchers can investigate and implement sustainable techniques like bio-inspired synthesis or the use of environmentally friendly reducing agents. ·The significance of nanomaterials in biosensing applications is demonstrated by the incorporation of graphene-silver nanocomposites. Researchers can investigate these materials' special qualities, like their large surface area, superior conductivity, and biocompatibility, to improve the biosensors' sensitivity and selectivity. Ethambutol and Pyrazinamide are two specific medications that demonstrate how the developed nanobiosensors may be used in the field of tuberculosis (TB) drug monitoring. By learning about the difficulties and specifications involved in creating biosensors that can identify particular medications, researchers can further the field of personalised medicine. This research is a combination of materials science, biosensing, and chemistry. When tackling complex challenges, researchers can recognise the importance of interdisciplinary collaboration. Advanced sensing technologies and creative solutions can result from interdisciplinary experts working together.
Lessons about the significance of validation and dependability in biosensing technologies can be learned by researchers. The accuracy and repeatability of the created nanobiosensors must be ensured by rigorous testing and validation, particularly when used in practical applications.

Biography

In addition to serving as the acting Deputy Dean for Research in the Faculty of Natural Sciences, at the University of the Western Cape (UWC), Fanelwa Ngece Ajayi is an Associate Professor of Physical Chemistry. Additionally, she works as a lead researcher in the SensorLab laboratories at the Chemistry Department, UWC. She specialises in research at SensorLab on the creation of drug metabolism sensors through the use of different green synthesised metallic nanomaterials and the identification of a variety of biological uses for them. Her publications, which include book chapters and research publications, contain the results of her research.

III-Nitride Optoelectronic Materials and Devices: Molecular Beam Epitaxy, Bottom-up approach to fabricate nanomaterial

Alaa Jabbar Ghazai
Al-Nahrain University, Iraq

Abstract:
The optoelectronic properties of quaternary AlxInyGa1-x-yN thin films grown via plasma assistance molecular beam epitaxy on sapphire (Al2O3) and silicon (Si) substrates for different optoelectronic applications, including AlxInyGa1-x-yN metal-semiconductor-metal (MSM) photodetectors (PDs), solar cells and multi-quantum well (MQW) laser diodes (LDs). Due to the mismatch problems between the quaternary epilayer and substrates, an AlN buffer layer was inserted at low temperature to reduce the lattice mismatch to approximately 4%, to produce high-quality epitaxy films. Defect-free films with high structural, optical and electrical qualities were obtained, New Ag/n AlxInyGa1-x-yN /p-Si/(Au, Al) solar cells withacceptable conversion efficiencies, were fabricated and characterized. Finally, the simulation of AlxInyGa1-x-yN MQW LD was designed and optimized. The best performance of the LDs was achieved at a quantum well number of 4. The reduction of internal losses and ideal performance were characterized at well and barrier thickness of 3 nm and 6 nm respectively. The high optical confinement factor occurred with the use of quaternary Al0.25In0.08Ga0.67N rather than with ternary Al0.03Ga0.97N electronic blocking layers due to the built-in polarization and strain effect between the MQW LD layers were also studied.

Biography

He was born in Baghdad in 1974. I get BSC from Almustansiria University, Baghdad, Iraq In 1997 and I get MSC from same University – Education College In 2001. In July 2012 He get a PhD degree from School of Physics, University Science Malaysia (USM). My thesis entitled "A Study of optoelectronic devices characterstics based on quaternary al0.08in0.08ga0.84n thin films" under supervision of Prof. Haslan Abu Hassan and Prof. Zai Bint Hassan. I have work Lecturer and researcher in many places such as researcher, Nano Optoelectronic Research and Technology Laboratory (NOR Lab), School of Physics, University Science USM, Malaysia, Ministry of education and Iraqi Atomic Energy Commission (IAEC), Optoelectronic Field. Since 2004 I teach many subject such as Optics, Laser, Analysis Mechanic, Astronomy, General Physics, Solid state Physics, and Semiconductor devices in Physics department, Science college, Thi-Qar University. 2009 I become a Senior Lecturer. Member of Optical Society American (OSA) since 2010, Awarded ITEX Silver Medal for invention Novel Solar Cell Efficiency For Nanostructured CdS (2012), Top Published at OSA since 2011 for article titled “Quaternary ultraviolet AlInGaN MQW laser diode performance using quaternary AlInGaN electron blocking layer”, Opt. Express. 19, pp. 9245-9254, A

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Day 2

Realizing unassisted photocatalytic overall pure water splitting for green hydrogen production

Siang-Piao Chai
Monash University Malaysia

Abstract:
Hydrogen (H2) serves as a green energy source and plays a pivotal role in attaining carbon neutrality goal. Harvesting the Earth's two most abundant and readily accessible free resources, i.e. the Sun and water, in solar-to-hydrogen conversion has attracted global attention. In particular, direct solar water splitting using particulate photocatalysts represents a cost-effective approach for H2 production due to its simplicity. Lately, an interesting ternary metal chalcogenide photocatalyst – zinc indium sulfide (ZIS) has gained enormous attention in the field attributed to its high photo-responsiveness and favourable band structures for photocatalytic water splitting. It is worth noting that the utilization of single component photocatalyst to drive an unassisted photocatalytic pure water splitting in the absence of sacrificial reagent and co-catalyst is extremely challenging. This is due to the majority of the semiconductor photocatalysts suffer from unsatisfactorily photon utilization, sluggish H2 reductive kinetics, selfoxidation and deficiency of catalytic oxygen (O2) evolution reaction sites that limit the application of photocatalytic overall water splitting.

In our work, we introduced the incorporation of heteroatom Pdoping into ZIS to modulate the intrinsic S active sites and tailor the electronic structure to realize photocatalytic overall pure water splitting. On the other hand, we also constructed a unique superhydrophilic defect-mediated ZIS with hollow hierarchical framework to catalyze solar-driven pure water splitting. Such modification collectively enhances exposure of surface-active sites, ameliorates. water interaction and diminishes surface kinetics. The details of the photocatalyst modification strategies and future direction in this research field will be discussed.

Biography

Prof Siang-Piao Chai is a Professor in Chemical Engineering, and the Deputy Head of School (Research) for the School of Engineering, Monash University Malaysia campus. Prof Chai is an active researcher in the areas of heterogeneous catalysis, photocatalysis, reaction engineering and advanced functional materials. His current research interest primarily focuses on the development of advanced photocatalytic materials for environmental and sustainable energy applications. He has published more than 200 journal articles, accumulating a total citation of more than 20,000 times. He has won numerous awards and recognitions, such as the Highly Cited Researcher by Clarivate.

In situ visualization of ultrafast electrocatalyst on MoS_2 during hydrogen evolution reaction

Chih-Wei Luo
National Yang Ming Chiao Tung University, Taiwan

Abstract:
Because of the ultrathin nature of two-dimensional (2D) transition metal dichalcogenides (TMDs) catalysts, the buildup of electrolyte ions across the nanometer-scale electrochemical double layer (ECDL) may cause the formation of excitons and trions in monolayer (ML)-MoS_2 during hydrogen evolution reaction (HER), similar to those observed in gate-controlled FET devices. Using the distinct carrier relaxation dynamics of excitons and trions as sensitive descriptors, an in-situ micro-cell-based ultrafast time-resolved liquid cell microscopy (TR-LCM) is setup to simultaneously probe the ultrafast carrier dynamics and electrochemical reactions at ML-MoS_2 catalyst during HER process. It is found that the whole surface of MoS_2 becomes "trion-dominant" as the potential is at HER-on state while it becomes "exciton-dominant" as the potential is at HER-off state. Through 2D mapping image on the evolution of the individual constituents of excitons and trions on ML MoS_2 surface during HER, the interplay between exciton/trion dynamics and electrocatalytic activity of ML MoS_2 affected by electrolyte gating during HER process can be unequivocally revealed. This in-situ probing technique provides an excellent platform to explore carrier behaviors at the atomic layer/liquid electrolyte interfaces during the electrocatalytic reaction of 2D TMDs.

Biography

Chih-Wei LUO is a professor and a Vice Chairman in the Department of Electrophysics, National Yang Ming Chiao Tung University (NYCU), TAIWAN. After receiving his Ph.D. degree at National Chiao Tung University (NCTU), he joined NCTU in 2006 and started independent research. He used to be an Associate Vice President in the Office of International Affairs at NCTU (2016-2018). His current research interests include ultrafast dynamics in strongly correlated materials (e.g., topological insulators, superconductors, etc.) and photovoltaic materials, THz spectroscopy, and material processing by femtosecond lasers. He received 15 patents; authored and co-authored 5 book chapters, and 181 refereed papers.

Rheology of Gums Used in the Food and Flour Industry for "Tortillas"

Ioana Stanciu
University of Bucharest, Romania

Abstract:
Food gums are hydrophilic colloids, which due to their functional properties are used in the food industry. Their most important functional properties are: water retention capacity, decrease in evaporation rate, change in cooling rate, change in the formation of ice crystals, regulation of rheological properties, participation in chemical processes, keep insoluble particles in suspension, stabilize foams and emulsions.

Many seemingly homogeneous liquids are composed of particles with irregular shapes or inhomogeneities of the liquid phase. On the other hand, there are polymer solutions with long or curly molecular chains. At rest, all these materials are characterized by an irregular internal structure and consequently oppose the flow, having high viscosity.
With the increase of the deformation speed, ie the shear rate, the constituent particles are oriented in the direction of flow. Molecular chains in melts or solutions loosen, stretch and orient in parallel with the direction of action of the forces that tend to deform the fluid domain. This orientation allows the relative sliding between the fluid layers, corresponding to a reduction of the viscosity.
In other words, the nonlinear mechanical properties of these fluids are attributed to the changes that occur in the organization of the component molecules of the fluid, when they are subjected to a force that induces the deformation of the fluid. In the case of small molecules and molecular segment rotations, the duration of these changes is of the order of 10-12 s to 10-9 s being equivalent to the duration of Brownian fast motions. In the case of slow movements of reorientation or reorganization of macromolecules or large groups of molecules, the duration is longer, being of the order of 10-3 - 100 s.
Experimental data were obtained with a Haake RV20 rotary viscometer with a con-plate system. The range of shear speeds for which the determinations were made was between 24 and 3177s-1, and the shear stresses between 2.2 and 116.9Pa.

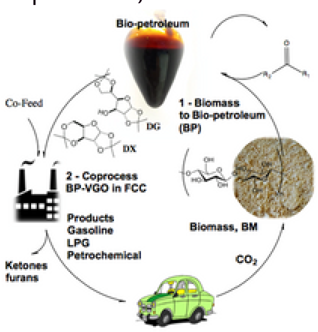
Biography

Ioana Stanciu working at the University of Bucharest, Faculty of Chemistry has a 20 years experience in teaching and conducting research on the study of polymers used as additives for lubricating oils, the rheological behavior of vegetable oils and mineral oils added to polymers. Ioana Stanciu is the author of 26 books and has the recognition of publishing 115 works in the field of physical chemistry. Ioana Stanciu is the editor of several international magazines. He has presented over 29 national research papers of which 5 research papers at international conferences. He has earned over 320 diplomas awarded nationally and internationally. Ioana Stanciu is a member of the Romanian Society of Rheology. Chief Editor of the magazine, European Journal of Rheology''.

From Biomass to Fuels: a Novo Carbon-Efficient Route Controlled by Catalysis

Marcelo Maciel Pereira
Federal University of Rio de Janeiro, Brazil

Abstract:
One of the most significant challenges is balancing energy production with the carbon footprint. Beyond avoiding climate change, only renewable energy sources can provide energy for us and future generations[1]. The amount of second-generation biomass can support the production of green fuel and petrochemical inputs [2] as fuel consumes ≈¼ of worldwide energy. Our proposed circular technology initiates with a mild ketalization of second-generation biomass to give a liquid product BP which shows feasible physical-chemical properties for subsequent transformation (density 1.2 g.cm-3, viscosity 200 cp (60 °C), specific heat 1.8 J g.°C-1). As detailed in our publications, it is composed mainly of ketal-sugar derivatives, composition ≈C2nH3nOn (ranges C1.4-2H2.2-2.9O1N0.007) [3]. BP and representative compounds like DG and DX (fig 1) can be transformed into aromatics [4-6], paraffins, isoparaffins,



and cycloalcanes[7-9] with high yields and low coke amounts. The flexibility to be converted to various products in typical refinery processes strongly suggests that BP could progressively substitute mineral oil. Hence, oil refineries can benefit from reducing their carbon footprint. Further research and developments to approach zero net-carbon fuels will have great impacts and demands in advances in chemistry and especially in heterogeneous catalysis. We will focus on catalysis design and innovations to produce a self-consistent route, using carbon from BM exclusively to produce target productions at the conference. In conclusion, our approach can be a secure transition in the structure of the matrix of energy to reduce carbon footprint and circumvent oil depletion. Figure: Circular economy of biomass to fuel in two steps. Step 1- BP production in mild conditions (temperature from 90-140oC, mineral acid from 0.1-0.4 wt.%, flexible to carbonylate type, like acetone and 2,5-hexadione for example, pressure varies in function of temperature and type of carbonylate, from room to 7 atm). Step 2 – BP and example of representative compounds DG; 1,2:5,6-di-O-isopropylidene-α-D-glucofuranose and DX; 1,2:3,5-di-O-isopropylidene-α-D-xylofuranose are converted to value products. For instance, BP mixture with vacuum gasoil (VGO) in a typical fluid catalytic cracking process conditions gives a drop-in fraction in gasoline and liquefied petroleum gas (LPG), petrochemicals, and oxygenates (ketones can be recycled to prepare BP, furans derivatives used as gasoline booster).

Biography

Marcelo Maciel Pereira is the head of Laces (laboratory for catalysis and sustainable energy), which has around 15 people developing their works among students and researchers, teaching at the Chemical Institute of UFRJ since 1994. The main research objective is to use applied catalysis and fundamental understanding. In the last years, I have used biomass to improve catalyst properties [10-12], CO2 activation coupled to green-hydrogen production [13, 14], and, more importantly, an innovative approach to converting biomass into fuel and petrochemicals [3, 8, 9, 15]. Regularly, I produce an average of 3-5 articles and 1-2 patents per year. I have done classes on general and experimental chemistry and catalysis.

Catalytic Cracking of Model Compound of Bio-Petroleum (sugar di-ketals) using Beta zeolite and Beta catalyst

Cristiane Cardoso
Federal University of Rio de Janeiro, Brazil

Abstract:
The conversion of second-generation biomass (BM) to fuel under typical refinery conditions is a promising solution to reduce the carbon footprint. However, BM favors parallel and undesirable reactions in its transformation chain. These issues have not yet been resolved in the production of bio-oil derived from biomass pyrolysis. Batalha et al.
got around this problem by modifying BM through hydrolysis/ketalization reactions, which resulted in a liquid rich in carbohydrate acetals, stable and neutral, which we call Bio-petroleum (BP). Herein we use a representative compound of BP, DX (1,2:3,5-di-O-isopropylidene-α-D-xylofuranose) co-processed with n-hexane were studied. We demonstrated the production of higher add-value hydrocarbons. We explored the type of catalyst and two type of reactors, fixed bed (FB) and fluidized bed (FCC). Concerning catalyst development, firstly, fresh zeolites (Beta, ZSM-5, and USY) were explored under conditions pre-established by the group. Beta Zeolite showed high performance in converting DX into hydrocarbons. Therefore, the tests to define the reaction parameters that maximize conversion were carried out in a fixed bed with Beta zeolite. In the best reaction condition, fresh Beta zeolite completely converted DX in the mixture containing 10%wt/wt DX in n-hexane produced a yield of 5.1%wt/wt in aromatics in the liquid, 0.5%wt/wt in oxygenates and 1.8% wt/wt in coke. We point out the high formation of liquid products (using Beta) compared to USY and ZSM-5 zeolites. Subsequently, two types of modifications were investigated. First, Beta was thermally treated using water vapor steam (to reduce the density of acidic sites). The best conversion to monoaromatics was obtained at 720°C, 5.5% wt/wt, reducing the gas yield twice and generating 1.3% wt/wt in coke. Second, we improved accessibility by creating mesoporosity. Beta with mesopores fully converted DX in more concentrated mixtures (30% DX mixture with n-hexane) and impaired by ten times the oxygenates in the liquid, increased liquid product ~3 times compared to the pristine Beta catalyst, also the coke did not exceed 4.9% wt/wt. To enable the use of the FCC process, we used a catalyst containing Beta as the main active phase. The catalyst was thermally treated using previously optimized conditions. We used a cat/feed ratio of 3 (30 times more mass compared to the fixed bed), and reaction occurred at 540°C. We explored mixtures of DX from 10 to 70% in nhexane. A mixture containing 70%DX incorporated ≈77% of green carbon and hydrogen from DX into useful products (olefin, aromatics, furans, and cyclo-alkanes), in all cases we obtain high green carbons convertion into products. When correlating the FCC with the FB processes under similar conditions, the FCC process showed better performance, as it increased the liquid product and contributed to reducing the oxygenated compound. Thus, with the appropriate reaction parameters and modifications, Beta zeolite and Beta catalyst acted adequately in different types of reactors, demonstrating promise for the conversion of a renewable feedstock with a greater yield of carbon into Biohydrocarbons with high added value.

Biography

Cristiane Cardoso concluded in 2022 sandwich doctorate in Chemistry from the Federal University of Rio de Janeiro(UFRJ) and the Paul Scherrer Institute. Her research studied the conversion of the model compound obtained from sugarcane bagasse into biohydrocarbons through catalytic cracking with Beta zeolite. This work produced 3 publications [1-3]. She is currently carrying out a post-doctorate in heterogeneous catalysis at the Catalysis and Sustainable Energy Laboratory coordinated by Professor Marcelo Maciel (UFRJ).

Composite LSCF as Potential Cathode Material for Intermediate Temperature Solid Oxide Fuel Cell

NoorAshrina A Hamid
Universiti Sains Malaysia, Malaysia

Abstract:
Solid Oxide Fuel Cell (SOFC) is a device that produce high amount of energy with elevated conversion efficiency that produces water as by-product. Generally, SOFC is operated at a high temperature 1000 oC with multiple types of fuel for the oxygen reduction reaction process. However, high capital and operating cost hinder SOFC application. Reducing operating temperature to intermediate temperature (600-800 oC) also known as IT-SOFC can suppress the component degradation as well as improve cell durability and reduce system cost. Lowering the operating temperature decreases the electrode kinetics and increases interfacial polarization resistance and the effects is more prominent for the oxygen reduction reaction (ORR) at cathode side. To minimize the polarization resistance of the cathode, a favourable electronic and ionic conductivity along with excellent catalytic activity for oxygen reduction must be developed. La0.6Sr0.4Co0.2Fe0.8O3 (LSCF) doped with copper oxide (CuO), zinc oxide (ZnO) and nickel oxide (NiO) can be an alternative cathode material for IT-SOFC because it has good chemical compatibility and high catalytic activity for the oxygen reduction reaction in an intermediate temperature range. These composite materials were synthesized via modified sol-gel method which employing EDTA as chelating agent.

Biography

Noor Ashrina A. Hamid completed her Ph.D in 2013 at the University of Duisburg-Essen, Germany with a thesis entitled "Cathode Materials Produced from Spray Flame Synthesis for Li-Ion Batteries". She graduated from Universiti Kebangsaan Malaysia with a Master of Science with a thesis entitled "Development of La1-xSrxCo0.2Fe0.8O3 (LSCF) Cathodes for Intermediate Temperature Solid Oxide Fuel Cells (IT-SOFCs)" in 2009. Currently, she holds a position as a senior lecturer and is actively engaged in oxide metal nanomaterials for energy storage applications as well as turning waste into wealth by converting biomass waste into hydrochar via hydrothermal carbonization.

Production of renewable hydrocarbons using the strategy of ketalization

Debora N. dos Santos
Federal University of Rio de Janeiro, Brazil

Abstract:
Converting second-generation biomass into fuels is a promising approach to reducing carbon emissions. As this raw material produces undesirable products during its transformation, our group sought to solve this problem with a new process: converting this biomass under mild temperature conditions on a semi-continuous flow process using acetone and an acid catalyst. The reaction presents a mass gain in relation to the converted biomass, producing an oil called biopetroleum, BP. BP is composed of sugar ketals, mainly 1,2:3,5-di-O-isopropylidene-α-D-xylofuranose (DX), and has more favorable properties for use as a feed in a refinery of petroleum or in independent units.1 The conversion of BP as well as DX by catalytic cracking mainly produces aromatics and light olefins, and the hydroconversion process produces paraffins and naphthenics.2, 3 In this work, the conversion of DX mixed with different hydrocarbons (n-hexane, cyclohexane, methylcyclohexane, and toluene) was studied in order to obtain information about the DX transformation pathway.4 Initially, the DX mixture (10 to 20% by weight) with hydrocarbon was cracked by a Beta zeolite at a temperature of 500 °C in a fixed bed reactor. DX reduced the hydrocarbon conversion, and depending on the hydrocarbons, the DX conversion slightly. We interpret this result as a competition for the active sites following the order: n-hexane < cyclohexane < methylcyclohexane < toluene, where DX was completely converted in n-hexane and its conversion was 73% in toluene. The hydrocarbons with increasing hydrogen transfer capacity increased the yields of aromatics and naphthenics and the level of green carbon incorporated as useful products. The values were high: 73 and 78% by weight of C from DX were transformed into useful products in mixtures with cyclohexane and methylcyclohexane, respectively. Methylcyclohexane resulted in a much more significant increase in aromatics in the products than cyclohexane, being the preferred co-load to maximize aromatic products. Toluene is the most competitive for active sites and greatly reduces the transformation of DX and its derivatives. However, it can be used when seeking to obtain oxygenated intermediates. We observed that water was the first product of deoxygenation. Besides that, ketones and furanic derivatives were important intermediates for subsequent decarbonylation and decarboxylation, yielding hydrocarbons. DX reduced the hydrocarbon protolysis of both σC-C and σC-H bonds, decreasing the formation of H2 and light hydrocarbons while the co-feed (and intermediates) contributed to the formation of aromatics, enabling a bimolecular reaction with oxygenates. The results will impact the design of more efficient and specific catalysts to BP conversion and new processes to increase green carbon into target products.

Biography

Debora N. Dos Santos Graduated in Chemistry (Bachelor's degree) from the Federal Institute of Education, Science and Technology of Rio de Janeiro (2015), Master's degree in Chemistry from the Federal University of Rio de Janeiro (2017) and PhD in Chemistry from the Federal University of Rio de Janeiro (2023). Has experience in the catalysis area, working mainly with biomass conversion processes to obtain products with greater added value and renewable hydrocarbons through homogeneous and heterogeneous catalysis.

The properties of aluminum closed-cell foam blocks shielded by Aluminium tubes and blocks patterns designed for applications

Mohamed Hassan Dadoura
F & D Engineering, Egypt

Abstract:
Explaining the components of Aluminium closed cell foam blocks (ACCFBs) shielded by aluminium tubes, selecting shapes and size, fabrication methods. The results of enhancement of energy absorption for ACCFBs by comparing to Pure aluminium foam block. Specifying the required properties of blocks by quasi static and dynamic impact testing. Study of corrosion and heat transfer of blocks. Applications of blocks and Designing of blocks patterns to be used in different applications.

1.Knowing the easy methods to make aluminium foam blocks by sizes
2.How to test energy absorption of blocks and specifying block properties.
3.How to tailored blocks pattern with known energy absorption capacity.
4.How to use blocks parameters in calculations of tailoring protector patterns.
Selection of block material and working medium.

It will help to secure vehicles with low cost where it will be available for normal people and small works shops technician to make it and increase the protection of their automobiles.

It is simplifying the using of enhanced foam blocks as protector against impacts it is easy estimated and determine also it can be branch method for solving complex big parts issues by transform it to small parts. If research team find organization or company support this research, 2nd and 3rd generation of foam blocks will be produced in short time.

It is solving three main problems in cost and manufacturing and in maintenance cost too. Furthermore, the availability to increasing the protection of vehicles versus impacts.

It is easy to calculated and give benefits of:
1-Low cost of fabrication.
2-Low cost of maintenance.
3-Easy to use and assembled.
4-It easy to work as composite material by add other materials.
5-All component of ACCFBs (shielding tube and Foam) exist in traditional market.
6-High energy absorption more than pure aluminium foam block with the same size.

Biography

-B.Sc. from Mechanical power Dept., Benha university. (2011)
-M.Sc. from Mechanical Design Dept., Helwan university. (2023)
-Tribology Lab Supervisor, Cairo university. (2012-2015)
-R&D Mechanical Design Engineer, MCS OIL Co. (2017)
-CEO, Professional Engineers Company. (2017-2018)
-Cathodic protection and corrosion engineer, EMC in Iraq. (2018-2022)
Mechanical Engineering Consultant, F&D Engineering Co. (2023 - Current)

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