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Group

16th Edition of Global Conference on

Catalysis, Chemical Engineering & Technology

14-16, SEPTEMBER, 2023

VALENCIA, SPAIN

Venue:
Olympia Hotel, Events & Spa, Carrer Mestre Serrano,
5, 46120 Alboraia, Valencia, Spain

BOOK OF ABSTRACTS

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ABSTRACTS

16TH EDITION OF
GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

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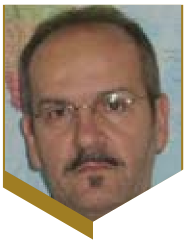

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Turkey

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Thank You
All...

Speakers

Abdul-Rhman H Muhammad
Cairo University,
Egypt

Ashanendu Mandal
University of Calcutta,
India

Carola Bahamondes Donoso
Universidad Tecnológica
Metropolitana, Chile

Christian Vianey Paz Lopez
Chulalongkorn University,
Thailand

Danuta Drozdowska
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Delia Teresa Sponza
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International Research Group,
Lithuania

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Teesside University,
United Kingdom

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Mekelle University,
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O'higgins, Chile

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Technology, Tunisia

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Federal do Paraná, Brasil

Jhonattan David Manosalvas Mora
Louisiana State University,
United States

Krisztián Lőrincz
XiMo Hungary Ltd,
Hungary

Louloudi Maria
University of Ioannina,
Greece

Speakers

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Columbia University Irving Medical Center, United States

Paul Somerville
Self Lab, United Kingdom

Ram Sambhar Shukla
Central Salt and Marine Chemicals Research Institute (CSMCRI), India

Sergey Suchkov
Institute for Global Health of MGUPP, Russia

Stefan Müller
Evonik Oxeno GmbH & Co. KG, Germany

Shanpei Liu
Jingchu University of Technology, China

Sung Chyr Lin
National Chung Hsing University, Taiwan

Suresh C. Ameta
PAHER University, India

Teresa Matoso M Victor
Higher Polytechnic Institute of Technologies and Sciences, Angola

Vitali Bakhtadze
Ivane Javakhishvili Tbilisi State University, Georgia

Wael Hamd
Al Koura Campus, Lebanon

Xueli Su
Hubei Kailong Chuxing Chemical Industry Group Co., Ltd, China

Welcome Message

Chemical Engineering is a field that continues to thrive, making significant contributions towards improving catalysts. Catalysts. An interesting word. According to the Webster's Dictionary (which I am quite fond of), a catalyst is "an agent that provokes or speeds significant change or action." Catalysts can be physical or psychological. In science, we often just think of physical catalysts to speed up reactions. But society needs catalysts as well. Physical and psychological catalysts for more efficient alternative energy, proactive medicine, more inexpensive material synthesis, improving the environment, faster process reactions, and so much more.

However, frequently, once researchers enter these fields, they often become separated from one another, removing the opportunity to collaborate. Collaborations need catalysts. This is so true especially considering the breakdown of collaborations that occurred during COVID-19. With conferences shut down, University labs closed, travel halted, and so much more, the world almost stopped collaborating during COVID. Catalysts stopped. Collaboration is so important, especially when seeking novel solutions to persistent traditional problems such as improved energy, medicine, green and sustainable materials, nanotechnology, and more. Often times, solutions to one field can help another. They are our catalysts. Yet, we do not know these solutions unless we collaborate, and.....meet. It is now time to make up for lost COVID time and take advantage of every conference available to us. It is time for catalysts to collaborate.

I am pleased to encourage you to attend and welcome you to the 16th Edition of Global Conference on Catalysis, Chemical Engineering & Technology (CAT 2023) with the conference theme "Expedite the Future Endeavors in Catalysis and Chemical Engineering". Whatever your field of expertise in Chemical Engineering, we all need a catalyst to find those solutions. We all need conferences as our catalyst.

Let's help each other serve as catalysts and discover some great collaborations and solutions to our greatest societal problems. I look forward to seeing you at this catalyst.

Sincerely,

Thomas J Webster, Ph.D.

H-index: 114

Novel Prize in Chemistry Nominee (2013)

Interstellar Therapeutics, United States

Welcome Message

On behalf of the CAT-2023 meeting, I am honored to welcome all of you to the 16th Edition of Global Conference on Catalysis, Chemical Engineering & Technology, which will be organized during September 14-16, 2023 at Valencia, Spain. During my presentation, I will be discussing the development of a new class of tunable unsymmetrical ferrocene-based ligands (MPhos) and their Pd Complexes (MPhosPdCl2) for API Synthesis via various kinds of Csp2-Csp3 Cross Couplings. These ligands and complexes are now commercially available. For details, please check: G. Xu, P. Gao, T. J. Colacot, ACS Catal. 2022, 12(9), pp. 5123–5135. Newer applications of these ligands and catalysts in organic transformations can be identified by academic and industrial research. I am looking forward to seeing you all.

Thomas J. Colacot, PhD, MBA, FRSC
MilliporeSigma, United States

Welcome Message

It is my honor and great pleasure to write a few welcome notes to you. Through centuries people were fascinated with the possibilities of synthesis of new materials with extraordinary properties. New materials are practically needed in all domains of life. Design and synthesis of new materials is one of the most important and interesting part of material sciences. Particularly a synthesis of new active and selective catalysts is a very important challenge. Our main aim concentrates on the new methods of the synthesis of single-site hierarchical porous zeolite catalysts with acid-base and redox properties. Such zeolite catalysts with active sites formed by incorporation of heteroelements in their framework are perspective as catalysts of protection of environment and biofeedstock conversion into valuable chemicals.

Professor Stanislaw Dzwigaj

Sorbonne University, France

Welcome Message

Dear congress visitors, it is a privilege to write some words of welcome to you. A key message is that both Chemistry and Chemical Engineering are now surging forward in the field of Green Hydrogen which will overtake fossil fuels like natural gas and diesel by 2050. The understanding of catalysts for hydrogen and oxygen electrodes in membrane electrolysers and fuel cells is in urgent demand to create a new industry that barely exists at present. Many academic and applied new recruits are needed now to push this exciting field forward fast. Catalyst loading in these devices has dropped by an order of magnitude in the last 20 years, with performance also rising, and lifetime extending significantly. This meeting will be well worth attending to reveal new advances.

Dr. Kevin Kendall, FRS

HydrogenUnited.org, United Kingdom

Welcome Message

I am pleased to announce that this Conference is prepared to offer all of you its 16th edition, open to science, technology, and innovation, and shaking hands with all chemical engineers coming from academia and industry.

I am a chemical engineer and personally have experience 47 years of carrier in chemical industry, namely, in oil refining and petrochemical enterprises.

There are no technology and project institutes in chemical industries who does not deal with metals and alloys, and who did not cope with corrosion problems. First of all, corrosion studies should be applied to such metal-intensive industrial fields, as chemical, oil and gas, refining, petrochemical, biotechnology, energy sector, military, water supply, aircraft and aerospace, nuclear power, pharmaceutical and medical technology, pulp and paper industry, land transportation industries, mining and metal processing industries, food and beverage industry, microelectronics industries, fossil and alternative fuel industries, and building industry.

Dr. Alec Groysman

Technion (Israeli Institute of Technology), Israel

Welcome Message

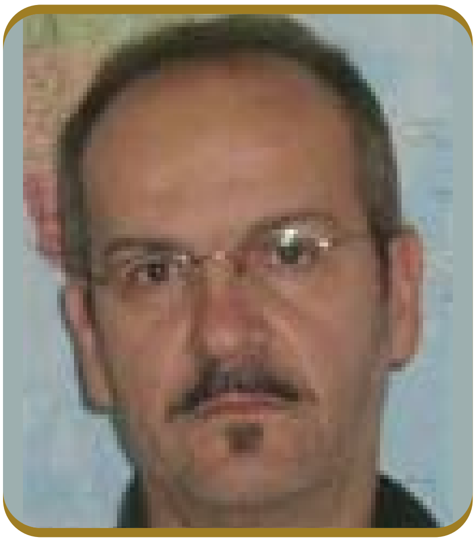
Dear congress attendants. It is an honor and pleasure to welcome you to the 16th Edition of Global Conference on Catalysis, Chemical Engineering & Technology. Heterogeneous photocatalysis using titanium dioxide represents a very important issue from the point of view of fundamental and applied science, offering new opportunities to combine science and technology for environmental purposes. The technology is optimal to remove especially recalcitrant pollutants from water such as heavy metals and metalloids, which cannot be treated by conventional methods. This low-cost technology is able to increase the knowledge of young generations and also to offer sustainable ways of controlling pollution in water, air, and soils. I hope you enjoy this relevant Conference.

Marta I. Litter

Marta Litter

University of General San Martin, Argentina

Welcome Message



It is an honor and pleasure to write a few welcome notes. Industrial-Scale Nanotechnology today makes unprecedented progress, in catalysis, energy, nanosensing, nanomedicine, materials science. The recent thrust for a decisive leap towards Green-Energy and Circular Economy opens new opportunities to adapt Industrial-Scale Nanotechnology to modern solutions via catalysis, to achieve Green-technologies and to introduce intelligent, differentiated methods to work against climate-crisis. It is not a coincidence that CO_2-mitigation via H_2-valorisation is diligently achieved in natural Photosynthesis. Since photocatalysis & electrocatalysis by nanomaterials are based on processes that try to imitate nature, it is obvious that both Industrial-Scale Catalytic Nanotechnology and Artificial Photosynthesis basically could go together. A forward-looking leap via Industrial-Scale Catalytic Nanotechnology will be the future basis for success.

Yiannis Deligiannakis

University of Ioannina, Greece

Welcome Message

It is my great honour and pleasure as an Organizing Committee Member and Speaker to invite you to join with a contribution to 16th Edition of Global Conference on Catalysis, Chemical Engineering & Technology" CAT 2023), to be held as Hybrid Event in Valencia, Spain during September 14-16, 2023. The global summit will revolve around the theme "Expedite the Future Endeavours in Catalysis and Chemical Engineering" and provides a forum for exchanging the most recent research findings and innovative research methodologies. The Conference will include Keynote speeches and Invited speeches which will be given by Distinguished Scholars and Experts from academic institutions and industry, and oral presentation by delegates and poster presentations by young junior participants.

Devoted to the rapid development of Catalysis and Chemical Engineering and Technology, the conference will bring together distinguished experts, researchers, scientist, scholars, and young students from different cultures and different countries, providing them with the opportunity to report, share, and discuss scientific questions, achievements, in these fields. This conference will provide excellent opportunity to meet distinguished scholars and experts and to exchange new ideas and application experiences, to establish research relations and collaborations for future research and projects. This conference has a wide range of Catalysis and Chemical Engineering from Catalysis and Porous Materials, Catalysis in Nanotechnology, Computational Catalysis to Catalytic Materials, Plasma Catalysis and Green and Sustainable Chemistry.

International scientific activities are big scientific platforms for the scientists from all over the world to interact and communicate with each other. As a Committee Member, I believe that CAT 2023-Conference will provide this opportunity for delegates from different cultures and countries. Also, this conference will be performed successfully, in favor of the experienced and qualified scholar and with their valuable presentations.

I am pleased to invite prospective authors to submit their original contributions to this important conference.

Yours truly,

On Behalf of Organizing Committee,

Dr. Osman Adiguzel,

Retired Professor of Physics, Firat University, Elazig, Turkey

ABOUT
MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus Group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conferences and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.

ABOUT CAT 2023

Magnus Group is hosting the "16th Edition of Global Conference on Catalysis, Chemical Engineering & Technology" from September 14-16, 2023, in Valencia, Spain. You can participate either in-person or virtually. The conference theme is "Expedite the Future Endeavours in Catalysis and Chemical Engineering," focusing on sharing the latest research and innovative methodologies in this field. The event brings together industry, regulatory, and academic leaders to discuss traditional and cutting-edge topics, technology, and applications in catalysis and chemical engineering. It's an excellent opportunity for senior experts and young researchers to network, exchange ideas, and explore career prospects. The conference features plenary talks, keynote sessions, oral and poster presentations, and promises a valuable experience for all attendees. Don't miss this remarkable conference in the field of Catalysis, Chemical Engineering, and Technology.

BOOK OF ABSTRACTS

14-16 SEPT

DAY 01

KEYNOTE FORUM

16TH EDITION OF
GLOBAL CONFERENCE ON

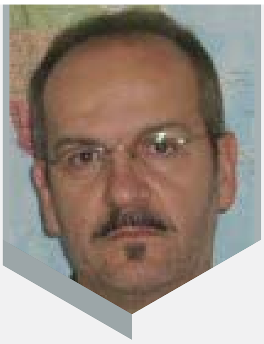
CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

Industrial scale production of high performance nanophotocatalysts: Flame Spray Pyrolysis (FSP) as a scalable technology for transition from lab to industrial engineering and the TRL hurdles

Establishing methods & protocols for synthesis of High-Performance Photocatalytic nanomaterials is a long-sought aim in science and economy. Technology-Readiness-Level (TRL) is a validation ladder that dictates the stages to achieve a successful transition from Lab towards Industrial Engineering and commercialization of research achievements. Flame Spray Pyrolysis (FSP) is an established aerosol technology for production of metal oxides at industrial level. Herein we discuss the use of FSP-technology towards production of High-Performance Photocatalysts and exemplify its connection to the advancement of Technology-Readiness-Level. Key-Performance-Indicators are highlighted in connection with the underlying nanophysics. As a working-topic we focus on Artificial Photosynthesis: currently this is considered among the most challenging high-end photocatalytic technologies, since it encompasses H_2O splitting, H_2 production and ultimately CO_2 reduction towards added-value organics. Optimizing the FSP process to each-one of these steps, plus the selectivity of CO_2 reduction towards a targeted product, pose great challenges on nano-physical chemistry, and process engineering. Defect engineering vs. lattice integrity, surface configuration vs. selectivity, cocatalyst-particle synergy vs. inhibition are among the challenges that the FSP process is owing to face and optimize. Herein we will discuss these aspects for three case-studies on innovative FSP-made oxide nanomaterials e.g. $ZrO_{2-x,}$ Cu-suboxides, $NaTaO_3$-heterojunctions. FSP reactor configurations will be discussed in tandem with the subtleties posed by the demand for multiparametric balancing of the nanoparticle properties towards competitive TRL advancement.

Audience Take Away Notes

- Technology-Readiness-Level (TRL) is linked with the ability to engineer nanomaterials at an Industrial Scale
- Efficient Nano Photocatalysts for Artificial Photosynthesis are long-sought by researchers
- Flame Spray Pyrolysis offers a versatile, scalable synthesis technology for Industrial Scale TRL advancement
- Specific engineering challenges posed by Artificial Photosynthesis will be discussed, including nanophysics-aspects, cost/efficiency aspects



Yiannis Deligiannakis

Department of Physics,
University of Ioannina, Ioannina
Greece

Biography

Yiannis Deligiannakis is a Professor at the Department of Physics of the University of Ioannina, head of the Laboratory of Physical Chemistry of Materials and the Environment. He is an elected Visiting Professor at the Department of Mechanical Engineering at ETH Zurich. He has worked at the "Democritos" Research Center, and at the Section de Bioenergetique Nuclear Research Center (CEA) of Saclay, Paris, France. He has served as President-elect of the International Humic Substances Society (2018-2020). His scientific work focuses on the development of new nanocatalysts at Industrial Scale, using Flame-Spray-Pyrolysis (FSP) technology and their applications in Green Environmental Technologies with an emphasis on "Artificial Photosynthesis" production of H_2 from H_2O and the conversion of CO_2 into next generation liquid fuels. In addition, his research includes studying the environmental behavior of new nanomaterials, understanding their environmental impacts and their life cycle. He has published >200 research articles (h=43). He holds 14 Patents in applied materials technologies.

TE/TM polarization MMI combiner based on silicon slot-waveguide technology

The study of designing a compact Transverse Electric (TE)/ Transverse Magnetic (TM) Polarization Multimode Interference (MMI) combiner based on silicon slot-waveguide technology is proposed for solving the high demands for high-speed ability along side more energy power and minimizing the environmental impact of power consumption, achieving a balance between high-speed performance and energy efficiency has become an important consideration in an optical communication system. The MMI coupler has a significant difference in light coupling for TM and TE at 1550 nm wavelength. By controlling the light propagation mechanism inside the MMI coupler, a lower order of mode can be obtained which can lead to a shorter device. The polarization combiner was solved using the Full-Vectorial Beam Propagation Method (FV-BPM) and the main geometrical parameters were analyzed using Matlab codes. Results show that after a short light propagation of 16.15 µm, the device can function as TM or TE combiner polarization with an excellent extinction ratio of 10.94 dB for TE mode and 13.1 dB for TM mode with low insertion losses of 0.76 dB (TE) and 0.56 dB (TM) and the combiner function well over the C-band spectrum. The polarization combiner also has a robust MMI coupler length tolerance of 450 nm. These attributes make it a good candidate for using this proposed device in photonic integrated circuits for improving power ability at the transmitter system.

Audience Take Away Notes

- It will help to understand how to design polarization combiner devices
- It will help them to design silicon photonic chips
- Yes, it can be used to improve the power losses which is a cause of the need of using a larger RF line
- Yes, it will improve the accuracy of the polarization combiner design

Dror Malka

Faculty of Engineering, Holon Institute of Technology (HIT), Holon, Israel

Biography

Dror Malka received his BSc and MSc degrees in electrical engineering from the Holon Institute of Technology (HIT) in 2008 and 2010, respectively, Israel. He has also completed a BSc degree in Applied Mathematics at HIT in 2008 and received his Ph.D. degree in electrical engineering from Bar-Ilan University (BIU) in 2015, Israel. Currently, he is a Senior Lecturer in the Faculty of Engineering at HiT. His major fields of research are nanophotonics, super-resolution, silicon photonics and fiber optics. He has published around 50 refereed journal papers, and 50 conference proceedings papers.

BOOK OF ABSTRACTS

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14-16 SEPT

DAY 01

SPEAKERS

16TH EDITION OF
GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

Enrico Paris[1]*, B. Vincenti[1,2], M. Carnevale[1], A. Palma[1], F. Gallucci[1], F. Quaglini[2], M.V. Migliarese Caputi[2], D. Borello[2]

[1] Council for Agricultural Research and Economics (CREA), Center of Engineering and Agro-Food Processing, Monterotondo, Italy
[2] Department of Mechanical and Aerospace Engineering (DIMA), La Sapienza University of Rome, Rome, Italy

Sorption Enhanced Water Gas Shift (SEWGS) process during biomass gasification

The research activity carried out responds to the need to find sustainable alternative energy sources. Gasification is a thermochemical energy conversion technique of biomass that allows to obtain a syngas, which can be stored or directly used as a fuel. In this work a prototypal Fluidized Bed Gasification (FBG) plant (1.5 kW) was used to thermochemically convert a waste biomass (hazelnut shells) in an H_2-rich syngas thanks to the Sorption Enhanced Water Gas Shift (SEWGS) reaction. SEWGS is an exothermic reversible chemical reaction that combines the Water Gas Shift reaction for the production of H_2 with an adsorption reaction of unwanted products (CO_2). The use of an appropriate catalyst (e.g. nickel, iron and chromium oxides, etc.) and water vapor in the syngas allows the Water Gas Shift (WGS) reaction to take place. The reaction typically occurs at temperatures between 200-400, and the use of an adsorbent material allows to subtract CO_2, pushing the equilibrium of the reaction towards the products and increasing the yield of H_2, in accordance with the principle of Le Chatelier. In particular, using a post reactor, at relatively low temperatures (200 system C) and an adsorbent/catalyst material, a syngas with 13.97% H_2 was passed to a syngas with 22.93% H_2.

Audience Take Away Notes

- The proposed work is mainly informative and shows how it can also produce a "small" gasification plant that allows the disposal of residual biomass in small farms (plant consumption of about 1.5 kg/h)
- It also shows how the proposed gasification system can be easily interfaced with a post-reactor that optimizes the production of H_2
- The proposed H_2 optimization and production work is particularly useful for those involved in:
  - Disposal of biomass
  - Altrenative energy
  - Circular Economy
  - Biohydrogen

Biography

Dr. Enrico Paris studied Analytical Chemistry at La Sapienza University of Rome (Italy) and graduated as MS in 2017, with the thesis "Development of a method for the analysis of micro-pollutants in air using adsorption traps based on activated carbon fiber and TD GC / MS analysis." In 2018 he obtains a scholarship to CREA-IT of Monterotondo and is a member since 2020 of the Italian Association of Chemists and Physicists. In 2022 he received his PhD degree cum laude in "Energy and Environment Engineering" at La Sapienza University of Rome. From 2022 he is Technologist at the CREA-IT in the LASER-B (Laboratory for Experimental Activities on Renewable Energy from Biomass). He is a reviwer and editor of numerous international scientific journals and has been a member of the scientific committee of several international conferences. He has 46 publications on Scopus and H-index equal to 7.

Maria Louloudi

Department of Chemistry, University of Ioannina, Ioannina, Greece

Hybrid molecular catalysts for industrial-scale H_2 production from C_1-substrates at near ambient conditions: Opportunities and challenges

Within the context of the forthcoming Hydrogen-Economy, catalytic H_2-production under mild, near ambient P, T, conditions from C1-substrates e.g. HCOOH, HCHO, MeOH, represents highly potent technology. A key foreseen challenge is H_2-production at high-rates i.e. Kg H_2/hour, complying with industrial-scale needs. Formic Acid (HCOOH, FA) has been already identified as an efficient H_2-storage carrier, demonstrating that catalytic FA dehydrogenation is currently an advanced H_2-production approach. Herein we discuss Hybrid-Catalytic materials based on Transition-Metals-Molecular-Catalysts, demonstrating high performance and selectivity with H_2-production rates >>103Lt/Kg catalyst/hour. We will present innovative Hybrid Molecular Catalysts for FA dehydrogenation developed by metal-complex catalysts grafted on appropriate solid matrices, which allow large-volume, continuous production of H_2, for several weeks, under ambient P, T. These Hybrid Molecular Catalysts emerge as a next generation technology i.e., when catalysts' efficiency is asked to be combined with their reusability, cost efficiency and stability. Herein we discuss highly efficient Hybrid Molecular Catalysts associated with nanoparticles, polymers, or fibers for H_2 production from HCOOH, HCHO, or CH_3OH with zero CO. Mechanistic insights will be highlighted regarding the role of initial Hydride-Metal species formation, the role/need-or-not of cocatalysts, the contribution of the support matrix, the role of inhibitory factors. Finally, we will focus on the techno-economical aspects connected with synthesis routes and key factors as metal precursors, ligands, solvents, additives in order to identify limitations that impede a putative future implementation.

Audience Take Away Notes

- Hybrid Molecular Materials represent versatile active materials for innovative applications
- Efficient, durable catalytic materials for H_2 production are of high interest for research community
- Catalytic process can gain efficiency, catalysts' reusability, and stability by using appropriately developed Hybrid Molecular Catalysts
- Specific synthetic challenges posed by large scale H_2 production will be discussed, including mechanistic aspects, techno-economical aspects

Biography

Maria Louloudi is a Professor at the Chemistry Department of University of Ioannina, Greece, head of the Laboratory of Biomimetic Catalysis and Hybrid Materials. She has worked as research fellow at University Rene Descartes/CNRS, Paris, France. Her research focuses on the development of hybrid catalysts based on molecular complexes associates with nanosurfaces, functional materials, antioxidants and biomimetics. H_2 production form C1 substrates is among the key-research topics in her lab aiming to establish connection of laboratory technologies with industrial production of H_2. In addition, her research includes understanding of the physicochemical basis catalytic mechanisms in connection with redox, plasmonic photoexcitations, and thermodynamic aspects. She has published >110 research articles and holds 18 Patents in functional materials.

Faizan Ahmad*, Danial Qadir, Humbul Suleman
School of Computing, Engineering and Digital Technologies, Teesside University, United Kingdom

Hydrogen technologies for sustainable future

Hydrogen economy relies on hydrogen as the commercial fuel that would deliver a substantial fraction of a nation's energy and services. Hydrogen technologies and policies have gained considerable attention as promising approaches for addressing energy and environmental issues. Hydrogen is a flexible and clean energy carrier that can be used in a variety of industries that includes transportation, manufacturing, and power generation. This paper provides a detailed review of hydrogen production technologies and their respective challenges. Furthermore, this paper presents a comparison of hydrogen production costs by different methods. It also presents a detailed review of hydrogen purification methods in terms of its benefits and limitation. A comprehensive summary of the global policies and roadmaps for achieving a hydrogen economy to curtail fossil fuel usage is also presented.

Audience Take Away Notes

- Overview of Hydrogen technologies and their challenges
- Cost comparison of different hydrogen production methods
- Hydrogen purification methods and their limitations
- Global policies and roadmaps for achieving hydrogen economy

Biography

Dr Faizan Ahmad is associate professor of chemical engineering and leading a research group “Hydrogen and Decarbonisation Technologies” as part of “Centre of Sustainable Engineering” at Teesside University. Faizan’s research has contributed to more than 30 peer review articles in the renowned journals. He has a patent entitled "Parameters prediction and simulation of hollow fiber membrane system". In addition, his research work has been presented in more than 20 international conferences and 3 invention exhibitions while receiving two gold medals and one silver medal. Faizan has worked on several research projects funded by Innovate UK, GCRF and ERDF in the field of industrial carbon capture, Greenhouse Gas Reduction (GGR) and hydrogen economy.

Hoda Shafaghat[1]*, Andre Selander[1], Panagiotis Evangelopoulos[2], Samina Gulshan[3], Weihong Yang[3]

[1]Division of Bioeconomy and Health, Department of Biorefinery and Energy, RISE Research Institutes of Sweden AB, SE-941 28 Pitea, Sweden
[2]Department of System Transition and Service Innovation, Unit of Resources from Waste, RISE Research Institutes of Sweden AB, SE-114 86 Stockholm, Sweden
[3]KTH Royal Institute of Technology, Department of Material Sciences and Engineering, Brinellvagen 23, Stockholm, Sweden

Catalytic pyrolysis of waste electrical and electronic equipment plastics for chemical recycling

Waste Electrical and Electronic Equipment (WEEE) constitutes one of the fastest growing waste streams globally. In Europe, almost 10 kg per capita of WEEE has been collected during 2019 and more specifically, Sweden, where this study performed, the amount collected is even higher than the average of EU, 15.1 kg/capita. This massive amount of waste cannot be excluded from the circular society that we all trying to create, therefore recovering of WEEE materials constitutes a major priority. The most common waste management techniques for WEEE materials include a series of physical separation steps such as manual detoxification by removing toxic components, then shredding, sorting, and compounding which increases the recovery of metals and flame retardants from plastic components. At the end of these processes, several plastic materials are extracted, which are difficult to be further processed by mechanical means, and therefore thermochemical recycling is needed for increasing their material recovery. As a final step, the recovery of energy is proposed since no more material recovery can be achieved with the current available technology. For instance, in Sweden, Boliden Mineral AB is operating a facility located at Boliden Ronnskar focusing on the recovery of metals from these WEEE fractions but with a limited recovery of other substances. This study aimed to improve the recycling of WEEE fractions into monoaromatic hydrocarbons and metal residues using an efficient pyrolysis system. Non-catalytic and catalytic pyrolysis of WEEE fractions were performed using a bench-scale batch pyrolyzer equipped with a fixed-bed catalytic reactor. The materials used as feedstock were real waste fractions with different copper contents processed by Boliden Mineral AB, in Sweden, to recover copper. This research studied the feasibility of thermochemical recycling of the WEEE plastics via a pyrolysis process in parallel with copper recovery. Indeed, a pyrolysis system with an efficient recycling of chemicals from WEEE can add value to the copper metal recycling process which is currently performed by Boliden Mineral AB. The pyrolysis was followed by catalytic upgrading to recover metals in solid products and monoaromatic hydrocarbons in liquid products. Metal residues from pyrolysis process can be recycled for relevant industrial applications. Besides the application of monoaromatic hydrocarbons as fuels/additives, they can be used as building blocks in chemical production industry, enhancing the resource efficiency of the metal recovery industries. Hence, the pyrolysis tests were carried out at 500°C followed by ex-situ catalytic upgrading at 450°C. HZSM-5 was used as catalyst with the feedstock to catalyst ratio of 10/1 w/w. The hydrocarbon mixture of Benzene, Toluene, and Xylenes (BTX) was considered as the target product to evaluate the process performance. The experimental results indicated that the HZSM-5 catalyst was suitable for selective production of BTX and other monoaromatic hydrocarbons from the WEEE fractions tested.

Audience Take Away Notes

- Circular economy concept in the management of Waste Electrical and Electronic Equipment (WEEE) fractions
- Role of zeolite catalyst in the conversion of wax pyrolyzates of WEEE into high-value chemicals of BTX

- Efficiency of a bench-scale batch pyrolyzer equipped with a fixed-bed catalytic reactor in chemical recycling from WEEE

Biography

Dr. Hoda Shafaghat is a Project Manager at RISE Research Institutes of Sweden, where she leads the projects combined of basic and applied science related to valorizing waste materials toward circular (bio-) economy and developing chemical processes to produce gasoline, diesel fuel, jet fuel and chemicals. She received her PhD in 2016 from the University of Malaya, where she studie d as a High Impact Research (HIR) Scholar and then held a Postdoctoral Fellowship at the University of Seoul. Her research experience is mainly on pyrolysis, biorefinery, heterogeneous catalysis, reaction engineering, catalyst synthesis/modification, and analytical chemistry.

Krisztian Lorincz*, Agota Bucsai, Janos Czirok, Georg Frater, Henrik Gulyas, Csaba Hegedus, Hasan Mehdi, Levente Ondi, Emmanuel Robe, Florian Toth, Mathieu Tschan, Benedek Vakulya, Jeno Varga

XiMo Hungary Ltd., Budapest, Hungary

Industrial scale olefin metathesis with schrock catalysts

Research into the field of olefin metathesis has led to the development of two prominent classes of catalysts known as Schrock catalysts and Grubbs catalysts. The two classes differ significantly in terms of reactivity and functional group tolerance. XiMo Hungary Ltd. (part of Verbio group), co-founded by Prof. R. R. Schrock (MIT/UC Riverside) and Prof. A. H. Hoveyda (Boston College) has developed olefin metathesis promoted by Schrock catalysts from a laboratory scale procedure into a ton scale, industrial technology with applications in fragrance and flavor, agrochemical and polymer production. Chemical transformations behind these applications include highly Z-selective cross metathesis of terminal olefins to afford internal olefins or efficient cleavage of Z double bonds via ethenolysis. The latter transformation opens up new ways to valorize natural fatty acids as renewable raw materials for the chemical industry. Novel complexes, developed to solve challenging tasks, e. g. highly E-selective cross metathesis of terminal olefins, are also demonstrated. Catalysts can be used in various forms: neat, stabilized by complexing ligands or as paraffin pellets that can be handled using standard laboratory practices, such as Schlenk technique. Several of these complexes are now made available by XiMo Hungary Ltd. not only for industrial partners, but also for the wider scientific community.

Audience Take Away Notes

- The audience will learn about the first industrial scale procedures promoted by Schrock catalysts. The examples prove that despite their sensitivity towards air and moisture these catalysts can be efficiently used under industrial circumstances using standard equipment
- Novel catalysts with unprecedented selectivities will be demonstrated
- Catalysts stabilized in various forms, developed to aid usage of Shrock catalysts in organic chemistry laboratories, thereby extending the toolbox of organic chemists, will be demonstrated
- The audience will be informed that some of the above-mentioned Schrock catalysts are now commercially available, even on a scale that allows for the development of industrial applications
- The information shared with the audience may help devise novel synthetic strategies

Biography

Krisztian Lorincz received his Ph.D. in Chemistry from Eotvos Lorand University (Budapest, Hungary) before joining XiMo Hungary Ltd. (Verbio group). XiMo, co-founded by Prof. R. R. Schrock (MIT/UC Riverside) and Prof. A. H. Hoveyda (Boston College), focuses on the synthesis and application of Schrock metathesis catalysts. In 2010/11 Dr. Lőrincz spent 6 months in Boston, USA in the laboratories of Prof. Schrock and Prof. Hoveyda to get familiar with the synthesis and use of Schrock catalysts. In the past twelve years, he has been involved in the development process that turned this field of chemistry from an exotic, laboratory scale transformation into an industrial scale production technology.

Christian Vianey Paz-Lopez*, Piyasan Praserthdam

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Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn
University, Bangkok, Thailand

Undoped and Co-doped anatase-brookite catalysts – An experimental/theoretical study of the less-studied TiO_2 mixed phase

Organic Pollutants (OrPo) removal from wastewater is challenging, due to their unique behaviour, mechanisms and side effects. Advanced Oxidation Process (AOPs) is a group methods based on pollutants mineralization by generating highly Reactive Oxygen Species (ROS), such as hydroxyl radicals (•OH). The diffusion distance of •OH ROS was determined to be between 1.3 and 2.4 nm (after the catalytic surfaces). Therefore, maintaining the OrPo inside the •OH ROS attack range (1.3-2.4 nm) is crucial. Molecular Recognition (MRec) is an essential requirement in the initial stage of organic reactions. After the MRec, molecular-orientations and Molecular-Orbitals Energy-Levels (MOrbE) will occur. In the photocatalytic systems, MRec will be performed in the catalyst-environment interface (restricted by •OH ROS at 1.3-2.4 nm above catalytic surface). This interface has been studied using a variety of theoretical approaches due to its complexity. Molecular Dynamics (MD) simulation is a powerful tool employed to explore the interface nature by assessing the surface/environment energy affinities (Ebinding) related with MRec. Thus, if the MRec is also taken into consideration as a key component, the understanding of photocatalytic systems used in AOPs wastewater treatment would be increased.

This experimental/theoretical study focused to provide additional parameters to comprehend less studied anatase-brookite mixed-phase (doped and undoped), in H_2O (aerobic/anaerobic) environments, Vis-light and OrPo Methyl Orange (MO). Nanoparticles of anatase-brookite mixed-phase (TiO_2NP) and anatase-brookite mixed-phase doping with 0.1 at% of Co (TiO_2NP-Co) photocatalysts were obtained using the sol-gel technique. Several methods (XRD, BET, SEM, HR-TEM and FT-IR) were used to characterize the morphologies and surfaces. UV-vis DRS and PL, respectively, were employed to study photo-response and electron-hole pair (e--h+) recombination. The position of the Conduction-Band (CB) and Valence-Band (VB) was determined using the Mott-Schottky plot. Finally, MD simulation was used to study the MRec of the systems, focusing on the second-order interactions (van der Waals and Hydrogen bonds) between catalysts-environments.

The results exhibit that the photoactivity in Vis-light is boosted by anatase-brookite mixed-phase. But distinct MO degradation rates in TiO_2NP and TiO_2NP-Co were exhibited, indicating that their •OH ROS generation and MO degradation behaviours are unique. The Mott-Schottky plot suggests that TiO_2NP band is thermodynamically favourable for water splitting, whereas TiO_2NP-Co is favourable toward oxygen reduction. As result, TiO_2NP-Co is favored by an aerobic environment (O_2 rich) because oxygen molecules remove electrons from CB to produce •O_2- ROS which will transform into •OH ROS.

The DM results revealed that the doping-free surfaces (121-brookite and 101-anatase) possessed an advantageous surface affinity. According to TiO_2NP ($E_{binding}$) values of, anatase is the phase that generates •OH ROS via H_2O oxidation, while brookite is the phase that strongly attracts the MO molecule toward the reaction zone (favourable MRec between MO and surfaces). The TiO_2NP-Co ($E_{binding}$) values show a reduction in affinity toward MO, indicating that MO will be less attracted to the reactive zone in this catalyst. TiO_2NP experimental/theoretical results exhibit remarkable photocatalytic degradation toward MO in both aerobic and anaerobic environments.

Audience Take Away Notes

- The crucial function of molecular recognition
- A deep comprehension of the catalytic interface
- The Interpretation of binding energies in photocatalytic systems
- The catalyst plays an unquestionable role, but the media on the catalytic surface is the other component of the system. The OrPo behavior will play a key role, as well as, the reactive media. If the surfaces are not compatible with the components in the reactive media, the photocatalytic system won't be efficient. The first approximations of the different components are equally important that the energy-levels of the catalysts
- This contribution has been addressed to analyze the photocatalytic systems (applied in wastewater treatment) from multiples point of view. The different theoretical sceneries can offer different insights on their works
- Yes, is this research that other faculty could use to expand their research or teaching
- No, this will not provide a practical solution to a problem that could simplify or make a designer’s job more efficient
- Yes, it will improve the accuracy of a design, or provide new information to assist in a design problem
- List all other benefits
    - Multiple characterizations were employed to design/build the theoretical models, which exhibited the influence of the environments in the interface space
    - The feedback between theoretical and experimental results was established. This theoretical and experimental analysis can be applied to different systems

Biography

Dr. Christian Vianey Paz Lopez studied Chemical Engineering at the Universidad Michoacana de San Nicolas de Hidalgo (U.M.S.N.H) in Mexico and graduated as MS in 2013. She received the PhD degree in 2018 at the same institution. Actually, she is in her third postdoctoral year supervised by Dr. Piyasan Praserthdam at the Center of Excellence on Catalysis and Catalytic Reaction Engineering, Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand. She has published 5 Tier-1 articles during the postdoc.

Ilhem Omri*, Saadia Gammouri, Moktar Hamdi, Maher Gtari

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Analysis of phosphoric ore bacterial and eucaryal microbial diversity by molecular tools and Small-Subunit (SSU) sequencing

Pollution of water and soils with heavy metals is becoming one of the most severe environmental and human health hazards. Therefore, the application of heavy metal-solubilizing microorganisms is a promising approach for increasing heavy metal bioavailability in heavy metal amended soils. The living communities that exist in extreme conditions have always attracted much interest from taxonomists, microbiologists, and ecologists alike. Little data was found about the microbial structure of mining residue from phosphoric ore processing and the level of cultivable microorganisms reported on these habitats is extremely low. In order to better understand the functions of the microbial community, a full description of the microbial ecosystem previously unknown is required. Recent progress in the Molecular biological tools of microorganisms for industrial purposes promises to revitalize not only the bacterial leaching of metal-bearing ores but also the microbiological treatment of metal-contaminated waste water. The aim of this study was to investigate the phosphoric ore bacterial and eucaryal microbial diversity by using culture-dependent molecular approaches.According to the highly bacterial variable V3 region of 16S rRNA sequences, bacterial species were identified as: Stenotrophomonas maltophilia, Stenotrophomonas sp and Halomicronema hongdechloris as a predominant bacteria in the miming residue. The phylogenetic analysis revealed Aphanomyces astaci Neurospora crassa Phytophthora sojae as the most common eucaryal taxa for the different sites of interest. These findings provide new opportunities into phosphoric ore microbiology that could be useful in for the bioremediation of heavy metal contaminated sewage and waste water.

Keywords: Heavy Metals, Phosphoric Industries, Microbial Community, Molecular Approaches.

Audience Take Away Notes

- The use of these bacteria and eucaryal species for the removal of metal cations can also be an interesting alternative
- The application of heavy metal-solubilizing microorganisms is a promising approach for increasing heavy metal bioavailability in heavy metal amended soils
- Better understand the functions of the microbial community in mining environment
- A full description of the microbial ecosystem previously unknown is available

Biography

Dr. Ilhem Omri is a Doctor engineer from National Institutes of Applied Sciences and Technology of Tunisia (INSAT). She is currently Municipal advisor in the City of GAFSA Tunisia. She is in charge of Health, safety and Environment committee. She received her PhD in 2013 from the University of Carthage In Tunisia where she has successfully completed her research work on “Bioprocess for H_2S removal from waste gas" at Laboratory of Microbial Ecology and Technology at National Institute of Applied Sciences and Technology and then held a Postdoctoral Fellowship at Campagny of phosphates of GAFSA. She got very good experience in designing bioreactors. She has 12 years of teaching and research experience in Microbiol process and Environmental engineering. Her research experience is mainly on Applied and environmental microbiology, Bioremediation, Bioprocess using Bioreactors, Biofilters, various Biological treatment methods for waste gas and wastewater the microbial diversity of various naturals’ ecosystems using molecular tools. She has handled more than 5 research projects funded by various companies. More than 20 students have awarded PhD and engineer degrees under her guidance. She has published papers in journals with high impact factor.

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Design of novel ZnO nanostructures for enhancing the photocatalytic degradation of organic pollutants

In recent years, photocatalysis has emerged as an eco-friendly method for the degradation of various types of organic pollutants in liquid and gas phases. More precisely, photocatalysts like Zinc oxide (ZnO) offer various advantages including low cost, chemical–physical stability, and environmental friendliness. However, this promising new catalytic platform suffers from major drawbacks such as i) fast photogenerated electron–holes recombination; ii) restricted visible-light response ability and iii) low specific surface area of photocatalysts. To address these aspects, three different strategies will be adopted. The first one consists of understanding the degradation mechanisms on molecular and particle scales while the second one entails the design of highly porous and nanostructured ZnO by hydrothermal and sol gel processes. Finally, in the third strategy the novel ZnO nanostructures are coupled with Fenton process to accelerate the degradation kinetics and improve the removal of pollutants in water flow.

Audience Take Away Notes

- The audience will be able to use the developed methods in this study to apply advanced oxidation processes such as photocatalysis and Fenton processes in wastewater treatment
- People working on the removal of recalcitrant organic molecules could use these environmentally friendly techniques to improve the efficiency of their systems without the addition of external energy
- This research gives new insights about the latest advances in Zinc oxide nanostructuration for photocatalytic applications
- This study provides new approaches to treat organic pollutants, making the design of photocatalytic reactors more facile and practical

Biography

Dr. Hamd obtained his master's degree in Catalysis and Inorganic Chemistry from Claude Bernard University/Lyon 1 in 2005. He completed his PhD in Chemical Process Engineering from the National School of Industrial Ceramics/ENSCI and the University of Limoges/France in 2009. He worked as a postdoctoral researcher at Sorbonne University, College de France, Paris Diderot University, Atomic Energy Commission/CEA and the American University of Beirut/AUB until 2014 before joining the chemical engineering department at the university of Balamand as an associate professor. He has published more than 20 papers in peer reviewed journals and participated in more than 40 scientific conferences.

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Production of zeolites by conversion of kaolin for application in the process of catalytic cracking in fluidized bed

The Fluidized Catalytic Cracking (FCC) process of petroleum is employed in the petrochemical industry to transform the heavy fractions of distillation residues into light products with higher demand and added value, such as gasoline and LPG. The FCC process employs zeolitic catalysts to promote molecular cleavage reactions and is therefore a heterogeneous catalytic process. The main zeolite used in the process, type Y, has a crystalline structure and well-defined pores. Therefore, this work has as main objective the production of Y zeolites by adaptation of the standard method IZA. Given the different and main forms of zeolites production, such as the Hydrogel process and conversion of kaolin tailings, the second option was chosen due to the fact that it presents greater product stability and efficiency. In view of the elaboration of the block diagram involving the mass balance, it was necessary to define a nominal capacity resulting in 1225 ton/day of zeolite Y. The economic viability analysis showed that the company will have an annual revenue of 6,706,875,000 USD/year and the indicators (VPL, TIR, TL and Payback) proved that the implementation of the factory in Angola is possible and feasible.

Keywords: Heterogeneous Catalyst, FCC Process, Zeolite Y, Kaolin.

Biography

Dr. Teresa Matoso M. Victor, studied Chemistry with Chemical Engineering at Northumbria University, United Kingdom 2001 and graduated 2004 with MSc in Sustainable Chemical Engineering, University of Newcastle upon Tyne, United Kingdom. She then joined research group of Prof. Galip Akay and Prof. Alan Ward, School of Chemical Engineering and Advanced Materials, for her PhD, during her studies, invented a micro-porous inert material. She obtained PhD in Chemical Engineering, with a multidisciplinary project encompassing the areas of Chemical Engineering and Biotechnology, defended her thesis 2008. Currently associate professor and Researcher at the Higher Polytechnic Institute of Technologies and Sciences, Luanda, Angola.

Hossam Ahmed Tieama
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Synthesis and characterization of modified cellulose acetate ultrafiltration membranes prepared from CA/PVP/additives/solvent used for water ultrafilteration applications

The main objective of this work is to achieve a high performance membrane with respect to flux and rejection characteristics, with good hydrophilicity and mechanical properties by blending the main polymer cellulose acetate with polymers having desired qualities. The cellulose acetate CA blending with PVP as candidate materials in the presence of ethylene glycol, Acetonitrile, glycerol, poly ethylene glycol, or di ethylene glycol as a pore forming agents (Additives), and (Acetone/Ethanol) as a solvent. Modified cellulose acetate membranes for ultrafiltration processes prepared by solvent evaporation technique. It was found that using PVP with any of these different additives can increase the membrane porosity, wettability and enhance the permeation flux by changing the membrane morphology. The average permeation flux of MCA was 742 $L/D/M_2$ at TMP 0.3 MPa and Ion Exchange Capacity (IEC) for MCA membrane was 2.7 meq /gm, with water uptake 24% at 20°C. The changes in chemical structure for MCA membranes were characterized by FTIR and The membrane structure of CA and MCA including external surface, internal surface and cross section were characterized by Scanning Electron Microscopy (SEM).

Biography

Dr. Hossam Ahmed Tieama studied Chemistry at Alexandria University, Egypt and graduated in 2000. He then joined the research group of Polymer Chemistry. He obtained his PhD degree in the field of water and waste water treatment applications using modified membranes. He is currently employed as a utilities general manager at Abu Qir Fertilizers company, and he has got 21 years of experience in the field of water treatment. He has participated in many international conferences and presented many researches in water purification applications using modified membranes. He has published in several international journals on membranes topics and continuing his research activity at the city of scientific research and technology applications.

Guodong Qi*, Qiang Wang, Jun Xu, Feng Deng
National Centre for Magnetic Resonance in Wuhan, State Key Laboratory of Magnetic Resonance and Atomic and Molecular Physics, Wuhan Institute of Physics and Mathematics, Innovation Academy for Precision Measurement Science and Technology, Chinese Academy of Sciences, Wuhan, China

Open Sn sites on Sn-Beta Zeolite and their role in MPVO reaction: A solid-state NMR study

The Meerwein-Ponndorf-Verley reduction of aldehydes and ketones and Oppenauer's oxidation of alcohols (MPVO reactions) are important reactions in selective reduction of carbonyl groups under mild conditions. Recently, MPVO reactions have been considered as the bridge that could connect biomass upgrading and chemical industry. As the most promising catalyst, Sn substituted Beta (Sn-Beta) zeolite has attracted wide attention in many processes of biomass upgrading due to its unique activity, including MPVO process. The open site ($(SiO)_3$Sn-OH), closed Sn sites ($(SiO)_4$Sn), and extra-framework SnO_2 particles are supposed can be formed on Sn-Beta zeolite, depending on the preparation method. The open Sn site has been considered as the active site for many reactions on Sn-Beta zeolite. However, the direct characterization of open Sn site and understanding of their role in biomass-related reactions are challengeable works. Here, two types of open tin sites are unambiguously identified via correlating the hydroxyl groups to Sn atoms by using of one and two-dimensional proton-detected $_{1}$H/$_{119}$Sn correlation solid-state NMR spectroscopy, which only amounts to ca. 17% of the total tin content. A reversible transformation between the open and closed tin site is observed. Additionally, we find the experimental evidence for the activation of carbonyl group of a ketone in the MPVO reaction catalysed by Sn-Beta zeolite. $_{13}$C, $_{119}$Sn, and $_{13}$C–$_{119}$Sn double resonance NMR spectroscopic studies demonstrate that only the open Sn site acetone is responsible for the activation of acetone to form a stable surface gem-diol-type species. In-situ NMR experiments together with Density Functional Theory (DFT) calculations suggest that the gem-diol-type species exhibits high reactivity and can serve as an active intermediate in the MPVO reaction of acetone with cyclohexanol.

Audience Take Away Notes

- Methodology of solid-state NMR and its application heterogenous catalysis
- This will help the audience in understanding the structure and role of metal lewis acid sites on zeolite
- This provides a practical solution to characterize the active sites on zeolites
- This will be helpful for the design of highly active zeolites catalysts in biomass conversion

Biography

Guodong Qi received his Ph.D. in Analytical Chemistry from Wuhan Institute of Physics and Mathematics (WIPM), Chinese Academy of Sciences, in 2014. He worked at WIPM after his Ph.D. In 2016, he was appointed as an Associate Professor at Innovation Academy for Precision Measurement Science and Technology, CAS. His current research interest focuses on solid-state NMR characterization of metal-modified zeolites.

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Compaction characteristics predictive model from index properties of fine - grained soils case in mekelle city, Northern part of Ethiopia

The compaction test Optimum Moisture Content (OMC) and Maximum Dry Density (MDD) has been acknowledged as an important parameter to characterize the strength/bearing capacity of earth structures. Technically, the compaction tests are carried out in the laboratory or in the field. However, in large construction sites, the test is a routine time-consuming which requires large amount of soils for laboratory testing and is infrequently performed due to the equipment needed and the fact that the field moisture content keeps changing over time. Over the years, many correlations have been developed for the prediction of OMC and MDD by various researchers. However, in this paper the data are transformed and the empirical predictive models have checked the multicoliniarity and interaction of the predictor parameter was analyzed through the NCSS software and it gives better R_2 and RMSE value compared with other models. Therefore, the objective is to develop a compaction predictive model of fine grained soil from their index properties. Accordingly, a total of 24 primary, 91 secondary standard proctor tests data and 114 secondary modified proctor test data were collected from the northern Ethiopia. Specific to this research, statistical software (NCSS-12) was employed. NCSS software has a full array of powerful software tools for regression analysis. The results show that about five (5) equations with subset selection trials for each modeling one, two and three Parameters OMC and MDD models from various soil index properties were performed. Subset selection with interaction option of the NCSS-12 statistical software is used for the task of finding variables that does a good job of predicting the dependent variable. Moreover, the unique nature of the developed models utilizes only three parameters namely percentage pass of (P200), Liquid Limit (LL) and Plastic Limit (PL) which are simple and to test than compaction tests.

Keywords: Compaction, Index Properties, Predictive Model, NCSS-12, North Ethiopia.

Abdul-Rhman H. Muhammad

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Bioluminescence: Studying the behavior of the light-off bioreporter DF4/PUTK2 as a light-on assay against lead

Recombinant bioluminescent bacteria are frequently directed towards use as environmental biosensors because it has high sensitivity, selectivity, costless, easy to use and function as rapid measurement to detect heavy metals. The bioluminescence of DF4/PUTK2 assay is based on using the bio-reporter Acinetobacter DF4/PUTK2 carrying luciferase genes luxCDABE which emit light constitutively. This can be measured in time intervals by luminometer to determine the behavior of bio-reporter against lead. The light emitted in the lead treated samples was equal or increased than the control. Therefore, the bio-reporter DF4/PUTK2 was subjected to intensive studies to elucidate its behavior with lead and if it was possible to be employed as a lead light-on assay in water in reverse order. Time exposure (5 to 990 min), lead concentration (0 to 30000 ppm), and lead salts (acetate-chloride and nitrate) were included in this study. The bio-reporter DF4/PUTK2 was more sensitive to lead concentrations range (19.25 to 15000 ppm). However, at high concentrations of lead, the light was being decreased due to cell death and/or metabolic burden simultaneously. It was possible to detect the presence of lead in water samples through light-induction in specific concentrations which add another advantage to the bio-reporter DF4/PUTK2. These biosensor systems are becoming appropriate alternatives to the traditional analytical methods including respirometry, measurement of bacterial growth inhibition, chemical analysis, and microscopic analysis. Bio-reporters provide a unique analytical capability because contaminants are quantified relative to the concentrations experienced by the bio-reporter organism as opposed to being relative to the extraction technique that is used for traditional analysis.

Audience Take Away Notes

- It was possible to detect the presence of lead in water samples through light-induction in specific concentrations which add another advantage to the bio-reporter
- Bio-reporters provide a unique analytical capability because contaminants are quantified relative to the concentrations experienced
- The luminescence tests have the advantages of being rapid, sensitive, costless and reproducible. A variety of microbial bioluminescent biosensors have been designed to detect metal contaminants in the environment

Biography

Abdul-Rhman has completed his master degree from cairo University and work as a speacialist at agricultural microbiology department at NRC and research assistant ship at at Environmental Biotechnology Department, Genetic Engineering and Biotechnology Research Institute (GEBRI). He has published paper in journal (Q1) under titile Studying the behavior of the light-off bioreporter DF4/PUTK2 as a light-on assay against lead, He received the Next Generation Scholars Scholarship, which is granted to outstanding students and top university graduates to study for a master's degree, lecturer at summer school of biotechnology, city for scientific research and technology applications from march 2018 to march 2019, Speaker at the 23rd Global Biotechnology Congress London, UK., Speaker at 10th international conference on food science and food safety & 24th Global Biotechnology Congress, Middlesex University, UK.

Shanpei Liu[1], Shiming Yu[2], Shihua Luo[2], Zhe Liu[2], Guofu Yang[2], Xueli Su[1]*

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Study on treatment and recovery of ammonia nitrogen wastewater

The production of nitric acid, ammonium nitrate, compound fertilizer, and other products, lead to producing lots of highly concentrated wastewater with nitrate nitrogen and ammonia nitrogen, which will pollute the environment and waste useful resource if discharged directly. A multi-stage electrodialysis and reverse osmosis wastewater treatment system was designed and installed by the company in 2020. Ammonia and 58% diluted nitric acid react to form ammonium nitrate throughout the production process. Ammonia nitrogen-containing steam will be created during the evaporation and concentration of ammonium nitrate, and the steam will then condense into industrial effluent that contains ammonia nitrogen. After treatment, the wastewater's ammonium nitrate content was reduced from 50g/L (20–70g/L) to within 10mg/L, its ammonia nitrogen content was reduced from 93.6g/L to within 3.5mg/L, and its conductivity was decreased from 70ms/cm to 3.4s/cm, allowing it The ammonium nitrate concentration in the concentrated water produced by electrodialysis and reverse osmosis can reach more than 100g/L and can be used again in the ammonium nitrate production system since the discharge water satisfies the discharge criteria. The treatment system can recover around 1600 t of ammonium nitrate and 127,000 t of fresh water yearly with a reuse rate of about 80%, which has significant positive effects on both the economy and the environment. In this work, the pre-treatment, multistage electrodialysis, and reverse osmosis methods for treating ammonia nitrogen wastewater from chemical industries were studied. The findings of the experiment indicated that: The removal rates for ammonium nitrate, ammonia nitrogen, and desalination are all above 99.8%, 99.9%, and 95%, respectively. The process has the advantages of short flow, simple operation, convenient maintenance, and easy mechanization and automatic control.

Audience Take Away Notes

- This paper shows the treatment and recycling of ammonia nitrogen wastewater in a chemical enterprise
- This paper provides reference for the study of industrial wastewater treatment, other faculty could use the result to expand their research or teaching
- Economic analysis of process operation is carried out

Biography

Prof. Xueli Su graduated from Nanjing University of Science and Technology, China with a B.E. in chemosynthesis and received MS in 2000 at Hubei University. She joined the research group of Prof. Wu Cai-ying at Wuhan University, did research in flavor compounds in beer and studied techniques in solid phase micro-extraction in 2003, and was supervised by Dr. Tom Brenna in 2014, studied polyunsaturated fatty acids at Cornell University as visiting scholar. Her research group has been funded by the local government and these grants have supported work in environmental and green chemistry and published more than 40 research articles in journals.

Prof. Shanpei Liu, male, born in 1978, Ph.D. and Associate Professor of Environmental Engineering, School of Environmental Science and Engineering, Nankai University; Mainly engaged in water pollution control and resource research. Published more than 20 papers, some of which were included by SCI and CA; He presided over and participated in more than ten scientific research projects at provincial, municipal and university levels.

14-16 SEPT

DAY 01

POSTERS

16TH EDITION OF
GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

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Application of a new generation of triazine-based coupling reagent in medicinal chemistry

Amide bond formation is an important transformation in organic synthesis. These bonds are often present in many active derivatives characterized by a variety of pharmacological activities, e.g. anti-inflammatory, analgesic, antimicrobial or anticancer. The amide group is also a useful intermediate for the synthesis of various biologically active molecules.

Several methods of amide formation have been developed recently. One method is the rhodium-catalyzed amidation of benzoic acids with isocyanates by activation/functionalization of the C-H bond, followed by decarboxylation. The use of rhodium (III) also allows the formation of amides from isocyanates and anilide or enamide. Another method is the synthesis of thioamides from aromatic carboxylic acids and isothiocyanates, which is mediated by palladium. The formation of an amide from a carboxylic acid and an isothiocyanate also occurs under high-temperature conditions in the range 160-170°C, but the yield is low in many cases due to the decomposition of the isothiocyanates at high temperature. The formation of amides from amines and carboxylic acids is also used under thermal and microwave conditions, but, although the catalyst-free approach is practical in many cases, the range of substrates is quite limited. In fact, the formation of carboxamides from carboxylic acids requires the initial activation of the carboxyl group.

Here we presented efficient coupling reagent, which was primarily designed for the synthesis of peptides and then used by us to obtain new active benzamide compounds. It is triazine-based molecule (4-(4,6-dimethoxy-1,3,5-triazin-2-yl)-4-methylmorpholinium tetrafluoroborate) aimed to work according to the concept of creating "superactive esters". This reagent was successfully used for synthesis of dipeptides in 80-100% yield and with high enantiomeric purity. It was therefore applied to the solid phase synthesis of benzene analogues of distamycin, obtaining the expected products in good yields. This reactant has great potential and can find wide application in many syntheses of both peptide and amide bonds.

Audience Take Away Notes

- The results presented enrich the knowledge of the directions of development of medicinal chemistry and methods of obtaining new active substances
- The audience will be able to broaden their knowledge of a new compound with interesting activities
- This research may inspire other scientists to extend their research in new directions, e.g. synthetic chemists to use this substance in their synthetic work

Biography

Dr. Drozdowska studied Chemistry at the Warsaw University, Poland and graduated as MS in 1989. She then joined the research group of Organic Chemistry, Medical University of Bialystok, Poland. She received her PhD degree in 1999 at the Medical University of Lublin, Poland and habilitation in 2012 at Medical University of Lodz, Poland. After that she obtained the position of an Associate Professor at the Department of Organic Chemistry at Medical University of Bialystok, Poland. She has published about 50 research articles in SCI(E) journals and promoted four doctors of pharmaceutical sciences as well as close to thirty master's theses.

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Development of a solid biocatalyst through the immobilization of laccase enzyme on a chemically modified polylactic acid support

Laccase enzyme is a non-specific oxidoreductase that has great potential in the pharmaceutical, food, chemical and environmental industries. This enzyme, which is mainly produced by lignolytic fungi, catalyses oxidation-reduction reactions of compounds of phenolic basis, among which are a diversity of emerging contaminants of pharmaceutical use. Unfortunately, like other enzymes, its use in its soluble form is limited, by some intrinsic properties of free enzymes, such as high sensitivity to changes in solvent, pH or temperature, low stability, non-reuse, and high cost of production, which makes laccase treatment not viable. Immobilizing laccase has proven to be the most direct way to overcome these problems.

There are numerous methods to immobilize enzymes, however, covalent immobilization on a support is one of the most studied and the one that has achieved the best results in terms of enzyme activity. The supports used must have functional groups that can form covalent bonds with specific amino acid groups of the enzyme without losing activity. In addition, the support must be innocuous to the reaction medium and stable.

One of the materials that has attracted attention is polylactic acid, which is used in 3D printing (also known as additive manufacturing), a fabrication process employing layer-by- layer deposition of materials to produce complex 3D structures with a high flexibility in design and minimal waste of material, which has found applications ranging from the aerospace and construction industry to smart materials, medicine and biotechnology. The problem is that the materials used lack the functional groups required for the interaction between the enzyme and the support. In this area, the chemical modification of printed materials is attracting more and more attention, since, by modifying printed carriers, enzymes can be immobilized on them. Thus, the development of versatile methods for chemical modification has the potential to provide low-cost, efficient enzyme immobilization approaches.

In this study, the immobilization of the enzyme laccase on a chemically modified PLA carrier was evaluated in order to find optimal conditions that allow the maintenance of the catalytic activity of the enzyme. For this, the material was subjected to a process of aminolysis and then activation with glutaraldehyde groups, finally the soluble enzyme was added to the material, causing the covalent bonding between the amino groups of the enzyme and the glutaraldehyde of the support. To determine the efficiency of the process, the activity of the soluble enzyme in the medium before and after immobilization was measured, as well as the activity of the immobilized biocatalyst, using the ABTS (2,2'-azino- bis-(3-etilbenzotiazolin-6-sulfonato)) substrate, through the measurement of the initial rate of hydrolysis in a spectrophotometer, at a suitable temperature and pH.

Audience Take Away Notes

The audience will learn how to transform a material into a biocatalyst with immobilized enzyme that can be used to catalyze oxidation-reduction reactions using the laccase enzyme, which have application in the elimination of pollutants of phenolic basis, solving problems at industrial and environmental level. With this, other researchers will be able to use this technology to immobilize other enzymes to a support

Biography

Dr. Carola Bahamondes studied Biochemical Engineering at Pontificia Universidad Católica de Valparaíso, Chile. She received her PhD degree in 2014 at the same institution. After three years postdoctoral at the same University, where she specialized in enzyme immobilization, worked as chief researcher in a private laboratory. She currently has a position as Assistant Professor at Universidad Tecnológica Metropolitana, has been adjudicated several projects and has published several researches in the area of Biocatalysts.

Siddhartha Seenivasagan, Sung-Chyr Lin*
Department of Chemical Engineering, National Chung Hsing University,
Taichung, Taiwan

Cellulose-based metal chelate-epoxy bifunctional adsorbent for concomitant purification and covalent immobilization of his-tagged trehalose synthase

The development and application of cellulose-based metal chelate-epoxy bifunctional adsorbent for the concomitant purification and immobilization of enzymes will be presented. Upon β-cyclodextrin grafting, the adsorption capacity of the cellulose-based metal chelate adsorbent for the model protein, recombinant His-tagged trehalose synthase, was increased by more than ca. 160% from 6.45 ± 0.01 mg/g to 16.97 ± 0.01 mg/g. While the adsorption capacity of the Ni^{2+}-loaded adsorbent exhibited the highest adsorption capacity of 17.46 ± 0.21 mg/g, the immobilized enzyme prepared with the Zn^{2+}-loaded adsorbent had the highest specific activity, 21.47 ± 0.94 U/g, indicating that Zn^{2+} had the highest selectivity for the His-tagged trehalose synthase. The adsorption of the model protein essential followed the Langmuir isotherm model. A series of metal chelate-epoxy bifunctional adsorbents with distinct [metal chelate group]/[epoxy group] ratios were prepared by adjusting the reaction time and iminodiacetic acid concentration accordingly. An ideal bifunctional adsorbent should contain both high level of metal chelate groups for selective adsorption of His-tagged protein and enough epoxy groups for the formation of covalent linkages with the adsorbed protein molecules. Although the bifunctional adsorbent with the highest [metal chelate group]/[epoxy group] ratio exhibited the highest metal chelating capacity and adsorption capacity for the enzyme, the lack of epoxy groups limited its utility for the subsequent covalent immobilization of the adsorbed enzyme. The bifunctional adsorbent with a [metal chelate group]/[epoxy group] ratio of 1.20 was found to exhibit a sound protein adsorption capacity of 8.17 mg/g and an immobilization yield of 62.6%. The immobilized enzyme thus prepared exhibited superior operational stability, retaining 90% of the initial activity after 20 cycles, in a repeated-batch process for the conversion of maltose to trehalose. The employment of the metal chelate-epoxy bifunctional adsorbent can significantly facilitate the process of the preparation of immobilized enzymes.

Audience Take Away Notes

- Grafting of beta cyclodextrin increased the adsorption capacity of the adsorbent by 162%
- The bifunctional adsorbent with a [metal chelate group]/[epoxy group] ratio of 1.20 was found to exhibit both a sound protein adsorption capacity and high immobilization yield
- The immobilized enzyme prepared with the bifunctional adsorbent exhibit superior operational stability in repeated-batch process
- The employment of the bifunctional adsorbent for concomitant selective adsorption and covalent immobilization can significantly facilitate the process for the preparation of immobilized enzymes

Biography

Dr. Lin studied Chemical Engineering at National Cheng Kung University, Taiwan and graduated as BS in 1985. Upon completing the military service, he joined the research group of Prof. George Georgiou at the University of Texas at Austin, USA, where he received his PhD degree in 1993. He joined the Department of Chemical Engineering at National Chung Hsing University, Taiwan as an Associate Professor in 1994. He has published numerous papers in the fields biosurfactants, bioseparations, and enzyme immobilization in SCI journals.

BOOK OF ABSTRACTS

14-16 SEPT

DAY 02

KEYNOTE FORUM

16TH EDITION OF
GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

Application of metal single-site zeolite catalysts in catalysis

The metal ions well dispersed at zeolite framework are considered to be active sites of catalytic processes. Therefore, the incorporation of these metals into zeolites as isolated tetrahedral sites appears to be the important task. We have earlier shown that the incorporation of transition metal ions into vacant T-atom sites of framework zeolite is strongly favored when, in the first step, zeolite is dealuminated by treatment with nitric acid solution and then, in the second step, the incorporation of transition metal ions results in the reaction between the cationic metal species of the precursor solution and the SiO-H groups of vacant T-atom sites created by dealumination of zeolite. During my keynote talk the design of single-site zeolite catalysts with transition metal will be described and characterized by different physical techniques both at the macroscopic (XRD, BET, TPR, TEM) and molecular level (FT-IR, NMR, DR UV-Vis, XPS, EPR, XAFS). The application of metal single-site zeolite catalysts in environmental catalysis will be discussed. This two-step postsynthesis method applied in this work allowed obtaining metal single-site zeolite catalysts active in different catalytic processes such as oxidative dehydrogenation of propane into propene, selective catalytic reduction of NOx to N_2, production of 1,3-butadiene or hydrogen from renewable sources, including ethanol obtained from biomass. Their catalytic activity strongly depended on the speciation and amount of metal incorporated into zeolite structure as well as their acidity.

Audience Take Away Notes

- The audience will be able to understand as control of preparation of catalyst systems
- They will see that catalytic activity depend on dispersion of metal in the framework of zeolite
- The researchers will be able, after my talk, do their own catalyst preparation using similar method

Stanislaw Dzwigaj

Sorbonne Universite, UMR, Laboratoire de Reactivite de Surface, France

Biography

Professor Stanislaw Dzwigaj received his PhD degree in 1982 in Jerzy Haber Institute of Catalysis and Surface Chemistry, Krakow (Poland). After two years of postdoctoral stay at the Laboratoire de Reactivite de Surface Universite P. et M. Curie (Paris) he obtained in 1990 a position of contracted researcher in the same Laboratory devoted to surface reactivity in relation to catalysis phenomena. Then, in 2008 he obtained permanent position in CNRS as a researcher. On February 19, 2014 for outstanding scientific achievements he received the title of professor. His published work includes more than 170 papers published in reputable international journals.

Green hydrogen by 2030 in UK

Green hydrogen is increasing rapidly across Europe with the UK highly involved in the electrochemical catalysts required. This year is significant because proof is emerging that electrolysis based on solar and wind power can produce green hydrogen that can compete economically with fossil fuels such as diesel. Both the fuel cell and the electrolyser technologies are important, requiring precious metals at present. The paper describes the supply chain issues, especially matching the hydrogen applications in transport and built environment.

Audience Takeaway Notes

- The audience will see the connection between fuel cell and electrolyser green technologies
- Both the fuel and oxygen electrode catalyst performance will be revealed
- The research covers the supply chain principles from renewable energy availability to utilization of the product green hydrogen
- The priorities needing attention are explained in detail

Kevin Kendall

HydrogenUnited.org,

United Kingdom

Biography

Dr. Kevin Kendall received his Surface Physics PhD in 1970 from the Cavendish Laboratory, University of Cambridge, UK. He then worked in industry at British Railways and ICI while continuing academic research in Australia, USA and Britain, ultimately starting his own spin-out company Adelan in 1996. He was elected Fellow of the Royalm Society in 1993 and has published about 400 papers and Patents, including 5 books.

Interface design for circular bio-composites: Sensing the failure

The performance of fiber-reinforced polymer composites is determined by the interface compatibility. In particular, the hydrophilic nature of cellulose fibers dispersed in a hydrophobic matrix requires additional surface modification as traditionally done with chemical surface grafting and hazardous solvents. Taking into account the environmental friendliness of cellulose composites, however, more sustainable routes are required to operate under aqueous environment and utilization of biopolymer substitution. Therefore, the use of polydopamine as adhesive mediator has been explored in providing a general platform to functionalize cellulose fibers. In this presentation, different conformations for surface modifications of cellulose fibers with dopamine are illustrated for enhancing compatibility. This is done either by self-polymerization of polydopamine into a compatible surface layer and/or the self-assembly of dopamine functional groups into vesicular structures that are physically adsorbed at the cellulose surface. After a study on the surface adhesion of modified cellulose fibers, they were incorporated in PMMA matrix through solution casting. The local adhesive properties of the modified cellulose fibers were probed by atomic force microscopy and seem to contribute to higher interfacial shear strength. This was confirmed by the single-fiber pull out tests at macroscale indicating an optimum concentration of nanoparticles at the cellulose surface. The tensile strength and elongation at break of the composites were function of the degree of surface modification and superior to untreated fibers. In addition, the nanoparticles show colorimetric and fluorescent response to mechanical shear stresses providing an evaluation tool to explore the interface phenomena upon failure of the PMMA composite. The reversibility of the interface for debonding can be regulated through solvatation under appropriate pH conditions.

Audience Take Away Notes

- Novel concept for regulating interface adhesion in biocomposites
- Analytical evaluation of the local stress state in the interface
- Analytical prediction of failure mechanisms in the interfaces
- Debonding of the interface for improved recyclability of fibers and matrix

Pieter Samyn

Department of Innovations in Circular Economy and Renewable Materials, SIRRIS, Leuven, Belgium

Biography

Dr. Pieter Samyn received Ph.D. in Materials Science and Engineering 2007 at Ghent University and followed an academic career at University Freiburg and Hasselt University, until 2021 when he joined the collective research center Sirris as a Senior Research Engineer. He has broad experience on the synthesis, processing and characterization of bio-based materials for composite and coating applications. His research focusses on surface functionalization and he subsequently led research projects on bio-inspired adhesion mechanisms, functional coatings for paper substrates and the development of (nano)composite materials from bio-based building blocks (cellulose, biopolymers).

Shape reversibility and temperature deformation relations in shape memory alloys

Shape memory alloys take place in a class of adaptive structural materials called intelligent or smart materials by exhibiting a peculiar property called shape memory effect and superelasticity with the recoverability of two shapes at different conditions. Shape memory effect is initiated with thermomechanical treatments on cooling and deformation and performed thermally on heating and cooling, with which shape of the material cycles between original and deformed shapes in reversible way. Deformation in low temperature condition is plastic deformation, with which strain energy is stored in the materials and released on heating by recovering the original shape. This phenomenon is governed by the thermal and mechanical reactions, thermal and stress induced martensitic transformations. Thermal induced martensitic transformations occur on cooling with cooperative movement of atoms in <110 > -type directions on a {110} - type plane of austenite matrix, along with lattice twinning reaction and ordered parent phase structures turn into the twinned martensite structures. The twinned structures turn into detwinned martensite structures with deformation by means of stress induced martensitic transformations.

Superelasticity is performed in only mechanical manner with stressing the material and releasing in the parent austenite phase region, and shape recovery occurs instantly upon releasing, by exhibiting elastic material behavior. Superelasticity is performed in non-linear way, loading, and releasing paths are different at the stress-strain diagram, and hysteresis loop refers to the energy dissipation. Superelasticity is also result of stress induced martensitic transformation and ordered parent phase structures turn into the detwinned martensite structures with stressing. Shape memory alloys are deformed in the low temperature condition for thermoelasticity, and they are stressed and released in parent phase region for superelasticity. Stressing or deformation at different temperatures exhibit different characteristics at stress-strain diagrams, beyond shape memory effect and superelasticity.

Copper based alloys exhibit this property in metastable beta-phase region. Lattice twinning is not uniform in these alloys and cause the formation of unusual complex layered structures, depending on the stacking sequences on the close-packed planes of the ordered parent phase lattice, depending on the stacking sequences on the close-packed planes of the ordered parent phase lattice. The layered structures can be described by different unit cells as 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice.

In the present contribution, x-ray diffraction and Transmission Electron Microscopy (TEM) studies were carried out on copper based CuZnAl and CuAlMn alloys. X-ray diffraction profiles and electron diffraction

Osman Adiguzel

Department of Physics, Firat University, Elazig, Turkey

Biography

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has been retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Also, he joined over 120 virtual conferences in the same way in pandemic period of 2020-2022. He patterns exhibit super lattice reflection. X-ray diffractograms taken in a long-time interval show that diffraction angles and intensities of diffraction peaks change with the aging duration at room temperature. This result refers to the rearrangement of atoms in diffusive manner.

Keywords: Shape Memory Effect, Martensitic Transformation, Thermoelasticity, Superelasticity, Twinning, Detwinning.

Audience Take Away Notes

- Shape memory alloys are functional materials and used in many fields from biomedical to the building industry
- This is a multidisciplinary conference, and I will introduce the basic terms and definition at the beginning of my talk and continue with experimental results

supervised 5 PhD- theses and 3 M. Sc- theses. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

14-16 SEPT

DAY 02

SPEAKERS

16TH EDITION OF
GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

Erik Christensen[1]*, Rolf W. Berg[2], Niels J. Bjerrum[1]
[1]Department of Energy Conversion and Storage, Technical University of Denmark, DK-2800 Kgs. Lyngby, Denmark
2DTU Chemistry, Technical University of Denmark, Kemitorvet, DK-2800, Kgs. Lyngby, Denmark

CH_4 and CH_3OH by co-electrolysis of CO_2 and H_2O at intermediate temperatures using bifunctional catalysts

A setup for steam electrolysis as well as steam electrolysis combined with CO_2 reduction at "Intermediate temperature" (240 -300°C) and elevated pressures (up to 30 bar) was constructed. This temperature range is placed in between the temperature range for Proton Exchange Membrane (PEM) electrolysis and alkaline electrolysis (up to 90°C), and the Solid Oxide Electrolysis (SOEC) range 700-900°C. This range is particularly Interesting for CO_2-H_2O co-electrolysis for synthesis of organic compounds (Power-to-X), as it is the range where such compounds are prepared by classical methods. The desired compounds are thermally stable, and low overvoltages for electrochemical reactions may be obtained.

The special characteristics of the process are: A) A solid electrolyte based on a proton conducting phosphate (CsH_2PO_4) – allowing for use at the temperature range mentioned.

B) The capability of applying a water vapor pressure above 1 bar, up to at least 10 bar, which is necessary to prevent the CsH_2PO4 from dehydrating and thereby loose its conductivity.

By this setup we have demonstrated direct synthesis of methane from co-electrolysis of CO_2 and water in a one-step process at more than 90% current efficiency and a low cell voltage, starting from a value as low as 1.3V for small current densities. The cathode material was nickel, which has been demonstrated to produce hydrogen both by a direct electrochemical reduction and by a chemical reaction between CO_2 and H_2 generated by the electrolysis. Recently we demonstrated production of methanol in a one-step process, using a bifunctional cathode consisting of a combination of platinum or nickel and a classical copper methanol catalyst. The system was operated with current densities of up to ca. 100 mA/cm^2 with a voltage of less than 2 volts producing methanol with a Faradaic efficiency of up to ca. 7%. As this is a new type of process, all components are under re-developmenet (Electrodes, electrolytes, bipolar plates, gasket materials, cell design, stack design).

Audience Take Away Notes

- A completely new concept for CO_2-H_2O co-electrolysis and water electrolysis (Power-to-X) have been demonstrated, so far in lab scale. It has led to the introduction of bifunctional catalysts/electrodes for formation of simple organic products at 240°C to 300°C
- The chance to find sufficiently active alternatives to Pt and IrO_2 in acidic electrolysis are improved compared to the possibilities for PEM electrolysers
- It opens new opportunities for research in electro-catalysts, as the data for the new temperature range so far are very limited
- In a similar way it opens new opportunities for research in bifunctional catalytic-electrocatalytic materials and processes

- Yes, this provide a practical solution to a problem that could simplify or make a designer's job more efficient
- Yes, it will improve the accuracy of a design, or provide new information to assist in a design problem
- List all other benefits
    - The results indicate that it is possible to store electrical energy as organic fuels in a one-step process instead of a two step process, i.e. first making hydrogen by electrolysis, and then react it with CO_2 in a separate reactor

Biography

Dr. Erik Christensen studied at the Technical University of Denmark (DTU), and graduated in 1983. He joined the Material Science Group of Prof. Niels J. Bjerrum at the Department of Chemistry, DTU, and received his PhD degree here in 1987. He continued to work there as assistant professor, but was then employed by the Danish company Danfoss, but still working at DTU on various collaboration projects until 2007. He then went back to DTU employment, now as a Senior Researcher to change his field to water electrolysis using various types of proton conducting solid electrolytes.

Stefan Muller[1,2]*, Peter Kucmierczyk[1], Robert Franke[1,2]

[1]Evonik Operations GmbH, Marl, Germany

[2]Department of Theoretical Chemistry, Ruhr-University Bochum, Bochum, Germany

Synthesis, reactivity and stability investigation of new ligands for the alkoxycarbonylation

The synthesis of carboxylic acids is of high importance for the chemical industry, as the resulting products can be found in multiple fields like pharmacy, cosmetics, polymer industry and other. The alkoxycarbonylation represents a very important reaction for these products as acids and esters are obtained via a one-step reaction by using olefins.

The synthesis pathway of new diphosphine ligands based on the structure of 1,2-(bis((tert-butyl (2-pyridyl) phosphaneyl) methyl) benzene and the reactivity for a general palladium-catalyzed alkoxycarbonylation of different alkenes is presented. Terminal, internal and sterically demanding olefins are converted to linear esters with high yields. Key-to-success is the variation of the above mentioned ligand structure by introducing different substituents to an aromatic ring, resulting in an increase or even a decrease in reactivity. Additionally, the stability of the ligands is investigated via NMR and quantified via qNMR.

Especially the addition of a methyl group to the para position in relation to the phosphorous atom results in an increase of the reactivity and a high increase in relation to the stability.

Audience Take Away Notes

- These results could be meaningful for other researchers to take a second look at already known and high performing ligands to make these even better, just by the introduction of small substituents
- It could help the audience by getting in touch with the problems and challenges of industrial processes and maybe give ideas to take another look at specific values that are not only interesting for academic research
- The influence of the substituents is not fully understood now, but as far, as it is, it could be used in various fields, like the calculation of a ligands potential with help of theoretical chemists
- The combined investigations of reactivity and the in-situ measurements give an idea of what should be improved and how it is able to do it. At least it has not only the potential to make the process more profitable. It also provides the possibility to make the process more efficient and less resource consuming

Biography

Stefan Muller studied Chemistry at the Westphalian University and the Ruhr-University Bochum, Germany and graduated as M. Sc. in 2019. In the same year he joined the R&D department of Prof. Franke at Evonik, where he is working on the development and application of new ligands for the homogeneous catalyzed alkoxycarbonylation.

Paul Somerville

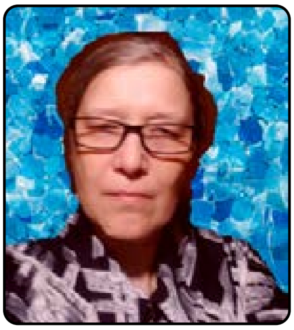
Home lab GatesheadTyne and Wear, United Kingdom

Evolving our knowledge of chemical and natural reactions involved with climate change, to help us find new ways to lessen its impact

Tackling climate change is the most urgent challenge we face, our efforts to stabilize temperatures so far have not had any impact. The purpose of this presentation is to explain my research findings. Over the course of many years, my understanding of how the atmosphere works, has evolved to a very high level of expertees. My talk will cover a lot of ground, explaining the atmospheric processes involved with greenhouse gasses, using references in various areas of science, highlighting the potential of water to help us combat climate change, and uncovering some of its many mysteries. One example is how it defies the laws of thermodynamics, put a cup of hot water in a room warmed to 20 degrees celsius, it will cool to approximately 10 degrees, going beyond our understanding of high to low.

Biography

Paul Somerville has completed 25 years, studying science independently, attending Newcastle college in 2005, to gain an educated understanding of his scientific knowledge. In June 2018 he participated in the GCGW in Turkey, where he gave two presentations (global warming could we be missing some important factors) and (heat exchange liquid to gas and investigating the potential of a dual ac converter). In April 2019, he attended the GCGW conference in Doha, Qatar. Resulting in a paper published with inderscience. Experimental analysis of carbon monoxide to establish the origin of dissolved gasses in water, and their role in weather anomalies. He found that his scientific understanding needed to improve and has spent the time since the conference, evolving his knowledge.



Milyute Elena[1]*, Milyus Algimantas (Alius)[2]

[1]International Research Group “LITAVEM-3”, Head of IRG “LITAVEM-3”, Vilnius, Lithuania

[2]International Research Group “LITAVEM”, Researcher-Consultant of IRG “LITAVEM”, Vilnius, Lithuania

Characterization of lonsdaleite as an indicator of crystal growth according to the laws of vortex dynamics of a spherical vortex

A variety of three forms of lonsdaleite was identified and studied during the crystallochemical formation of crystals in the bowels of the depth plasma fluid. From the study of the crystal-chemical and geometric properties of the minerals of kimberlite pipes and volcanic formations, and based on the spatial geometric crystallography and physics of "slow" fluids, it was found that these initial stages of formation cause the growth of crystals both along the faces and through sectorial regions according to the laws of "direct” spherical vortex, and “turned inside out direct” spherical vortex. Namely, the crystals, through lonsdaleite, that carry the genetic and morphological information about past pulsation processes in the depth plasma fluid interacting with the Earth's crust during movement and cooling. An analytical mathematical conformal analysis of the distribution and change of the density (viscosity) of its own "semi-frozen fluids" in the crystals themselves was carried out for the cases of two, three and four "chambers" of some crystals, characterizing the formation, structure and development of lonsdaleite according to the characteristic proposed by V. Milyuvene.

Biography

Milyute Elena – professional scientist-researcher in the field of Natural Science and Mathematics

Ashanendu Mandal
Energy Expertise and International Speaker, University of Calcutta, India

Removal of phenol from wastewater using biological and industrial wastes as adsorbents

This research aims for adsorptive removal of phenol from wastewater by solid materials generated from biological wastes viz. guava tree bark, rice husk, neem leaves, activated carbon from coconut coir and industrial wastes viz. rice husk ash, red mud, clarified sludge from basic oxygen furnace, activated alumina. The adsorbents are characterized by SEM, XRD, FTIR and BET analyzers. The experiments of phenol removal are carried out with the variation of initial phenol concentration (5-500 mg/L), initial pH (2-12), adsorbent dose (0.10-20 gm/L), temperature (25°C-50°C) and contact time (30-600 min). The maximum removal obtained is 97.50%. The kinetics shows that the pseudo-second order model is best fitted for all adsorbents except red mud. The kinetic modelings show that the adsorption mechanism is supportive of film diffusion, intra-particle diffusion and chemisorption for all adsorbents. The isotherm analysis suggests that Freundlich isotherm model is best supportive for guava tree bark, rice husk, neem leaves, activated carbon, red mud and activated alumina, whereas Langmuir and D-R isotherm are best supportive for rice husk ash and clarified sludge respectively. The thermodynamics shows the spontaneity, randomness and endothermic/exothermic nature of the adsorption processes. The ANN modelling using two popular algorithms viz., Levenberg-Marquardt and Scaled Conjugate Gradient establishes that the experimental and predictive data are within allowable range. The scale-up designs are performed for their commercial applications. The regeneration and the safe disposal of used adsorbents are also studied for checking their wider industrial applicability.

Biography

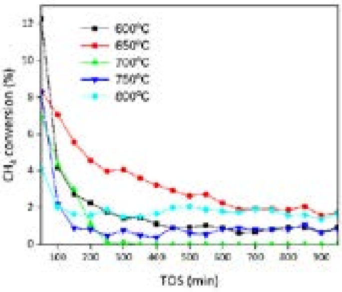
This research aims for adsorptive removal of phenol from wastewater by solid materials generated from biological wastes viz. guava tree bark, rice husk, neem leaves, activated carbon from coconut coir and industrial wastes viz. rice husk ash, red mud, clarified sludge from basic oxygen furnace, activated alumina. The adsorbents are characterized by SEM, XRD, FTIR and BET analyzers. The experiments of phenol removal are carried out with the variation of initial phenol concentration (5-500 mg/L), initial pH (2-12), adsorbent dose (0.10-20 gm/L), temperature (25°C-50°C) and contact time (30-600 min). The maximum removal obtained is 97.50%. The kinetics shows that the pseudo-second order model is best fitted for all adsorbents except red mud. The kinetic modelings show that the adsorption mechanism is supportive of film diffusion, intra-particle diffusion and chemisorption for all adsorbents. The isotherm analysis suggests that Freundlich isotherm model is best supportive for guava tree bark, rice husk, neem leaves, activated carbon, red mud and activated alumina, whereas Langmuir and D-R isotherm are best supportive for rice husk ash and clarified sludge respectively. The thermodynamics shows the spontaneity, randomness and endothermic/exothermic nature of the adsorption processes. The ANN modelling using two popular algorithms viz., Levenberg-Marquardt and Scaled Conjugate Gradient establishes that the experimental and predictive data are within allowable range. The scale-up designs are performed for their commercial applications. The regeneration and the safe disposal of used adsorbents are also studied for checking their wider industrial applicability.

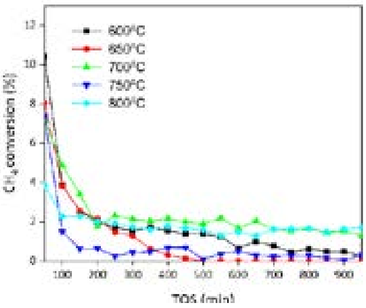
Jhonattan D. Manosalvas Mora*, A.K.M. Kazi Aurnob, James J. Spivey

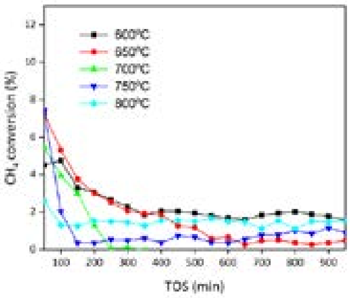
Louisiana State University and Agricultural and Mechanical College, Baton Rouge (LA), United States of America

Effect of solid acids in methane aromatization

Methane Dehydroaromatization (MDA) reaction is typically catalyzed by a bifunctional Mo/H-ZSM-5 catalyst to produce benzene from methane ($6CH_4 \rightarrow C_6H_6 + 9H_2$; ΔGo=432.5 kJ/mol). This reaction is one of the most complex problems of catalysis because of thermodynamic limitations (carbonaceous depositions) which are inevitable in deactivation. MDA is catalyzed by two sites: (a) a metal (typically Mo), and (b) an acid (typically H-ZSM-5). In this presentation, we will describe what solid superacids are, their main characteristics, and introduce the use of $Mo/WO_3/ZrO_2$ (Mo/W/Z) solid superacid catalysts in MDA instead of the widely used H-ZSM-5 with experimental results with three different molybdenum loadings (1% (wt.) Mo, 3% (wt.) Mo, and 6% (wt.) Mo). For this purpose, a series of reactions (TOS = 1000 min) were completed in two stages. Mo carburization ($MoO_3 \rightarrow Mo_2C$) was the first step. The second step involves MDA with CH_4 as the only reactant at temperature ranges from 600°C to 800°C at 50°C intervals, constant pressure (atmospheric) and 1500 mL/g·h (space velocity). The main organic products at each temperature were ethylene, ethane, propylene, and benzene. The fresh, carburized, and spent samples were characterized by XRD, XPS, BET, NH_3-TPD, pyridine DRIFTS, EXAFS, and XANES. Partial results show the conversion drops drastically in all the samples after 400 min. 6% (wt.) Mo/W-Z at 600°C has the highest CH_4 conversion (12.3% at TOS = 50 min), but it shows more thermostability and lower deactivation rate at 650°C. The conversion achieved by methane within the first 100 minutes (at the same space velocity) is 15.8%[1,2] with H-ZSM-5 which shows a big potential of WO_3-ZrO_2 catalyst.





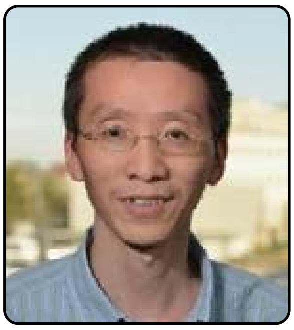


Audience Take Away Notes

- Recognize about the importance of Benzene in the chemical industry
- Learn about the Methane aromatization reaction
- Understand what solid super acids are
- Comprehend the application of solid super acids in methane aromatization reaction (specifically the use of Mo/WO_3-ZrO_2 catalyst)

Biography

Jhonattan Manosalvas finished his undergrad program of Chemical Engineering at Central University of Ecuador in 2018. He joined the graduate program of Department of Chemical Engineering at LSU in spring 2021. Since then he has worked in the methane aromatization reaction within the research group of Dr. James Spivey.



Haibo Ge
Department of Chemistry & Biochemistry, Texas Tech University, Lubbock, Texas, United States of America

Distal functionalization via transition metal catalysis

The ubiquitous presence of sp^3 C–H bonds in natural feedstock makes them inexpensive, easily accessible, and attractive synthons for the preparation of common and/or complex molecular frameworks in biologically active natural products, pharmaceutics, agrochemicals, and materials. However, the inertness of these bonds due to the high bond dissociation energies and low polarity difference between the carbon and hydrogen atoms makes them challenging reaction partners. Moreover, the desired site-selectivity is often an issue in reactions with multiple analogous sp^3 C–H bonds. To overcome these problems, transition metal-catalyzed C–H functionalization has been developed with the assistance of various well-designed directing groups which can coordinate to a metal center to deliver it on a targeted C–H bond through an appropriate spatial arrangement, enabling C–H activation via the formation of a cyclometalated species. However, the requirement of often additional steps for the construction of the directing groups and their subsequent removal after the desired operation severely hampers the efficacy and compatibility of the reactions. A promising solution would be the utilization of a transient ligand which can bind to the substrate and coordinate to the metal center in a reversible fashion. In this way, the directing group is installed, sp^3 C–H functionalization occurs, and the directing group is then removed in situ without affecting the substrate function after the catalysis is finished. Overall, the whole process occurs in a single reaction pot. Herein, we are presenting our studies on transition metal-catalyzed transient directing group-enabled C–H functionalization reaction.

Audience Take Away Notes

- This study could potentially be used for others to build small molecules in an efficient way
- This study could potentially be used for others to carry out late-stage functionalization of natural products or drug molecules
- This research could also be used by others to expand their research

Biography

Haibo Ge received his PhD degree in Medicinal Chemistry from The University of Kansas in 2006, and then moved to The Scripps Research Institute for postdoctoral study. In 2009, he began his independent academic career at the Indiana University – Purdue University Indianapolis and relocated to Texas Tech University in 2020. Research by his group is mainly focused on the development of novel methods for carbon–carbon and carbon–heteroatom bond formation through transition metal catalyzed C–H functionalization.

Milan Stojanovic*, Sergei Rudchenko, Steven Taylor, Nenad Milosavic, Maria Rudchenko

Department Medicine, Columbia University Irving Medical Center, New York, United Sates of America

Signal amplification in molecular cascades on cell surfaces

Molecular cascades that analyze pairs or triplets of surface markers on individual cells in a manner of Boolean logic gates are based on chemical reaction networks comprising oligonucleotide-antibody conjugates and partially complementary oligonucleotides. While traditional methods to positively select cells are based on a single marker, these cascades can be used to isolate, in a single step, a narrower subpopulation based on the presence of two or more surface markers. In our original design, oligonucleotide components irreversibly flowed from one cell surface marker to the next one, driven by increases in complementary interactions between oligonucleotides. Therefore, the magnitude of the final signal was always determined by the cell surface marker that was least abundant on the surface of each cell. We now improve our design to demonstrate, on two examples, the signal amplification from a less to a more abundant cell surface marker, where one component serves as a catalyst to activate multiple downstream elements, while itself being renewed by sacrificial solution-state component. We expect this new function to enable increasingly complex Boolean analysis of cell surfaces.

Audience Take Away Notes

- They will learn how to program more complex interactions between living tissues and chemical reaction networks

Biography

Milan Stojanovic is a Professor of Medical Sciences (in Medicine), Biomedical Engineering and Systems Biology at Columbia University Irving Medical Center. While his background is in organic chemistry, his current research interests are based on using oligonucleotides for sensing and autonomous computing.

George L. Morejon*, T. Poznyak, Julia Liliana Rodriguez

Lab. Ing. Quimica Ambiental, ESIQIE–Instituto Politecnico Nacional, Zacatenco, C.P, CDMX, Mexico

Elimination of sulfamethoxazole using ozone in the presence of catalytic films on iron and nickel base

Emerging pollutants are compounds of different classes, where could find pesticides, drug pharmacists, personal care products, flame retardants, plasticizers, and nanoparticles. Their presence has been quantified in effluents of wastewater plants from different hospitals, principally with a high concentration of pharmaceutical compounds. In other countries of Latin America for example Brazil, Venezuela, Argentina, Colombia, and Ecuador have been detected the presence of sulfamethoxazole was higher than the Predicted No Effect Concentration for health determined a few years ago through the United States Environmental Protection Agency.

In the present study, the degradation of Sulfamethoxazole (SX) carried out by ozone in the presence of different catalytic films on the base of Ni, Fe, and Fe:Ni [50:50] synthesized by means of the Ultrasonic Spray Pyrolytic technique (USP) varying a nozzle size up to 2.5 to 14 mm. The HPLC results showed a total removal of the initial compound by direct reaction with molecular ozone, while the catalyst effect showed in the decomposition of the ozonation intermediates. The catalyst's activity and selectivity depend on the chemical structure of the treated compound, as well as the catalyst films used in ozonation. In this study, the combined catalyst Fe:Ni [50:50] with a very small concentration (a precursor concentration of 0.1 mol/L) was more effective in the decomposition of ozonation intermediates.

As preliminary results may be seen the greatest crystal agglomerates are produced with a nozzle size of 14 mm, which remarks a significant impact of this parameter on the crystal structure and morphology of the catalyst surface. The HPLC chromatograms of the SX behavior in the ozonation process, where we can observe lower concentrations of SX in the presence of the FexOy:NiO [50:50] combined catalyst at the beginning of the treatment, marking the catalytic effect. The FexOy:NiO [50:50] catalyst showed greater catalytic activity and stability during ozonation, with the removal of 100% of the SX compounds during 60 minutes of treatment, while the treatment with FexOy, NiO, and O3-conv achieves major by-products formation.

When analyzing the degree of mineralization obtained by measuring TOC for the two systems: conventional and catalytic processes during 60 min of ozonation. Finally, it's possible to appreciate which method is more effective for the elimination of sulfamethoxazole in an aqueous solution model. The combined catalyst Iron/Nickel system had a major mineralization with only six films prepared at 0.1 mol/L concentration, in comparison with the conventional ozonation. This effect in the catalytic activity could be due to the major formation of oxidizing species (ROS) during the decomposition reaction of ozone.

Biography

George Luis Morejon Aguila is a Ph.D. Student in the Chemical Environment Engineering Lab, where he is developing his research science on the degradation of pharmaceutical compounds in water. He has experience in water treatment and final disposition using the Physical-Chemical and Bioremediation Methods. His recent activities include the ozonation to the pollution decomposition. Working with pharmaceutical compounds, waste, and toxic effluents, using conventional and catalytic ozonation with synthesized catalysts as films supported on glass by USPT. George is a Master's in Environmental Engineering and graduated as Chemical Engineer in 2020.

BOOK OF ABSTRACTS

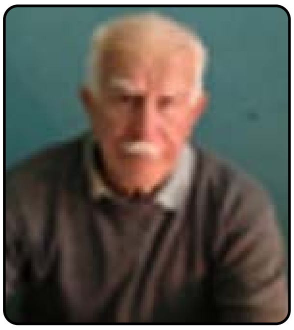
14-16 SEPT

DAY 02

POSTERS

16TH EDITION OF
GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY



Vitali Bakhtadze

R. Agladze Institute of Inorganic Chemistry and Electrochemistry of Ivane Javakhishvili Tbilisi State University, Tbilisi, Georgia

Synthesis of cordierite- MnOx- block carriers co oxidation catalysts

Block carriers are widely used for the preparation of automotive catalysts. All known block catalysts contain platinum group metals. However, these catalysts are expensive and mechanically insufficiently strong due to the difficulty of achieving the necessary adhesion of the secondary carrier to the frame material. As the main active components and the secondary coating of the aluminosilicate block-cordierite Mn-Pd catalyst for CO oxidation, instead of heat-resistant oxides (CaO, MgO. Al_2O_3), stable manganese oxides are considered: MnO_2, Mn_2O_3, Mn_3O_4, MnO. The results of studying the synthesis conditions and determining the basic physicochemical properties of block cordierite - carriers with Mn - coating for the preparation of CO oxidation catalysts are presented. SEM pictures of the components of the cordierite on the cordierite – MnOx 400°C and cordierite – MnOx 800°C carriers at 1μm of the showed of the oxides of Mn are distributed uniformly on the surface. Heat treatment at 800°C results in coarsening of manganese oxide particles from 10–100 nm to 500–600 nm. Additional high-temperature heat treatment at 800°C leads to the completion of the process of formation of the crystalline structure of the secondary Mn - block carrier coating. The introduction of Mn atoms in the framework structure of the carrier provides the required adhesion of the secondary Mn coating on the surface of the block catalyst. The successive application of a secondary coating of MnOx oxides increases the specific surface area of the cordierite block to 5.0 - 6.0 m^2. g^{-1}. The content of MnOx, in terms of Mn - metallic, reaches 5.5 - 6.0 wt. %. Activity of the Pd - MnOx - catalyst, was studied in the CO oxidation reaction. A positive effect on the activity of the Pd - MnOx / Cordierite catalyst was shown to be treated with aqueous ammonia. Exoeffects on the DTA thermal analysis wing with maxima at temperatures of 255°C and 305°C were attributed to the phase dissociation of the formed amine-palladium complex. X-Ray phase and thermal analyses of the catalyst showed the presence of PdO and PdO_2 (traces). The endoeffect on the ДТА curve at the temperatures 780°C и 826°C which in indicative of the phase decomposition of PdO. On catalysts Pd - MnOx 400°C / cordierite and Pd - MnOx 800°C / cordierite, the maximum conversion of CO - 80 - 100% is achieved in the temperature range 170 - 190°C. Modifications β - MnO_2 and α - Mn_2O_3 in Mn-Pd catalysts can be considered as active intermediate phases at the carrier-Pd interface.

Audience Take Away Notes

- The formation of a secondary Mn-coating at the interface Cordierite - Pd improves the physico-chemical characteristics and positively affects the activity of Mn - Pd CO oxidation catalysts

Biography

Dr. Vitaly Bakhtadze graduated from the Georgian Polytechnic Institute with a degree in technology of inorganic substances. 1964 - 1974 a post-graduate student and then a researcher at the catalysis laboratory of the Institute of Inorganic Chemistry and Electrochemistry of the Georgian Academy of Sciences. From 1974 to the present day, head of the catalysis laboratory. He published over 50 scientific articles.

Cristian Valdebenito[1], Jose Gaete[1], Cesar Morales Verdejo[1], Kerry Wrighton Araneda[2], Gabriel Abarca[1]*

[1]Centro Integrativo de Biologia y Quimica Aplicada (CIBQA), Facultad de Ciencias de la Salud, Vicerrectoria Academica, Universidad Bernardo O'Higgins, Santiago, Chile

[2]Centro de Investigacion, Innovacion y Creacion UCT (CIIC-UCT), Departamento de Ciencias Biologicas y Quimicas, Facultad de Recursos Naturales, Universidad Catolica de Temuco, Temuco, Chile

Ionic liquid phases on copper nanoparticles: DFT insights and modulation of the electronic environment for catalysis

A novel series of Supported Ionic Liquids (SILPs) based on triazolium core were meticulously synthesized and harnessed as catalysts for facilitating the N-arylation of aryl halides with anilines. The synthesis procedure involved the adept chemical modification of triazoles through copper-catalyzed azide-alkyne cycloaddition. he ensuing comprehensive surface characterization divulged a robust correlation between the volume of the triazolium cation and the textural attributes of the SILPs. Notably, Scanning Transmission Electron Microscopy (STEM) unveiled the well-dispersed arrangement of Copper Nanoparticles (Cu NPs) on the SILPs, presenting diameters ranging from 3.6 to 4.6 nm. This variance in size was contingent upon the specific triazolium cation employed.

Additionally, X-ray Photoelectron Spectroscopy (XPS) findings illuminated the manipulable nature of the Cu(0)/Cu(I) ratio through the electronic density of triazolium substituents. Through a combination of XPS and computational analysis, mechanistic insights were acquired, elucidating the pathways that stabilize Cu NPs. Particularly intriguing, triazolium ring-bonded electron-rich groups were inclined towards cation adsorption pathways, whereas less electron-rich groups favored anion adsorption pathways. Significantly, Cu@SILP composites possessing electron-rich groups demonstrated remarkable efficacy in the C-N Ullmann coupling reaction, underscoring their function as electron reservoirs that promote N-arylation via oxidative addition. This study highlights the fundamental role of triazolium-based SILPs in delineating the nature of active sites on Cu NPs surfaces, thereby offering promising avenues for innovative applications in the realm of confined and stabilized metal nanoparticle catalysis.

Furthermore, an exhaustive exploration into the interplay between Supported Ionic Liquid Phases (SILPs) incorporating triazole and copper nanoparticles was meticulously undertaken through density functional theory (DFT) calculations. This study encompassed three distinct triazolium cations ($T1^+$, $T2^+$, and $T3^+$) alongside four different anions (I^-, $BF4^-$, $PF6^-$, and $NTf2^-$) for the assembly of Cu@SILP complexes. Notably, the simulations unveiled a pronounced preference for anion adsorption onto copper nanoparticles, surpassing cation adsorption. The interaction between Cu@SILP complexes was intricately governed by coordinate covalent bonds, subject to modulation through chemical substitutions at positions N1 and N3 on the triazole ring, encompassing electron-rich groups. Noteworthy, the Cu@(I)SILP1 (R: Bn and Ph) complex exhibited the most potent adsorption, attributed to its elevated electron-rich triazole characteristics and substantial SILP adsorption onto the Cu surface (5.18 eV). Leveraging surface modifications, the manipulation of complex properties became feasible, wherein anions induced coarse adjustments while precise fine-tuning was accomplished via chemical modifications of the triazolium ring. This dual-pronged investigation furnishes invaluable insights into the tailored design and manipulation of triazolium-based SILPs, ultimately leading to catalytic augmentation and promising applications within Cu nanoparticle interactions.

Audience Take Away Notes

- The audience will gain a comprehensive understanding of the synthesis, characterization, and applications of Supported Ionic Liquids (SILPs) based on triazolium in catalytic processes involving copper nanoparticles. They will acquire insights into the relationship between the triazolium cation's characteristics and the resulting textural properties of SILPs, which can guide future material design and synthesis. Furthermore, attendees will learn about the mechanistic insights derived from XPS and computational analysis, offering a deeper comprehension of the pathways that stabilize copper nanoparticles and their catalytic behavior
- Professionals in the catalysis and materials science field will benefit by incorporating the knowledge gained into their research and development efforts. They can apply the findings to design more effective catalysts, tailor active sites for specific reactions, and optimize synthesis processes. Understanding electron-rich groups' role in catalytic reactions will enable them to engineer more efficient and selective catalysts for various chemical transformations
- The presented research holds substantial potential for other faculty members in the catalysis and materials science domain to expand their research and teaching. The insights into the design, synthesis, and characterization of novel SILPs can inspire new avenues of exploration. Additionally, the mechanistic understanding of catalyst stabilization and catalytic pathways could enrich teaching curricula and enhance students' comprehension of catalytic processes
- The research offers practical solutions for designing and optimizing catalysts using tailored SILPs and copper nanoparticles. By understanding the interplay between electron-rich groups, triazolium cations, and copper nanoparticles, designers can fine-tune catalysts to achieve higher efficiency and selectivity, simplifying the catalyst development process for various chemical reactions. This material design could be applied to modulate the chemical reactivity of other Metal Nanoparticles (MNPs), expanding the variety of targeted reactions
- Yes, the research introduces new insights that can significantly improve the accuracy of catalyst design. Understanding how electron-rich groups influence cation and anion adsorption pathways on copper nanoparticles provides a new dimension in catalyst engineering. This information enables designers to create catalysts with enhanced precision and desired catalytic properties
- List all other benefits
    - Enhanced understanding of interactions between supported ionic liquids and metal nanoparticles, expanding the knowledge base in the field
    - Potential for developing more sustainable and efficient catalytic processes, contributing to green chemistry practices
    - Insight into modulating electronic properties of catalysts, opening avenues for innovative materials design
    - Establishment of a foundation for further research in the design of advanced catalysts and materials for various applications
    - Contribution to the broader scientific community by disseminating findings, fostering collaboration and knowledge exchange

Biography

Dr. Gabriel Abarca is an Associate Professor at the Universidad Bernardo O'Higgins. He earned his Ph.D. in Chemistry from the University of Chile in 2014, specializing in catalysis and olefin methoxycarbonylation. With a Chemistry degree from the University of Santiago de Chile (2009), he pursued postdoctoral research in Brazil under Dr. Jairton Dupont, focusing on molecular catalysis. His research interests encompass Nanocatalysis, Ionic Liquids, Green Chemistry, Supported Ionic Liquids, Sustainable Chemistry, Transition Metal Nanoparticles, and Catalysis.

14-16 SEPT

DAY 03

KEYNOTE FORUM

16TH EDITION OF
GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

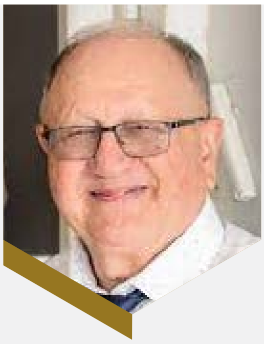
Corrosion risk management and process safety in chemical engineering processes

The aim of this work is to analyze how corrosion risk management influences process safety. Both issues are wide and occupy an important niche in the chemical industry. Corrosion risk management includes identifying, analyzing, assessing, and managing corrosion hazards. Process safety is a discipline that focuses on preventing fires, explosions, and accidental releases at chemical process facilities. Corrosion can cause all these detrimental events. A hazard is a substance, object, or situation with the potential for an accident or damage. Corrosion is one of the biggest hazards because it is related to substances, objects, and situations leading to the interaction between them and the deterioration of both.

Numerous data show that large failures resulting in harmful consequences occur because of corrosion once a week in many chemical enterprises. There is much literature about both topics, corrosion risk, and process safety, separately but there is nearly no research concerning intersections. Usually, specialists in process safety do not know much about the subject of corrosion. Accordingly, corrosionists do not specialize in process safety. In this work, I analyze the role of corrosion risk management in the prevention of corrosion accidents related primarily to the safety of personnel and the environment.

We unite three wide phenomena-concepts: Corrosion, corrosion risk management, and process safety. Corrosion management is achieved by the use of anti-corrosion measures, corrosion monitoring, regular inspection, the study of each accident, implementation of meetings, publications of minutes, education, and knowledge transfer. Corrosion risk is achieved by identifying, analyzing, assessment of occurring, and modeling possible corrosion phenomena. Process safety includes the prevention of unintentional releases of dangerous chemicals and energy during processes that can have a serious effect on the plant and environment. This is achieved by the prevention of equipment malfunction, over-pressures, over-temperatures, leaks, spills, and corrosion. All these phenomena are interlinked and interdependent. Process safety programs focus on the design and maintenance of equipment, effective alarms and control points, procedures, and training. Corrosion risk management is an active instrument in all these aspects of process safety and takes part in achieving its main purposes.

The level of corrosion failure and its consequences, defining corrosion risk, may be different: The leak of crude oil, natural gas, water, liquid and gaseous hazardous chemicals, fire, explosion, damages, deterioration of the environment, injuries, and death of people and animals. Due to the biological and psychological properties of human nature, we are unlikely



Alec Groysman

Chemical Engineering Department, Technion (Israeli Institute of Technology),
Honor President of the Israeli Association of Chemical Engineers and Chemists, Haifa, Israel

Biography

Dr. Alec Groysman graduated from the Chemico-Technological University named after Mendeleev in Moscow. He received his Ph.D. in physical chemistry and corrosion. He has experience in corrosion, corrosion control and corrosion monitoring from 1976 in the oil refining, oil and gas, petrochemical, and chemical industry and teaching the subject of corrosion. He worked for 22 years for oil refinery, Haifa and at the same time taught corrosion science and technology in universities (Technion, Haifa; Bar-Ilan University, Tel Aviv, Ariel University) and College of Engineering (Karmiel, Israel). He is an Honor President of Israeli Association of Chemical Engineers and Chemists. He has special interests in corrosion education and in searching for relationships between corrosion, art, history, and philosophy. His first book "Corrosion for Everybody" published by Springer in 2010 received the innovation award winner of Materials Performance Readers choice in 2012 year in the USA.

to exclude human mistakes. The human factor plays a vital role in both corrosion risk management and process safety, and as a result in the prevention of corrosion failures and improvement of both. We should pay significant attention to education, dissemination of information, knowledge transfer, collaboration, and communication. Correct corrosion risk management gives rise to the improvement of process safety at stages of design, fabrication, implementation, erection, service and maintenance of equipment and constructions in the chemical industry. Many practical examples will be given during the lecture.

Application of metal single-site zeolite catalysts in catalysis

The presence of heavy metals and metalloids in water represents nowadays one of the most important environmental problems. These species have infinite lifetimes, and chemical or biological treatments present severe restrictions or are economically prohibitive. Hexavalent chromium, mercury, uranium, arsenic, or lead are on the list of priority pollutants of most environmental agencies, with more and more exigent limits of discharge or concentration in drinking water. From the beginning of the development of heterogeneous photocatalysis, the transformation and deposition of metals or metalloids were visualized as processes with promissory potential application to remove these pollutants from water. Three types of mechanisms can be considered for these processes, all of them taking place through successive monoelectronic electron transfer steps: (a) direct reduction by photogenerated electrons; (b) indirect reduction by intermediates generated from electron donors (reducing radicals); (c) oxidative removal by holes or hydroxyl radicals. This presentation is an overview of the work performed in our laboratories with the cases of hexavalent chromium and arsenic being treated in profundity. In the case of hexavalent chromium, direct reductive photocatalysis and indirect reduction by intermediates coming from Ethylene Diamine Tetracetic Acid (EDTA) or citric acid added as electron donors are the main processes governing the removal of Cr(VI) by TiO_2 photocatalysis. In the case of arsenic, removal can proceed by oxidation of As(III) to As(V), a very much studied process. However, reductive photocatalysis has been less studied and can take place under specific conditions, leading to the removal of As species by the formation of As(0) on the surface of the photocatalyst. While for As(III) direct reduction by photogenerated electrons is possible, As(V) reduction only proceeds in the presence of an electron donor such as methanol. The mechanisms taking place in these cases will be postulated in this presentation and the possible application to real systems will be discussed.

Audience Take Away Notes

- An understanding of the mechanistic pathways involved on chromium and arsenic photocatalytic removal will help the audience to use the concepts to optimize experimental conditions on lab- scale and/or operational parameters on field scale to improve the rate and yield of the removal processes
- Same answer as before. Additionally, the presentation will emphasize the problem of pollution of water by heavy metals and arsenic and the effects on human health of these elements, especially in drinking water.
- The experimental setup for the experiments is very simple and can be implemented easily in other university laboratories

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[1]School of Habitat and Sustainability, University of General San Martin, 25 de Mayo y Francia, Buenos Aires province, Argentina

[2]Consejo Nacional de Investigaciones Cientificas y Tecnicas (CONICET), Buenos Aires, Argentina

[3]Center of Chemical Technologies, National Technological University, Regional Buenos Aires Faculty (UTN-FRBA), Medrano 951, Buenos Aires, Argentina

[4]Chemistry of the Environmental Remediation Division, Chemistry Management, National Atomic Energy Commission (DQRA-GQ, CNEA), Av. Gral. Paz 1499, San Martín, Buenos Aires province, Argentina

Biography

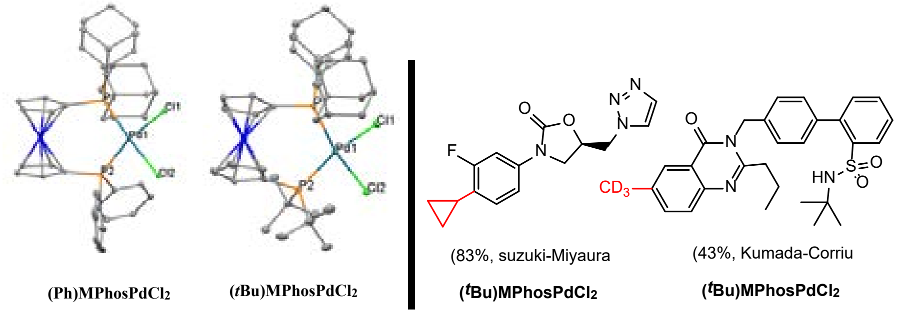
Prof. Litter is Dr. in Chemistry (Buenos Aires University, Argentina), with postdoctoral studies at the University of Arizona, USA. She is a Senior Researcher at the National Research Council and a Full Professor and Consultant at the National University of San Martín (Argentina). She has more than 250 publications in journals, books, and book chapters. She received the Mercosur Prize (2006 and 2011), the Charreau Prize for Regional Scientific-Technological Cooperation, the Prize for Latin American Women in Chemistry

- Photocatalysis is a very simple and low-cost technology, as TiO_2 is a very stable, reusable, and cheap material and solar light can be used to start the pollutants removal process
- Reactors can be easily designed, and scaling is even possible
- List all other benefits
    - Photocatalytic processes use concepts from several disciplines such as physics, chemistry, chemical engineering, and environment. Thus, it is an interdisciplinary subject that can improve the knowledge of the state of the art of this theme by the audience

(2021), and the Houssay Prize (2022). She was designated pioneer in photocatalysis in Argentina and is a Member of TWAS, ACAL, and the Argentine Academy of Environmental Sciences.

Tunable unsymmetrical ferrocene based ligands (MPhos) for API synthesis via Csp2-Csp3 cross couplings

Ferrocene-based unsymmetrical bis phosphines, Fc (PAd2)(PR2) (R= Ph, Cy, iPr and tBu) abbreviated as MPhos ligands, as well as their corresponding (MPhos)PdCl2 complexes as pre-catalysts were developed in very good yields and fully characterized. These complexes as precatalysts were effectively utilized for many Csp2-Csp3 cross-coupling reactions such as Murahashi-Feringa, Kumada-Corriu, Negishi and Suzuki-Miyaura for model and "drug-like" substrates to demonstrate their potential applications in API synthesis. The details of the design of the catalysts and their applications in organic synthesis will be presented.



(Ph)MPhosPdCl₂ (*t*Bu)MPhosPdCl₂

(83%, suzuki-Miyaura
(^{t}Bu)MPhosPdCl₂

(43%, Kumada-Corriu
(^{t}Bu)MPhosPdCl₂

Audience Take Away Notes

- They can understand the latest development in cross coupling the most active area in homogenous catalysis
- Apply the principles in organic synthesis for pharmaceutical, electronics and agrochemicals applications both in academia and industry
- Yes, this research and other faculty could use to expand their research or teaching
- Yes, of course. Sp2-sp3 coupling one of the underdeveloped areas in cross coupling
- Yes, it will improve the accuracy of a design, or provide new information to assist in a design problem
- List all other benefits
    - o These catluarts are now commercially available through MilliporeSigma (Merck KGaA, Darmstadt, Germany)

Thomas J. Colacot*,

Guolin Xu

Research and Development,
Science and Lab Solutions–
Chemistry, Life Science Division,
MilliporeSigma (Business of
Merck KGaA, Darmstadt), N.
Teutonia Avenue, Milwaukee, WI,
United States of America

Biography

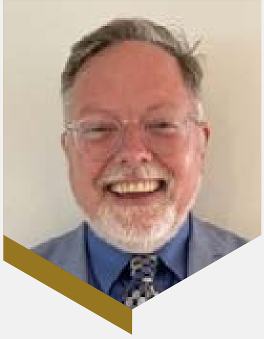
Thomas J. Colacot joined MilliporeSigma (a business of Merck KGaA, Darmstadt, Germany) in 2018 as an R&D Fellow and Director of Global Technology Innovation, Life Science Business, in Milwaukee, WI. He has extensive experience in developing new and innovative products and technology with a very strong track record of commercialization globally and is considered an industrial expert in organometallics and homogeneous catalysis in organic synthesis. He has over 120 peer-reviewed publications and over 65 patents internationally. Thomas is a recipient of many awards and honors, including the 2021 Scientific Curriculum Vitae (Life Time Achievement Award) from the Chairman of the Board and CEO of Merck KGaA, Darmstadt, Germany; the 2018 Outstanding Researcher Award from Merck KGaA, Darmstadt, Germany; the 2017 Catalysis Club of Philadelphia Award for outstanding contributions in the area of catalysis; the 2015 ACS Industrial Chemistry Award; the 2015 IPMI Henry Alfred Award; the 2016 IIT Madras Distinguished Alumnus Award for Technology Innovation; the 2016 Chemical Research Society of India (CRSI) Medal; and the 2012 RSC Applied Catalysis Award and Medal. Dr. Colacot was responsible for developing a very successful homogeneous catalysis program at Johnson Matthey from 1995 to 2018. He holds an MBA degree from Penn State University and a Ph.D. degree in chemistry from IIT Madras. He has also carried out postdoctoral work in the U.S. and is a fellow of the Royal Society of Chemistry. He is also a visiting professor many leading universities internationally.

Nano implants: A catalyst for human clinical success

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

Audience Take Away Notes

- Human clinical data for nano implants
- How nano implants can increase tissue growth
- How nano implants can decrease infection without antibiotics
- How nano implants can reduce inflammation



Thomas J. Webster

Interstellar Therapeutics, Boston, MA, United States of America

Biography

Thomas J. Webster's (H index: 114; Google Scholar) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA). He has served as a professor at Purdue (2000-2005), Brown (2005-2012), and Northeastern (2012-2021; serving as Chemical Engineering Department Chair from 2012 - 2019) Universities and has formed over a dozen companies who have numerous FDA approved medical products currently improving human health. He is currently helping those companies and serves as a professor at Hebei University of Technology, Saveetha University, Vellore Institute of Technology, UFPI, and others. Dr. Webster has numerous awards including: 2020, World Top 2% Scientist by Citations (PLOS); 2020, SCOPUS Highly Cited Research (Top 1% Materials Science and Mixed Fields); 2021, Clarivate Top 0.1% Most Influential Researchers (Pharmacology and Toxicology); 2022, Best Materials Science Scientist by Citations (Research.com); and is a fellow of over 8 societies. Prof. Webster has over 1,350 publications to his credit with over 53,000 citations.

BOOK OF ABSTRACTS

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SPEAKERS

16TH EDITION OF
GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY

Sedigheh Ghadamgahi*, Nahid Nesari, Hoorieh Jahaniani
Department of Chemistry, East Tehran Branch, Islamic Azad University, Tehran, Iran

A green chemistry fabrication nanomaterials for waste water removal

Recently, graphene oxide and its products have been recognized as a common nanostructure material due to many applications. The synthesis of graphene oxide besides the extract of Juglans Nigra leaves caused to fabrication of Ag-shaped nanocomposites. The extract was added to 15 and 25 mg of $AgNO_3$ and MQ water and then the obtained mixture was refluxed through agitating a heater stirrer at 100□ for 3 h (i.e., 15Ag/GO-J and 25Ag/GO-J) or sonicated at room temperature for 30 min (*15Ag/GO-J). A range of characterizations including FE-SEM, EDS, XRD, and FT-IR proved the fabrication of cubic Ag nanoparticles immobilized in graphene oxide nanosheets. The Ag-shaped nanocomposites proved to be active photo-nanocatalysts for removing Methyl Blue (MB) and Methyl Orange (MO) from wastewater. MB and MO were degraded in the presence of UV or Vis radiation by *15Ag/GO-J, 15Ag/GO-J, and 25Ag/GO-J as photo-nanocatalysts. The results confirmed the nearly full conversion of MB (~ 97%) from wastewater in the presence of Vis radiation by *15Ag/GO-J photo-nanocatalysts even at the short reaction time (about 15 min).

Audience Take Away Notes

- Fabrication of nanocatalysts by a green chemistry process
- Remove water pollutants
- Using smart materials for chemical procedures

Biography

Dr. Ghadamgahi joined Prof. Khodadi and Prof. Mortazavi team at the University of Tehran (UT) as a post-fellow in 2015 for the research of heterogeneous nanocatalysts-nanocomposites of the gas-phase reactions. Before that, she completed her Ph.D. at the University of Canterbury (UC) in nanochemistry under Dr. Golovko and Prof. Williamson supervision, where she conducted research on heterogeneous nanocatalysts in the liquid-phase reactions and tutored chemistry labs, too. Prior to joining the UC, she did her masters in analytical chemistry at Urmia University as Pro. Farhadi's team and alsolectured papers in chemistry at Azad University in Tehran Branch. Dr. Ghadamgahi is interested in heterogeneous nanocatalysts and nanophotocatalysts fabrications, applications, and also characterizations. She has focused on smart materials, such as photocatalysis, natural and artificial polymers, complexes, clusters, composites, particles, colloids, catalysts, photocatalysts, and more recently smart concretes.

Eleonora Aneggi
Department of Agricultural, Food, Environmental and Animal Sciences,
University of Udine, Udine, Italy

Sustainable solvent-free selective oxidation of benzyl alcohol using Ru-based catalysts

Selective oxidation of alcohols to aldehydes or ketones is a fundamental process in organic chemistry and the development of green and sustainable transformations are strongly required. Indeed, the traditional reaction requires large amounts of solvent and oxidant, causing serious environmental issues. Recently, several efforts have been made to transform the reaction into a more sustainable process. Herein, we focused on the development of Ru-based catalysts deposited over Ceria-Zirconia (CZRu) or Alumina (AlRu) supports for the solvent free oxidation of benzyl alcohol using air as oxidant, thereby meeting atom economy and environmental requirements.

The materials were extensively characterized and, in addition to their activity, selectivity, and reusability, the environmental sustainability of the process was assessed according to green chemistry metrics.

XPS characterization of the material reveals that, for AlRu the formation of metallic Ru on the support plays a key role in the catalytic activity, while, when ruthenium is supported over ceria-zirconia, the formation of RuO_2 on the surface is necessary to achieve higher catalytic activity. For CZRu the activity is strongly related to the reducibility of the material and to the close interaction between ceria-zirconia and RuO_2, with the likely formation of Ru-O-Ce arrangements. The greater mobility of oxygen due to the formation of bridging oxygens in Ru-O-Ce and to the formation of superoxide species (O^{2-}) over Ce^{3+} sites, significantly boosts the selective oxidation of alcohols.

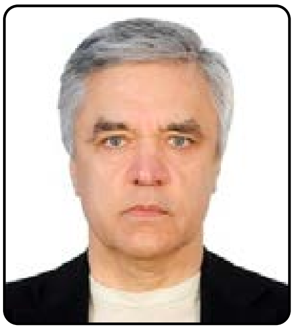
CZRu and AlRu are promising materials with remarkable alcohol conversion at 90°C (more than 60%) and complete selectivity in a very sustainable process (without a solvent and with air as oxidant), as indicated by the very low E-factor value. Overall, the formulations are among the most active reported so far under solvent free conditions and molecular oxygen. In addition, AlRu is a very stable formulation and maintains high activity after recycling.

Audience Take Away Notes

- Recent insight on heterogeneous selective oxidation of alcohol
- Development and characterization of novel catalysts
- Understanding of the sustainability of the process

Biography

Dr. Ghadamgahi joined Prof. Khodadi and Prof. Mortazavi team at the University of Tehran (UT) as a post-fellow in 2015 for the research of heterogeneous nanocatalysts-nanocomposites of the gas-phase reactions. Before that, she completed her Ph.D. at the University of Canterbury (UC) in nanochemistry under Dr. Golovko and Prof. Williamson supervision, where she conducted research on heterogeneous nanocatalysts in the liquid-phase reactions and tutored chemistry labs, too. Prior to joining the UC, she did her masters in analytical chemistry at Urmia University as Pro. Farhadi's team and alsolectured papers in chemistry at Azad University in Tehran Branch. Dr. Ghadamgahi is interested in heterogeneous nanocatalysts and nanophotocatalysts fabrications, applications, and also characterizations. She has focused on smart materials, such as photocatalysis, natural and artificial polymers, complexes, clusters, composites, particles, colloids, catalysts, photocatalysts, and more recently smart concretes.



Sergey Suchkov[1-6]*, William Thilly[9], Robert Langer[9], Daniel Scherman[10], Shawn Murphy[7], David Smith[11], Hiroyuki Abe[8], Holland Cheng[12], Trevor Marshall6, Jeff Skolnick[13], Noel Rose[8,13]

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[2]EPMA, Brussels, European Union

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[4]ISPM, Tokyo, Japan

[5]AHA, Houston, United States of America

[6]Autoimmunity Research Foundation, Los Angeles, United States of America

[7]Partners Healthcare and Harvard Medical School, Boston, United States of America

[8]ISPM, Tokyo, Japan

[9]MIT, Cambridge, MA, United States of America

[10]Centre de Recherche Pharmaceutique de Paris (CRP2); Faculte de Pharmacie, Université Paris Descarte, Centre National de la Recherche Scientifique, Unité de Technologies Chimiques et Biologiques pour la Santé (UTCBS) Inserm, Paris, France

[11]Mayo Clinic, Rochester, MN, United States of America

[12]T College of Biological Sciences, UC Davis, CA, United States of America

[13]Center for Autoimmune Disease Research, John Hopkins University, Baltimore, Director of the Center for the Study of Systems Biology, Georgia Institute of Technology and School of Biological Sciences, Atlanta, GA, United States of America

Personalized and Precision Medicine (PPM) as a unique healthcare model to be set up via biodesign, bio- and chemical engineering, translational applications, and upgraded business modeling to secure the human healthcare and biosafety

Traditionally a disease has been defined by its clinical presentation and observable characteristics, not by the underlying molecular mechanisms, pathways and systems biology-related processes specific to a particular patient (ignoring persons-at-risk). A new systems approach to subclinical and/or diseased states and wellness resulted in a new trend in the healthcare services, namely, Personalized and Precision Medicine (PPM).

To achieve the implementation of PPM concept, it is necessary to create a fundamentally new strategy based upon the biomarkers and targets to have a unique impact for the implementation of PPM model into the daily clinical practice and pharma. In this sense, despite breakthroughs in research that have led to an increased understanding of PPM-based human disease, the translation of discoveries into therapies for patients has not kept pace with medical need. It would be extremely useful to integrate data harvesting from different databanks for applications such as prediction and personalization of further treatment to thus provide more tailored measures for the patients and persons-at-risk resulting in improved outcomes and more cost effective use of the latest health care resources including diagnostic (companion ones), preventive and therapeutic (targeted molecular and cellular) etc.

Translational researchers, bio-designers and biomanufacturers are beginning to realize the promise of PPM, translating to direct benefit to patients or persons-at-risk. For instance, companion diagnostics tools and targeted therapies and biomarkers represent important stakes for the pharma, in terms of market access, of return on investment and of image among the prescribers. At the same time, they probably represent only the generation of products resulting translational research and applications. So, developing medicines and predictive diagnostic tools requires changes to traditional clinical trial designs, as well as the use of innovative (adaptive) testing procedures that result in new types of data. Making the best use of those innovations and being ready to demonstrate results for regulatory bodies requires specialized knowledge that many clinical development teams don't have. The areas where companies are most likely to encounter challenges, are data analysis and workforce expertise, biomarker and diagnostic test development, and cultural awareness. Navigating those complexities and ever-evolving technologies will pass regulatory muster and provide sufficient data for a successful launch of PPM, is a huge task. So, partnering and forming strategic alliances between researchers, bio-designers, clinicians, business, regulatory bodies and government can help ensure an optimal development program that leverages the Academia and industry experience and FDA's new and evolving toolkit to speed our way to getting new tools into the innovative markets.

Healthcare is undergoing a transformation, and it is imperative to leverage new technologies to support the advent of PPM. This is the reason for developing global scientific, clinical, social, and educational projects in the area of PPM and TraMed to elicit the content of the new trend. For instance, proteomics is being used to compare the protein profiles of cells in healthy and diseased states, whilst utilizing a combination of OMICS-technologies and bioinformatics-related software. And as such can be used to identify candidate proteins associated with disease development and progression. Those candidate proteins might provide novel targets for new targeted therapeutic agents and biomaterials, or aid the development of assays for disease biomarkers and identification of potential biomarker-target-ligand (drug) tandems to be used for the targeting. Latest technological developments facilitate proteins to be more thoroughly screened and examined in the context of drug discovery and development. The latter would provide a unique platform for dialogue and collaboration among thought leaders and stakeholders in government, academia, industry, foundations, and disease and patient advocacy with an interest in improving the system of healthcare delivery on one hand and drug discovery, development, and translation, on the other one, whilst educating the policy community about issues where biomedical science and policy intersect.

The above-mentioned PPM model, Biodesign- & TraMed-related tools applied would need for novel training since the society is in bad need of large-scale dissemination of novel systemic thinking and minding. And upon construction of the new educational/training platforms in the rational proportions, there would be not a primitive biodesigner/biopharma artist to be able to enrich flow-through biomedical and life sciences standards with creative elements to gift for a patient a genuine hope to survive, but, in turn, for a person-at-risk – a trust for being no diseased. And the Grand Change and Challenge to secure our Health and Wellness are rooted not in Medicine, and not even in Science! Just imagine WHERE?! In the upgraded Hi-Tech Culture!

Biography

Sergey Suchkov was born in the City of Astrakhan, Russia, in a family of dynasty medical doctors. In 1980, graduated from Astrakhan State Medical University and was awarded with MD. In 1985, Suchkov maintained his PhD as a PhD student of the I.M. Sechenov Moscow Medical Academy and Institute of Medical Enzymology. In 2001, Suchkov maintained his Doctor Degree at the National Institute of Immunology, Russia. From 1989 through 1995, Dr Suchkov was being a Head of the Lab of Clinical Immunology, Helmholtz Eye Research Institute in Moscow. From 1995 through 2004 - a Chair of the Dept for Clinical Immunology, Moscow Clinical Research Institute (MONIKI). In 1993-1996, Dr Suchkov was a Secretary-in-Chief of the Editorial Board, Biomedical Science, an international journal published jointly by the USSR Academy of Sciences and the Royal Society of Chemistry, UK.

At present, Dr Sergey Suchkov, MD, PhD, is:

- Professor, Chair of the Dept for Personalized Medicine, Precision Nutriciology & Biodesign of the Institute for Global Health of MGUPP, and Professor, Dept for Clinical Immunology, A.I. Evdokimov Moscow State University of Medical and Dentistry, Moscow, Russia
- Member, New York Academy of Sciences, USA
- Secretary General, United Cultural Convention (UCC), Cambridge, UK

Dr Suchkov is a member of the:

- American Chemical Society (ACS), USA
- American Heart Association (AHA), USA
- European Association for Medical Education (AMEE), Dundee, UK
- EPMA (European Association for Predictive, Preventive and Personalized Medicine), Brussels, EU
- ARVO (American Association for Research in Vision and Ophthalmology)
- ISER (International Society for Eye Research)
- Personalized Medicine Coalition (PMC), Washington, DC, USA
- All-Union (from 1992 - Russian) Biochemical Society
- All-Union (from 1992 - Russian) Immunological Society

Delia Teresa Sponza

Environmental Engineering Department, Engineering Faculty, Dokuz Eylül University, Izmir, Turkey

Removal of some sulfonamides using reused MXene doped to bismuth ferrite (MXene/ $BiFeO_3$) nanocomposite from pharmaceutical industry wastewaters

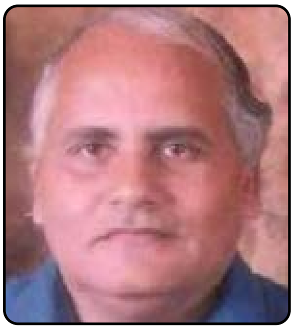
The treatment of three sulfonamides namely Sulfadiazine (SDZ), Sulfathiazole (STZ) and Sulfamerazine (SMZ) were performed via adsorption process to reused MXene doped to bismuth ferrite (MXene/ $BiFeO_3$) nanocomposite. The adsorption activity of MXene/ $BiFeO_3$ nanocomposite was improved by doping of $BiFeO_3$ to the nanocomposite. BiFeO3 facilitate the removal of sulfonamides with high surface area properties. The adsorption kinetics and isotherm models of sulfonamide on MXene/ $BiFeO_3$ nanocomposite exhibited a pseudo-second-order kinetics and Langmuir mode, respectively. MXene/ $BiFeO_3$ nanocomposite was reused 35 times with adsorption yields as high as 97-99%. The effects of MXene doped to bismuth ferrite (MXene/ $BiFeO_3$) nanocomposite concentrations (1, 3, 5, 7 and 9 mg/l), adsorption time (5, 10, 15 and 20 min), sulfonamide concentration (50, 100, 200, 400 and 600 mg/l and Ph (4, 7 and 10) on the sulphonamid adsorption yields were investigated. Furthermore, $BiFeO_3$/MXene is stable and retains its original properties upon desorption. The maximum Sulfadiazine (SDZ), Sulfathiazole (STZ), Sulfamerazine (SMZ) adsorption yields were 99%, 98% and %99 after 15 min adsorption time, at pH= 7.00 at a MXene/ $BiFeO_3$) nanocomposite concentration of 3 mg/l and at sulphonamide concentrations of 400 mg/l.

Audience Take Away Notes

- The audience will be able to understand as control of preparation of nanocomposite
- It will help full for audience in their job to share the new results
- Yes, this research and other faculty could use to expand their research or teaching
- Yes, it will provide a practical solution to a problem that could simplify or make a designer's job more efficient
- Yes, Will it improve the accuracy of a design, or provide new information to assist in a design problem

Biography

Dr. Delia Teresa Sponza is currently working as a professor at Dokuz Eylül University, Department of Environmental Engineering. Scientific study topics are; Environmental engineering microbiology, Environmental engineering ecology, Treatment of fluidized bed and activated sludge systems, Nutrient removal, Activated sludge microbiology, Environmental health, Industrial toxicity and toxicity studies, The effect of heavy metals on microorganisms, Treatment of toxic compounds by anaerobic / aerobic sequential processes, Anaerobic treatment of organic chemicals that cause industrial toxicity and wastewater containing them, Anaerobic treatability of wastewater containing dyes, Treatment of antibiotics with anaerobic and aerobic sequential systems, Anaerobic and aerobic treatment of domestic organic wastes with different industrial treatment sludges, Treatment of polyaromatic compounds with bio-surfactants in anaerobic and aerobic environments, Treatment of petrochemical, Textile and olive processing industry wastewater by sonication, Treatment of olive processing industry wastewater with nanoparticles and the toxicity of nanoparticles. She has 289 international publications with a H factor of 40.



Ram Sambhar Shukla
Inorganic Materials and Catalysis Division, Council of Scientific and Industrial Research (CSIR)- Central Salt and Marine Chemicals Research Institute (CSMCRI), G. B. Marg, Bhavnagar, Gujarat, India

Rhodium- hydrotalcite catalyzed effective heterogeneous transformation of carbon oxides to organic chemicals

Transformation of carbon oxides, carbon monoxide and carbon dioxide, to organic chemicals is demanding area of research due to environmental concern on one side and utilization of the carbon oxides as feed stocks to produce chemicals on the other side. Severe environmental concerns have been raised by the rapid rise in CO_2 levels in the atmosphere and there is a potential opportunity to utilize CO_2 to produce value-added chemicals. In our focused research to develop heterogeneous catalysts for catalyzing transformation of carbon oxides, since heterogeneous catalysts have the potential benefit of easy separation and recycling of the catalyst as well as easy purification of the products, a Rhodium-Hydrotalcite (Rh-HT) heterogeneous catalyst is developed. Hydrotalcite is a layered double hydroxide solid soft base and had played potentially double role as solid support for the homogeneous Rh complex catalyst as well as base. Under homogeneous conditions by metal/metal complexes-based catalysts, in the reactions of carbon oxides, additionally liquid base and/or additives are also required. Hydrotalcite as support, had effectively afforded to avoid the use of liquid base and/or additives. Rh-HT had performed as novel and effective multi-functional catalyst for single pot synthesis of C_8-aldehydes, 2-ethylhexenal and 2-ethylhexanal and alcohol, 2-ethylhexanol from C_3-alkene, propylene. Industrially practiced process is under homogeneous catalysis for the production of C_8-aldehydes and alcohol from propylene, and involves three reactions (i) hydroformylation of propylene by carbon monoxide and hydrogen by Rh/Co based homogeneous catalyst, (ii) self aldol condensation of the hydroformylated product n-butanal using strong liquid base like KOH or NaOH in stoichiometric amounts to produce 2-ethylhexenal and (iii) two step hydrogenation of 2-ethylhexenal to 2-ethylhexanal and further hydrogenation of 2-ethylhexanal to the final product 2-ethylhexanol using Ni/Cu based catalyst. This industrially practiced process using KOH/NaOH generates 1.0 to1.5 ton spent liquid base for every 10 tones of product along with the problems of handling, storage, disposal and post reaction work-up of strong liquid base. It`s of a great economic concern also because 30% of the cost goes for cleaning and recycling the liquid base. The multifunctional Rh-HT heterogeneous catalyst afforded to carry out above stated reactions in single pot using carbon monoxide, hydrogen and propylene gases. The Rh-HT catalyst was also investigated for the hydrogenation of carbon dioxide and was found to be efficient for the selective formation of formic acid with a TON of 15840. My talk will account the presentation and discussion of these reactions emphasizing on the utilization of carbon monoxide and carbon dioxide for their transformations into value added chemicals.

Biography

Dr. Shukla received B.Sc., M.Sc., Ph.D. and PDF of CSIR (1981-83) from University of Allahabad, India. Worked as Research Scientist at CSIR-CSMCRI, Bhavnagar, India in the area of catalysis, for transformation of O_2, CO, CO_2 and CH4 into organic chemicals. Life Member of National Academy of Sciences, and Catalysis Society of India. As Bilateral Exchange of Scientists awardee, visited France (CNRS,1993) and Korea (KOSEF, 2002), and was awarded Brain Pool Scientist (2011) in Korea. Credited: 101 papers, 5 patents, 2 reviews, 4 book/chapters, 51 invited lectures: 20 international and 71 national conferences,17 students guidance and 20 projects.

Igor V. Shevchenko

M.P. Semenenko Institute of Geochemistry, Mineralogy and Ore Formation,
Kiev, Ukraine

Water can copy the size of its clusters and other molecules. "Water memory" and solar activity

We have found chemical evidence for the ability of water to replicate and reproduce the size of its clusters. On mixing water with organic solvents, for example with acetonitrile, water does not decompose into individual molecules, but forms clusters, the size of which can vary from a few water molecules to several hundreds. For example, 0.02% of water in commercial acetonitrile is structured into very small clusters, which, after a short contact with copper or silver, quickly combine into very large clusters. If bulk water is added to such acetonitrile before and after contact with these metals, then it will copy clusters of different sizes and turn, respectively, either into a large number of very small active clusters, or into a small number of very large passive clusters. After that, the rate of hydrolysis of triethyl phosphite with such differently structured water can differ by up to 500 times. This is easily and accurately measured by 31P-NMR spectroscopy. Water dissolved in AN can also be structured upon contact with organic molecules. For example, after contact with 0.2% sugar in AN, bulk water forms larger clusters and the hydrolysis of TEF can slow down several times.

The variations of solar activity and distribution of solar energy due to the rotation of the Earth around its axis and around the Sun also strong affect the self-organization of water molecules. As a result, the rate of hydrolytic reactions with participation of water clusters displays diurnal, very large annual variations, and is also modulated by the 11-year cycles of solar activity. The rate of hydrolysis also depends on geographic latitude and has different values in the Northern and Southern hemispheres. In different years of the solar cycle, the difference in the reaction rate can reach 200 times. This phenomenon may be well accounted for by the decomposition of water clusters under the influence of muons which are constantly generated in the upper atmosphere by the solar wind. Muons destroy water clusters; therefore, copying of large clusters does not occur under strong solar influence.

Since the muon flux is anisotropic, its influence depends on the area of a reaction solution which is affected by muons. For this reason, the reaction rate is highly dependent on the geometry of the solution and its position in space. For example, the difference in the rate of hydrolysis of triethyl phosphite in three 5-mm NMR tubes directed North-South, East-West and Vertically can be very large and it varies during the day depending on the position of the Sun in the sky.

The influence of the Sun on the stability of water clusters sheds light on the ability of water to memorize the structure of dissolved anti-LgE antibody and to retain its biological effectiveness after strong dilution. This mysterious phenomenon known as “water memory” is not always reproducible as it can only manifest itself under weak solar influence when water clusters are stable. Such periods often occur at the beginning and end of the 11-year cycle of solar activity, especially in winter away from the equator. We experimentally confirmed that cluster copying is much more stable in winter than in summer.

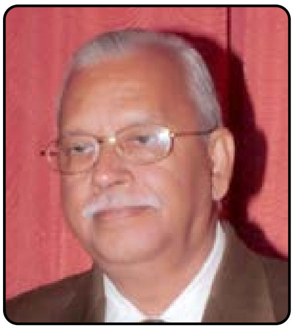
The dependence of the self-organization of water molecules and the chemical reactivity of water clusters on fluctuations in solar activity has a strong influence on all forms of life. It underlies the biological circadian, circannual and 11-year rhythms, and also displays the connection with epidemics.

Audience Take Away Notes

- Influence of the Sun on water has a strong influence on all forms of life. It sheds light on “water memory” mystery and displays the connection with epidemics
- Measurements of the rate of hydrolysis of triethyl phosphite in different places can provide important information about the influence of space weather on the Earth
- Hydrolysis of triethyl phosphite can be used to track changes in the direction of the muon flux
- Near the Equator where there are no seasonal differences, such measurements may become an independent method for estimating solar activity

Biography

Dr. Shevchenko studied Chemistry at the Kiev University, Ukraine and graduated as MS in 1979. He then worked at the Institute of Organic Chemistry in Kiev and received there his PhD degree in 1985. In 1990 he won Alexander von Humboldt scholarship and until 1996 was invited scientist at the Braunschweig University in Germany and at the Sothern Methodist University in Dallas Texas USA. Then he worked in Kiev at the Institute of Bioorganic Chemistry and Petrochemistry and the Institute of Geochemistry Mineralogy and Ore Formation, Ukrainian Academy of Sciences. He has published more than 60 research articles.



Suresh C. Ameta
Professor of Eminence, Department of Chemistry, Faculty of Science, PAHER University, Udaipur - 313024, (Raj.) India

Photocatalysis: An emerging green technology

The world is facing two major problems these days: Ever increasing pollution and scarcity of energy resources. Advanced Oxidation Processes are eco-friendly pathways and photocatalysis is one of these processes, which can provide a solution to both these issues. Hydrogen is advocated as a fuel of future and it can be produced photocatalytically from photosplitting of water. Global warming is another existing challenge, and the carbon dioxide has been predicted as the main culprit. Carbon dioxide can also be reduced photocatalytically to some value added fuels. The major limitation of photocatalyst in most of the cases is their less activity due to little or no absorption in visible range and recombination of electron- hole pairs. Efforts are being made to control both these limitations by increasing the photocatalytic activity by modifications of the semiconductor by metal or non-metal doping, sensitization, use of cocatalysts, composite formation, Z-scheme, etc. All this will be discussed along with other interesting applications of photocatalysis.

Biography

Prof. Suresh C. Ameta obtained his masters degree from university of Udaipur and was awarded gold medal-1970. He secured First position in M. Phil-1978 in Vikram University, Ujjain (M. P.). He also obtained Ph. D degree from this University in 1980. He has served as Professor & Head, Department of Chemistry, North Gujarat University, Patan (1994) and M. L. Sukhadia University, Udaipur (2002-2005) & Head, Department of Polymer Science (2005-2008). He also served as Dean, P.G. Studies for a period of four years (2004-2008). He has served as Dean, Faculty of Science, PAHER University, Udaipur for six years (2011-2017). Presently, he is working as Professor of Eminence (Distinguished Professor of Chemistry) in Pacific University, Udaipur. Prof. Ameta has occupied the coveted position of President, Indian Chemical Society, Kotkata (2000-2001) and is now lifelong Advisor (2002-continue). He was awarded a number of prizes during his career like National prize twice for writing Chemistry books in Hindi (1976 & 1978), Scientist of the Year Award (2002), Prof. M. N. Desai Award (2004), Prof. G. V. Bakore Award (2007), prof. W. U. Malik Award (2008), national Teacher Award (2011), and above all, Life Time Achievement Awards by Indian Chemical Society, Kolkata (2011), Indian Council of Chemists, Agra (2015), Association of Chemistry Teachers, Mumbai (2018), North Gujarat University, Patan (2022). He has successfully guided 110 students for Ph. D. Dr. Ameta has more than 450 research papers and 36 books to his credit. He has contributed Chapters in Books published by Trans-Tech, Switzerland: Nova Science, Taylor & Francis, and Apple Academic Press, USA. Three books on Green Chemistry, Microwave Assisted Organic Synthesis and Chemical Applications of Symmetry and Group Theory have been published by Apple Academic Press, USA. Two more books on Solar Energy Conversion & Storage and Photocatalysis; An Emerging Technology have been recently released by Taylor & Francis, USA and a book on Waste Water Treatments by AOPs by Elsevier. He has completed 5 Major Research Projects by DST, UGC, CSIR, and Ministry of Energy, Govt. of India. Prof. Ameta has delivered lectures and chaired sessions in National Conferences organized in almost every part of this country. He is also reviewer of number of international Journals. Prof. Ameta has an experience of more than 50 years of Teaching and Research. Indian Chemical Society, Kolkata has published a Special issue of Journal of Indian Chemical Society in December 2008 to felicitate him on his 60th birthday and has instituted aa Award in his name as Prof. Suresh C. Ameta Award to be given to a senior chemist of repute from 2003 onwards. He has delivered Keynote Addresses in International Conferences at Tokyo, Japan in May 2022, Hangzhou, China in July 2022 and Kunming, China in 2023. Above all, he has pointed out some problems in h-index and proposed a complimentary index as Ameta or A-index for further improving h-index and for this, he received approval of copyright for this improvement.

Delia Teresa Sponza

Department of Environmental Engineering, Engineering Faculty, Dokuz Eylul University, Buca Izmir Turkey

Photocatalytic treatment of industrial pulp and paper mill wastewater using Fe_2o_3/Tio_2 nanocomposite

In this study the pollutants (COD, CODdis, TOC, BOD_5, TSS, TDS, color) were degraded by Fe_2O_3-TiO_2 nanocomposite produced under laboratory conditions. The effects of pollutant concentration (COD dis=500, 700, 1000, 1500 and 2000 mg/l), photocatalytic power (25, 50, 75, 100 and 125 W/m^2), photocatalytic time (15, 25, 35, 45 and 60 min), nanocomposite concentration (2, 4, 6 and 8 mg/l), Ph (5, 7 and 8), presence of some anions (BrO_3, and ClO_4) and increasing temperatures (20, 30 and 40°C) during treatment were investigated. The pollutants were removed with yields as high as 99 % saccording to Langmuir-Hinshelwood kinetic model, with pollutant rate constants varied between 2 and 3. X 10-2 min^{-1} in the presence of 4 mg/l Fe_2O_3-TiO_2, 1500 mg/l COD dis, 50 W/m^2 power after 25 min at Ph=5 ant 20°C temperature. The magnetic properties of Fe_2O_3-TiO_2 showed high reusability (99% removal for 50 times) and easy separation of the photocatalyst from the wastewater.

Audience Take Away Notes

- The audience will be able to understand as control of preparation of nanocomposite
- It will help full for audience in their job to share the new results
- Yes, this research and other faculty could use to expand their research or teaching
- Yes, this will provide a practical solution to a problem that could simplify or make a designer's job more efficient
- Yes, it will improve the accuracy of a design, or provide new information to assist in a design problem

Biography

Prof. Dr. Delia Teresa Sponza is currently working as a professor at Dokuz Eylul University, Department of Environmental Engineering. Scientific study topics are; Environmental engineering microbiology, Environmental engineering ecology, Treatment of fluidized bed and activated sludge systems, Nutrient removal, Activated sludge microbiology, Environmental health, Industrial toxicity and toxicity studies, The effect of heavy metals on microorganisms, Treatment of toxic compounds by anaerobic / aerobic sequential processes, Anaerobic treatment of organic chemicals that cause industrial toxicity and wastewater containing them, Anaerobic treatability of wastewater containing dyes, Treatment of antibiotics with anaerobic and aerobic sequential systems, Anaerobic and aerobic treatment of domestic organic wastes with different industrial treatment sludges, Treatment of polyaromatic compounds with bio-surfactants in anaerobic and aerobic environments, Treatment of petrochemical, Textile and olive processing industry wastewater by sonication, Treatment of olive processing industry wastewater with nanoparticles and the toxicity of nanoparticles. She has many international publications.

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Green magnetic nanocatalyst to applied in emerging pollutants removal

This study describes the synthesis of an innovative nanomaterial of cobalt ferrite functionalized in niobium pentoxide $CoFe_2O_4@Nb_2O_5$ synthesized by green synthesis using orange peel extract. The material values the combination of a magnetic material (which allows easy recovery after catalyst) with niobium pentoxide (whose metal is abundant in Brazilian territory). Besides the magnetic properties, the type of synthesis created has several advantages over other types already reported in the literature. Among the advantages can be highlighted: Utilization of biomass, namely fruit peels; Extract production using only distilled water as a solvent and low temperatures; Incorporation of the niobium pentoxide support in the same stage of synthesis of cobalt ferrite; High support incorporation compared to other methods, without losing or decreasing the magnetic properties of cobalt ferrite; Added-value to a raw material abundant in Brazilian territory, the niobium; Low-cost synthesis, using standard equipment of the laboratory. The nanomaterial in question is being optimized for the degradation of emerging pollutants, an interest that has risen sharply over the last decade (as evidenced by article publications that have increased by more than 700%). Still, preliminary tests indicated that the $CoFe_2O_4@Nb_2O_5$ nanocatalysts were efficient in the degradation, showing better results under conditions of acid pH, catalyst concentration around $100mg.L_{-1}$, under irradiation of the 250 W mercury vapor lamp.

Audience Take Away Notes

- Other faculty could use this research to expand their research or teaching on synthesis of magnetic nanocatalysts
- This research offers a practical solution for recovering the nanocatalyst after use (with a magnet), allowing its reuse
- It is possible to obtain the material with few resources, allowing its reproducibility

Biography

Jessica studied Chemical Engineering at the Federal Technological University of Parana (UTFPR) and did a Double Degree at Polytechnic Institute of Braganca, Portugal, about Nanotechnology. She participated in the internship at the International Iberian Nanotechnology Laboratory (INL) and at the Institute of Experimental Physics (Slovak Academy of Science), perfecting some techniques with nanomaterials. She completed a Brazilian Masters at UTFPR, whose work resulted in the synthesis of an unprecedented nanomaterial which has intellectual protection through a patent. Currently, she is PhD student in Production Engineering, at UTFPR (Knowledge and Innovation Management), continuing to explore the versatility of the nanomaterial created.

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"We wish to meet you again at our upcoming edition..."

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