IRIS Scientific Group

World Catalysis and Chemical Engineering Network Congress

April 23-25, 2025

"Theme: Advanced Research and Techniques on Catalysis and Chemical Sciences"

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ABOUT US

Iris Scientific Group

IRIS Scientific Group stands as a pioneering organizer of international scientific conferences, recognized for its dedication to facilitating global research dialogue and interdisciplinary collaboration. Since its inception, the organization has consistently delivered high-quality academic events across diverse fields, including Medicine, Life Sciences, Environmental Sciences, Engineering, and Technology.

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IRIS Scientific Group continues to build a reputation as a trusted facilitator of academic excellence. Through its forward-thinking approach and unwavering focus on research impact, it remains dedicated to shaping the future of science and innovation on a global scale.

IRIS Scientific Group

WORLD CATALYSIS AND CHEMICAL ENGINEERING NETWORK CONGRESS

April 23, 2025

KEYNOTE FORUM

Dai-Yeun Jeong
Director of Asia Climate Change Education Center, South Korea

How to Overcome the Limitations Inherent in Sustainable Development

Sustainable development is the ideology and practical strategy of the present and future socio-economic development in harmony with nature. A wide range of policies and practical activities have been launched at a global, national and regional level in order to achieve sustainable development since its concept and implication emerged in 1987 by WCED. In 2015, United Nations adopted a set of sustainable development goals to be achieved over the next 15 years as a follow-up action plan of millennium development goals. However, it is true that sustainable development is not being achieved as successfully as planned. It is evidenced by the challenges such as climate change and natural disasters. This would mean that sustainable development includes limitations in its concept and implication. Nonetheless, it is quite rare to conduct a research on the limitations inherent in sustainable development. In such a context, this presentation aims at exploring the limitations inherent in sustainable development and how to overcome them.

This presentation will first examine the emergence process of sustainable development, and followed by its concept and implication, the critical debates on its concept and implication in the late 1990s and early 2000s, and the concept and implications of sustainable development goal launched in 2015. Based on the findings from the above review, this presentation will explore the limitations inherent in the concept and implications of sustainable development and examine what and how to overcome the limitations. The limitations and how to overcome them will be examined in terms of the existing concept of sustainable development and strategies being mobilized for achieving sustainable development such as nature-based, technology-based, and socioeconomic system-based approach.

The conclusion of this presentation will focus on what the existing concept and strategies of sustainable development should be supplemented. The significance of this presentation lies in proposing a new direction of the coexistence between humans and nature for achieving sustainable development

Audience Take Away Notes

- The concept and implications of sustainable development
- The limitations inherent in the concept and implications of sustainable development
- How to overcome the limitations in order to achieve really sustainable development
- This will help the audiences in different ways depending on their job. For example, this will provide the policy-makers with a new direction and content of establishing sustainable development while this will provide the enterprises with a direction of green management system for achieving sustainable development.

Yes, this can be used as a framework for other faculties to foster a critical eye on the existing concept, implication, strategies and means of sustainable development in their research and teaching.

Providing the non-government social organizations with a direction and content of their activities related to conservation and sustainable use of nature.

Providing the citizens with a direction and content of their environmentally friendly behavior in their everyday life.

Biography

Prof. and Dr. Dai-Yeun Jeong is presently the Director of Asia Climate Change Education Center and an emeritus professor of environmental sociology at Jeju National University in South Korea. He received BA and MA degree in sociology from Korea University (South Korea), and PhD in environmental sociology from the University of Queensland (Australia). He was a professor of environmental sociology at Jeju National University (South Korea) from 1981 to 2012. His past major professional activities include a teaching professor at the University of Sheffield in UK, the president of Asia-Pacific Sociological Association, a delegate of South Korean Government to United Nations Framework Convention on Climate Change (UNFCCC), a delegate of South Korean Government to OECD environmental meeting, and a member of Presidential Commission on Sustainable Development Republic of Korea, etc. He has published 60 environment-related research papers in domestic and international journals and 13 books including Environmental Sociology. He has conducted 100 unpublished environment-related research projects funded by domestic and international organizations.

Thomas J. Webster
Hebei University of Technology, China

How Have We Eliminated Infection? Nanotechnology Human Clinical Studies

This talk will discuss how we have used nanotechnology eliminate infections in over 30,000 humans to date. It will discuss how medical devices have been modified to have nanoscale surface features that repel bacteria while promoting tissue growth. Moreover, it will discuss how we are using artificial intelligence (AI) to design better biomaterials for various biomedical applications. In particular, AI is being used in implantable nano sensor design to prevent, diagnose, and treat various diseases from cancer to infection. Specifically, here, implantable sensors were designed, fabricated, and tested. Such sensors can detect the type of cell that attaches to an implant, communicate such information to a handheld device, and respond to ensure implant success. In particular, such sensors have been tested in animal studies in which sensors were inserted into the calvaria of rats, bacteria purposedly injected, and sensors used to detect bacteria presence as well as on-demand release antibiotics to eliminate infection. Further, AI has been used in such sensors to predict what types of drug delivery vehicles will be most effective for that particular patient based on prior patient health data and real time response to therapies. It is well known that due to variations in immune systems from patient to patient, patients will respond differently to the same biomaterial and drug treatment, thus, personalized or tailored treatments are necessary and can result from AI. In vitro, in vivo, and human clinical studies will be presented in which AI has already improved medicine. In this manner, this presentation presents a positive view on the implementation of AI into medicine via sensors showing how it can be used to improve disease prevention, diagnosis, and treatment.

Audience Take Away Notes

- How nanotechnology is being used in medicine in humans
- How nanomedicine improves tissue growth and decreases infection
- What is the future of nanomedicine

Biography

Thomas J. Webster's (H index: 129; 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 in over 30,000 patients. His technology is also being used in commercial products to improve sustainability and renewable energy. He is currently helping those companies and serves as a professor at Brown University, Saveetha University, Hebei University 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 is a former President of the U.S. Society for Biomaterials and has over 1,350 publications to his credit with over 55,000 citations. He was recently nominated for the Nobel Prize in Chemistry. Prof. Webster also recently formed a fund to support Nigerian student research opportunities in the U.S.

Eleonora Aneggi

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

Enhanced heterogeneous Fenton degradation for liquid waste treatment

Innovations in water technology are fundamental to finding solutions to the nowadays challenges: climate change, resource shortages, emerging contaminant, urbanization and sustainable development. Nowadays the use of conventional wastewater processes is becoming increasingly challenging mainly due to the presence of biorecalcitrant organic matter. An emerging technology is needed to deal with these highly concentrated and toxic non-biodegradable pollutants. Advanced oxidation processes (AOP) such as Fenton, Fenton-like and hybrid processes have been successfully employed for the treatment of different types of wastewaters. These processes typically rely on the generation of highly reactive hydroxyl radicals, which in turn attack the organics and degrade them. The conventional Fenton process generates large volumes of sludge that needs to be disposed, creating a serious environmental and economic problem. The heterogeneous Fenton process is the most viable solution for the treatment of wastewaters because it produces lower amount of sludge, the catalysts are recyclable and these features make this process feasible in terms of scalability and economics. However, there is a growing need for the development of new active catalysts to be employed in Fenton-like process, with extended life, improved activity and selectivity.

Here, we focused on mono- and bimetallic formulations based on Co, Cu, Fe and Mn, which were investigated for the degradation of model liquid waste, a pharmaceutical pollutant (model solution of ibuprofen), three model organic dyes (methylene blue, rhodamine B and malachite green) and a landfill leachate which contains refractory organic compounds. A bimetallic Mn-Fe catalyst results the best formulation with an almost complete degradation of methylene blue and malachite green at pH 5 in 5 minutes and of rhodamine B at pH 3 in 30 minutes. The results suggest that these formulations can be applied for the treatment of broad range of liquid wastes comprising of complex and variable organic pollutants. The investigated catalysts have resulted to be extremely promising when compared to other systems reported in the literature,

Copper-based catalysts have developed for the treatment of liquid wastes using a Fenton process, as a potential pretreatment before wastewater treatment line. Copper supported on zirconia exhibited a promising activity with an almost complete degradation of ibuprofen (98%) and 60% of mineralization, while working with the leachate a 67% of abatement of pollutants is obtained.

In addition, several analytical techniques have been used for the assessment of the reduction of toxicity of the landfill leachate after Fenton process over copper-zirconia catalyst. UV–vis spectroscopy and AOX analysis have been coupled to achieve further insight into the degradation of contaminants. For the first time, the qualitative abatement of organic compounds is monitored through proton nuclear magnetic resonance (1H NMR) analysis, providing a new method for evaluating the effectiveness of the treatment. Spectroscopic techniques reveal that the Fenton process induces a significant abatement of the aromatic and halogen compounds (51%) in the landfill leachate with a reduction of the toxicity that has been confirmed by ecotoxicological test with algae. These results validate the investigated tool for a simple rapid preliminary evaluation of the detoxification efficacy

Summarizing this study highlights the potential of different catalysts for the removal of organic compounds from liquid waste via heterogeneous Fenton-like process and a easy tools for the assessment of the reduction of toxicity.

Audience take away notes

- Recent insight on heterogeneous Fenton process
- Development and characterization of novel catalysts
- Evaluation of the degree of oxidation (mineralization or partial degradation of organic compounds in liquid waste)
- Optimization of reaction variables

Biography

Dr. Eleonora Aneggi is a temporary researcher at the University of Udine. She graduated in Chemistry in 2001 at University of Trieste and in 2007 she obtained her PhD at the University of Udine. Her main scientific interests are catalytic processes, mainly related to environmental. Her research activity involves the development of advanced catalytic materials for atmospheric and water pollutants. She worked on various national and international projects. She has been the winner of numerous national and international awards. She is author or co-author of more than 70 scientific publications in top international journals.

Maria JoseLavorante*, Daniel Floreal Sanchez, Daniel Guillermo Schiavo, Ricardo Martin Aiello, Christian Miguel Chiacchio

Research and Development Division of Renewable Energy, Institution of Scientific and Technological Research for Defence, Argentina.

Advances in the Development of Alkaline Water Electrolysis Cells: A Case Study

Most of the chemicals produced today will likely remain predominant even in a low- carbon society, as projected. The chemical industry is a significant contributor to greenhouse gas emissions due to its energy-intensive processes that rely on fossil fuels and raw materials. Therefore, the development of more sustainable production processes is essential and a priority.

Hydrogen produced from renewable electricity can be used to synthesize valuable chemicals, thus contributing to the decarbonization of the industry.

Power-to-X technologies focus on the chemical storage of excess renewable energy. Products that would otherwise be obtained from fossil sources can be converted into electricity or used for other purposes. These processes, which include hydrogen production from renewable sources, could play a key role in decarbonizing sectors of the economy. In this context, hydrogen is presented as a key intermediate product, which can be produced via water electrolysis.

Water electrolyzers are devices in which electrolysis occurs, a well-established and commercially used process for producing high-purity hydrogen by decomposing the water molecule. Electrolysis is an electrochemical reaction that splits water into hydrogen and oxygen using electrical energy.

Currently, the economic viability of water electrolysis is primarily influenced by the cost of electricity and the capital expenditures associated with electrolyzers. However, over time, there is a trend of decreasing renewable electricity prices, while capital expenditures are becoming more relevant. Therefore, optimizing and reducing these capital costs is essential.

Among electrochemical technologies for hydrogen production, alkaline water electrolysis is the most mature, with a technology readiness level (TRL) of 9. This technology is available for large-scale applications and uses low-cost materials for theelectrodes, such as iron and nickel. Due to these advantages, it dominates the current market and is a viable option for Power-to-X plants.

In this work, the steps followed for the development of an alkaline water electrolysis cell from TRL) 3 to 4 will be presented. The approach taken to evaluate the tested components and the results obtained will be described. TRL 3 corresponded to the phase in which a proof of concept was conducted, demonstrating the critical function of the technology through analytical and experimental tests, which allowed for the verification of the basic system principle under controlled conditions. Subsequently, at TRL 4, the components and their configuration were validated in a laboratory environment, where it was verified that the system elements functioned correctly when integrated.

Audience Take Away Note

- A clear understanding of the steps followed in advancing an alkaline water electrolysis cell from TRL 3 to4.
- Insight into the experimental and analytical approaches used to evaluate components and validate the functioning.

- Knowledge about the challenges and strategies for scaling up electrolysis cell.
- The ability to apply the methodologies used in the process to their own research or projects.
- The audience will learn about the methods for moving from proof of concept to a validated prototype, which can be applied in their own work to advance technologies, or similar fields. The insights into testing and component integration can inform their research or development processes.
- This research will provide practical insights into developing and scaling technologies in a lab environment, crucial for engineers, researchers, or designers working with electrolysis or energy systems. The validation process could improve the efficiency and accuracy of similar projects, aiding in faster, more reliable technology development.
- Yes, this work offers valuable data and methods that other faculty members can incorporate into their research. It could also be used in teaching to demonstrate the process of technology maturation and validation in applied science.
- Yes, the methodologies and validation approaches presented could simplify the design and testing of electrolysis systems, potentially saving time and resources in the development process, while ensuring the reliability and efficiency of the technology.
- By offering a clear understanding of how to transition from a proof of concept to a functional prototype, this work provides information that can improve the accuracy of designs for energy-related technologies.
- List all other benefits:

    1. It offers a structured approach to technology validation.
    2. It contributes to the development of sustainable energy solutions.
    3. It provides a framework for advancing similar technologies through the TRL process.

Biography

María José Lavorante collaborates actively to the Research and Development Division of Renewable Energy at the Institution of Scientific and Technological Research for Defense (CITEDEF), Buenos Aires Province, Argentina. Her research interests include water electrolyzers, fuel cells, dark fermentation and conductometric titrations. She is the Head Professor at the Engineer Faculty, at the National Defense University in charge of the subject Solids and Colloidal Chemistry. For 2021-2024, she was the coordinator of the ¨Electrolyzers for industrial use and storage¨ subnetwork of the CYTED network ¨Hydrogen: production and uses in transportation and the electrical sector (H2transel)

Tokeer Ahmad

Department of Chemistry, JamiaMilliaIslamia, Jamia Nagar, New Delhi, India.

Sustainable Energy through Heterogeneous Catalysis using Advanced Material

Semiconductor based photochemical and photoelectrochemical water splitting is an ultimate source of hydrogen generation as renewable green energy for tackling the ongoing fuel crisis. Carbon based materialsare ideal for overall water splitting as a result of the excellent alignment of its band edges with water redox potentials. However, a single catalyst with a limited number of active sites does not exhibit significant photo/electrocatalytic activity for hydrogen production. Therefore, we have developed the semiconductor heterostructures of carbon materials with oxides, sulphides, selenides, other TMCs/TMDs NPs and QDs as the highly efficient nanocatalysts for enhanced hydrogen evolution reactions. The monophasic heterostructures have been designed in different weight ratios with fairly uniform distribution of nearly spherical particles and high specific surface area which creates an interfacial charge transfer between two semiconductors. As prepared heterostructures showed significant hydrogen evolution which is evident by observing high apparent quantum yield, low onset potential, lower overpotential and high electrochemical active surface area that will be presented in detail.

Biography

Prof. Tokeer Ahmad is graduated from IIT Roorkee and Ph.D. from IIT Delhi. Presently, he is full Professor at Department of Chemistry, JamiaMilliaIslamia, New Delhi since 2019. Prof. Ahmad has supervised 16 PhD's, 84 postgraduates, 10 projects, published 219 research papers, one patent and three books with research citation of 9340, h-index of 57 and i10-index of 175. Prof. Ahmad is active reviewer of 198 journals, delivered 211 Invited talks, evaluated 69 external doctoral theses and presented 138 conference papers. Prof. Ahmad is the recipient of CRSI Bronze Medal, MRSI Medal, SMC Bronze Medal, ISCAS Medal, Inspired Teacher's President of India Award, DST-DFG award, IIT Delhi Alumni Faculty Award, Distinguished Scientist Award, Dr. S. S. Deshpande National Award, MaulanaAbulKalam Azad Excellence Award of Education, Teacher's Excellence Award, Elected Member of National Academy of Sciences India and Fellow of Royal Society of Chemistry (FRSC), UK. Prof. Ahmad has been figured in World Top 2% Scientists for consecutive five years since 2020 in both coveted lists including career long by Stanford University, USA.

Vasily Lutsyk[1,2*], Vera Vorobjeva[1], Anna Zelenaya[1], Maria Parfenova[1]

[1]Institute of Physical Materials Science, Siberian Branch of the Russian Academy of Sciences

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Digitization of Phase Diagrams of Ternary Halide Systems by Creating Their Computer Models for the Development of Catalytic Materials.

In many cases the chloride ternary systems are used as the catalytic compositions. Digital twins for the isobaric chloride phase diagrams (PD)Li,M,K||Cl (M=Ce,Gd,La,Nd,Pr,U) in the form of space computer models willbe discussed by our presentation. Completed 3D model of each PD will be made in the form of an independent object (including a commercial product protected by a patent), which can be offered to users in the form of a complete description of all possible phase transformations in a ternary system equipped with extensive capabilities for visualizing all fragments of the PD and the results of calculations of crystallization processes occurring in the system. To verify the model, a coherence analysis (cross validation) of the horizontal (on a polythermal section at a fixed temperature) and vertical (for some compositions of this isopleth) material balances may be carried out. Space models of PD (both for real systems and their prototypes) will be helpful to recognize the graphic errors in erroneous interpretation of experimental and computational (thermodynamic or ab initio) data. The publication of the graphics for the PD of many ternary systems makes it urgent to accelerate the training of students and more experienced specialists for the perception and understanding of such information. Development of technical specifications for the prototyping of the so-called exploded T-x-y diagrams will be very useful for this purpose. Two variants of disassemblable PD of the ternary systems will be shown: all phase regions of PD or their compressed variant – a puzzle with a complex element of the known origin.

Audience Take Away Notes

- The main benefits for the listeners are the follows: 1) they will receive the first experience in the multidimensional space PDof the multicomponent system digitization by the novel tool of materials science – PD computer models; 2) they will be prepared for the 3D-prototyping of the PD phase regions.
- 1) Digitization of space phase diagrams by the creation of commercial products is fulfilled by 3D computer models of verified PD with the patent support. Completed 3D model of each PD will be made in the form of an independent object (including a commercial product protected by a patent), which can be offered to users in the form of a complete description of all possible phase transformations in a ternary system equipped with extensive capabilities for visualizing all fragments of the PD and the results of calculations of crystallization processes occurring in the system. To verify the model, a coherence analysis (cross validation) of the horizontal (on a polythermal section at a fixed temperature) and vertical (for some compositions of this isopleth) material balances may be carried out.
- 2) Along with an expansion of the opportunities of computer design, space models of PD (for real systems and for their prototypes) will be helpful to recognize the graphic errors in erroneous interpretation of experimental and computational (thermodynamic or ab initio) data.The publication of the graphics for the (PD) of many ternary systems makes it urgent to accelerate the training of students and more experienced specialists for the perception and understanding of such information.
- 3) Development of technical specifications for the prototyping of the so-called exploded T-x-y diagrams will be very useful for this purpose. Two variants of disassemblable PD of the ternary systems will be shown: all phase regions of PD or their compressed variant – a puzzle with a complex element of the known origin.

Biography

Materials CAD Lab head, IPMS SB RAS. Professor, Banzarov Buryat State University. Session Organizer "Phase Diagram - Tool of Materials Science", Conferences on Competitive Materials and Technology Processes IC-CMTP, (Hungary, 2012, 2014, 2016, 2018). Presentation: India-Russia Scientific Webinar on Additive Manufacturing Technologies, 2022; Conf. on Materials Science and Engineering, Singapore, 2022; 18th International Conf. on Catalysis, Chemical Engineering and Technology, Paris, 2024; Webinar on 3D Printing & Additive Manufacturing, Dubai, 2024; 5th Global Virtual Summit on Pharmaceutical and Novel Drug Delivery Systems, 2024. Committee member: Conf. on Thermal Science and Engineering (TSE 2024), Ningbo, China.

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WORLD CATALYSIS AND CHEMICAL ENGINEERING NETWORK CONGRESS

April 23, 2025

SPEAKER SESSIONS

Joanna Drzeżdżon[1*], Dr.,Shengyu Dai[2],Huijun Fan[3],Artur Sikorski[4],Mateusz A. Baluk[5],Janusz Datta[6],Anatoliy Ranskiy[7],Dagmara Jacewicz[8],

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Modification of poly(2-chloro-2-propen-1-ol) with ethylenediamine towards the novel material morphology and CO_2 sorption properties

Currently, there's been a surge in attention towards CO_2 sorbents among scientists, engineers, and industry experts. CO_2, as both an air pollutant and a greenhouse gas, has become a major concernfor the environment. These sorbents aren't just for environmental cleanup—they're also proving valuable in various industrial and consumer activities.

This presentation concerns the catalytic synthesis of modified poly(2-chloro-2-propen-1-ol) with ethylenediamine (EDA). The process of oligomerization of 2-chloro-2-propen-1-ol is catalyzed by a new monocrystalline oxovanadium(IV) complex compound. We designed the synthesis of a new monocrystalline compound - vanadyl acetylacetonate linked by a water molecule through a hydrogen bond to 3-amino-2-chloropyridine and physicochemical properties were tested by XRD, MALDI-TOF-MS, coupling TG-FTIR, SEM, UV-Vis diffuse reflectance spectroscopy, photoluminescence spectroscopy, and elementary analysis. Novel materials exhibit a nanoporous structure attributed to EDA's presence. Our objective was not only to induce morphological changes but also to enhance CO_2 sorption capacity. The new oligomeric materials were characterized by several methods such as NMR, MALDI-TOF-MS, GPC/SEC, FTIR, TG, and DSC. Additionally, we utilized theoretical chemistry methods to pinpoint the most energetically favorable structural configurations of the modified material's oligomer chains.

The development of potent CO_2 sorbents, coupled with advanced olefin polymerization catalysts, holds promise in reducing greenhouse gas emissions and addressing environmental pollution stemming from plastics. These efforts align seamlessly with the principles of sustainable development, underscoring the significance of our research in contributing to a cleaner, greener future.

The part of this presentation about the synthesis of new oxovanadium(IV) compound and sorption studies is the subject filed with the Patent Office in Poland (application number P.448000).

Audience Take Away Notes

- The presented results may be helpful to other researchers in designing new catalysts for the polymerization and oligomerization of olefins and their derivatives, as they show how which ligands cause an increase in catalytic activity.

- Recipients of the presentation will see how structural modifications affect the morphologies of new materials.
- An important effect of the presented results will show the dependence of structural changes and sorption properties toward CO_2.

Biography

Joanna Drzeżdżon is an assistant professor at the Department of Environmental Technology, Faculty of Chemistry, University of Gdańsk in Poland. She obtained her PhD in 2017. She is a member of the “Polish Chemical Society” and the “European Chemical Society”.She headed the grant “Complex compounds of transition metals as new antioxidants - synthesis, physicochemical and biomedical characterization” “ funded by the National Science Center. She is a laureate of the START scholarship for Outstanding Young Scholars awarded by the Foundation for Polish Science in 2020 and the scholarship of the Minister of Science and Higher Education for Outstanding Young Scientists in 2019.

Sachin Sharma Ashok Kumar*, RameshKasi, Ramesh T. Subramaniam
Centre for Ionics University of Malaya, Department of Physics, Faculty of Science, Universiti Malaya, 50603 Kuala Lumpur, Malaysia

ENHANCEMENT OF BARRIER PROTECTION OF ORGANIC COATINGS WITH THE INCORPORATION OF GRAPHENE OXIDE AS A REINFORCING FILLER

Graphene and its derivatives are new materials with unique properties which have been widely employed as a reinforcing filler material in organic coatings. The superior properties of graphene oxide (GO) have resulted it to be a promising additive in anti-corrosion coatings. Moreover, due to the presence of oxygen-containing functional groups, the GO has exhibited high water dispersibility. In addition, the chemical functionalization that is facilitated by these functional groups on the GO surface resulted in the enhancement of dispersibility and corrosion protection performance. In this study, a series of coatings were developed by incorporating different loading rates of GO nanoparticles into the polymer matrix along with the inclusion of polydimethylsiloxane (PDMS). Furthermore, the contact angle (CA) measurements indicated remarkable enhancement of the surface hydrophobicity, exhibiting the highest CA of 87.55º. In addition, the cross-hatch test (CHT) revealed that all thecoatings received 4B and 5B ratings, thus possessing excellent surface adhesion. The barrier protection performance of the coated steel substrates was investigated using electrochemical impedance spectroscopy (EIS) over a period of 30 days. The results demonstrated that the best corrosion resistance was achieved by the 0.5% GO coating sample and the inclusion of GO nanoparticles remarkably enhanced the corrosion protection performance of the coatings. Moreover, the field emission scanning electron microscopy (FESEM) representations confirmed that the presence of the functional groups on the GO surface facilitated the chemical functionalization process, which led to excellent dispersibility. In summary, the fascinating features of graphene-based materials have emerged as a new class of nanofillers for corrosion protection applications.

Audience Take Away Note

- Corrosion is a serious threat to both economy and society. Hence, addressing these issues are essential to prolong the lifespan of metal-based substrates. The audience will be exposed to the new avenues and processes to prolong the corrosion reaction
- The findings of this research will significantly benefit the audience as prolonging the corrosion reaction will result in a remarkable cost reduction to replace the degraded metal/steel substrates. The multifunctional coatings that are described in this study provides a practical solution as it is well-known that corrosion issues cannot be solved but instead it can only be prolonged. Moreover, the study includes other beneficial explanations to why smaller content of nanofillers and uniform dispersion is more favorable in terms of enhancing the corrosion protection performance and smaller content used indicates the involvement of lowest cost of materials but yet providing a potential solution to this issue. In addition, the techniques employed in this study improved the efficiency of the coating design and wastage of coatings etc. were avoided. In overall, the findings reported in this study is essential for the researchers particularly in the field of corrosion science and it opened new avenues to further explore graphene derivatives for corrosion related applications.

Biography

Assoc. Prof. Ts. Dr. Sachin Sharma Ashok Kumar is a material scientists experienced in the development of graphene and graphene oxide nanomaterials incorporated with reinforced composites, supercapattery, batteries, hydrogen storage, polymer nanocomposites, corrosion coatings and 3D composites for numerous engineering applications. He received both of his BSc. degree (Hons.) and MSc. (Hons.) in Mechanical Engineering minor in Materials Science from Wichita State University, USA in year 2011 and 2012, respectively. He received his PhD in Advanced Materials Science Engineering in University of Malaya in 2023. His current research involves the synthesis of super-hydrophobic graphene-based polymer nanocomposite coatings to enhance corrosion resistance. He has published numerous articles in high ranked journals, participated in international conferences/exhibitions as a keynote speaker and has received several excellence awards at international levels. He is currently a member registered with the Board of Engineers Malaysia (BEM) and Malaysia Board of Technologists (MBOT).

Rahul Hajare
Sandip University, School of Pharmaceutical Science, India

Examination of Certain Biomolecules That May Be Effective in Preventing Sars-Cov-2/ Covid-19 Through In-Silico Analysis: Initial Studies

In 2019, the corona virus (SARS-CoV-2) with highly contagious features caused millions of cases worldwide. Scientists now feel more pressure than ever to create a unique cure. Due to the strong spreading properties that increased the death rate, medical professionals administered Remdesivir, dexamethasone, azithromycin, and hydroxychloroquine, among other treatments. An alternative Ayurvedic treatment that is safe and has no side effects can be helpful, even though a medication has now been licensed and vaccinations have been given to combat the symptoms. Because these plants are endowed with strong chemical contents, this study is focused on a selection of prospective plants. According to a review of the literature, these chemical components support the body's defenses against illness, lower inflammation, supply antioxidants, and increase resistance. Consequently, the protein crystalline structure of SARS-CoV-2 Mpro was carried out in the current study, In-silico analysis of selected markers against 6LU7. The average binding energy of the following compounds was determined: -5.67, -6.01, - 6.47, -6.41, -6.92, -6.52, -6.35, -6.47, -6.98, -6.83, -6.52, -7.86, -6.36 kcal/mol for nobiletin, tangeretin, sideroxylonal C, Coriandron, Epicatechin, epigallactocatechin gallate, luteolin, Ombuin, Tamarixetin, 6-deacetylnimbin, nimbolide, and Tricin, respectively. Furthermore, nine bioactive markers, namely PHE140, CYS145, GLU166, GLN189, Epicatechin, Nobiletin, Tamarixetin, Ombuin, and nimbolide, exhibit comparable binding active sites with the synthetic drug Remdesivir. Additionally, binding energy scores, binding affinity, and ADMET modeling are the main topics of the inquiry. Nonetheless, immunization is a necessary condition to stop the spread of infection.

Biography

Dr. Rahul Hajare is a Hyderabadi Brahmin, sweet in speech. Dr. Rahul Hajare is designed by a mother figure. Dr. Rahul Hajare is very reserved. He has higher compatibility with Brahmin. Dr. Rahul Hajare trained his mother about orientation on Earth. Dr. Rahul Hajare learned a modern degree from Respected Love one. He is a student of world renowned scientist, highly respected, and retired director of the National AIDS Research Institute, Dr. Ramesh S. Paranjape, which is well known and highly esteemed worldwide. Dr. Rahul Hajare read the people. Dr. Rahul has good genes foundation of Lady Luck.

Ashanendu Mandal
Energy Expert and International Speaker, India

Adsorptive removal of toxic phenol from wastewater to ensure water recycling in industry

This research aims for adsorptive removal of phenol from wastewater by solid waste materials viz. guava tree bark, rice husk, neem leaves, activated carbon from coconut coir, rice husk ash, red mud, clarified sludge from basic oxygen furnace and activated alumina. The characterizations of the adsorbents are performed by SEM, XRD, FTIR and BET analyzers. The experiments of phenol removal are carried out in batch process with the variation of initial phenol concentration (5-500 mg/L), initial pH (2-12), adsorbent dose (0.10-20 gm/L), temperature (25-50°C) and contact time (30-600 min). The maximum phenol removal percentage was found with neem leaves used as adsorbent and it was 97.50%. The kinetics study shows that the pseudo-second order modelisbest fitted for all adsorbents except red mud. The kinetic modeling shows 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 modelings using Levenberg-Marquardt and Scaled Conjugate Gradient algorithms establish that the experimental and predictive data are within allowable range. The studies of scale-up designs, the regeneration of adsorbents and the safe disposal of used adsorbents show that these adsorbents can be used for commercial applications. Further, the column study of phenol removal is also carried out using the most efficient batch adsorbent neem leaves. The research concludes that all these adsorbents can be used commercially for removal of toxic phenol from wastewater to ensure water recycling in industry.

Biography

Ashanendu Mandal has graduated as B. Sc in Chemistry and B. Tech in Chemical Engineering from University of Calcutta. He has got his M. Tech Degree in Chemical Engineering from IIT, Kharagpur. He has acquired MBA degree in Finance from IGNOU, New Delhi and has undertaken an Advanced Management Program from IIM Calcutta. He has also acquired the Degree of Ph. D. (Tech) in Chemical Engineering from University of Calcutta. Dr. Mandal has worked in ONGC for more than 34 years and his experience includes commissioning, modifications, safety, operations, artificial lifts, pressure maintenance, EOR and planning in offshore and onshore oilfields. He has also vast experience in marketing of upstream and downstream petroleum products. Dr. Mandal has published technical papers in Chemical Weekly and research papers in many international journals. He has visited more than 25 countries for attending training programs and for participating in international conferences as invited speaker or panelist. Dr. Mandal is a lifetime member of Indian Chemical Society and Indian Science Congress.

Omvir Singh

Department of Science & humanities, Rajiv Gandhi Institute of Petroleum Technology, Jais, Uttar Pradesh, India

Production of Renewable Aromatic Hydrocarbons from Long Chain Unsaturated Used Cooking Oil Over a Hierarchical Imidazole Supported Zeolite

The efficient and sustainable used of large spare of food waste in developing countries. The used of Used cooking oil (UCO) for different process (esterification, catalytic upgradation) is better and alternative feedstock for petrochemicals industry. The transformation of Methanol assisted upgrading of UCO into xylene rich aromatics over ZSM-5 catalyst with different loading of Ga and Co has been investigated in a continuous down flow reactor. To study the aromatization as well as alkylation effect of methanol on UCO for production of xylene aromatic. The Nano zeolite mainly Co-Ga supported ZSM-5 zeolite has increased its acidic site, and porosity which can interacted with UCO and methanol to give Xylene rich aromatics product. Different analytical techniques such as BET-surface area measurements, XRD, SEM, TEM, XPS, TPR, FT-IR, RAMAN, and TGA analysis were employed to characterize the catalyst. The BET shows a pore size of Co-Ga- ZSM-5 supported zeolite catalyst was found to be ~6.3 nm, which significantly contributed and enhanced the conversion and selectivity towards aromatic(C_6-C_8). The alkylation effect of methanol with used cooking oil (UCO) for achieving the p-xylene selectivity, the excess amount of methanol can cause side change alkylation reaction, resulting in the formation of Trimethyl benzene (TMB) and other alkylated product. Therefore, on the optimized condition 20% methanol bleeding with used cooking oil give the maximum selectivity of p-xylene 8.5% and total xylene selectivity is 20.1%. The deactivation of Cobalt supported zeolite acidic catalysts for the production of aromatic hydrocarbon via formation of intermediate depends on the catalyst acidity and pore size. This indicates the main reaction between Paraffinic rich UCO on bimetallic Co-Ga supported ZSM-5 with significant participation of the support. Gradually, the coke on the support Co-Ga supported ZSM-5 zeolite increases to an extent that it blocks the reaction also at that location.

Biography

Dr.Omvir Singh completed his PhD in Heterogenous catalysis from CSIR-Indian Institute of petroleum. Subsequently, he went to IISc Bangalore and the University of Kyushu (Japan) for his post-doctoral research. He was awarded the prestigious BRICS Young Scientist Award DST, 2022. Then he moved to India and joined as Assistant professor at Rajiv Gandhi Institute of Petroleum Technology. . His research focuses on converting unconventional feedstocks into value-added chemicals using heterogeneous catalysts for next generation of sustainable processes. Converting biomass/non-edible feedstocks into drop-in chemicals is highly demanding as they can be used without any modification of existing industrial setups. During his research, he synthesized various mesoporous unconventional nanomaterials and characterized them using advanced spectroscopic techniques. In his current work, he focuses on the catalytic production of drop-in chemicals.

Delia Teresa Sponza

Environmental Engineering Department,Engineering Faculty, DokuzEylül University, İzmir-Turkey

Low-density polyethylene (LDPE) and polyvinyl chloride microplastic removals with Fe-ZnO nanocomposite

The rapid increase in plastic production and disposal worldwide has adversely and significantly impacted the global environment and biology. Traditional treatment methods are not appropriate for microplastics (MPs) due to their highly polymerized, stable, and complex chemical structure. Photocatalytic degradation of MPs is a relatively new and environmentally friendly approach.The effects of increasing sun ligth power (7, 12, 18, 22 and 30 W/m2) , time (20 min, 40, 60 and 80 min),Ph (5, 7 and 9), temperature (20 Oc, 30 Oc and 40 oc), Fe-ZnO nanocomposite (2, 4,6,8 and 10 mg/l) and Low-density polyethylene (LDPE) and polyvinyl chloride (60, 200, 500, 800 and 1000 mg/l concentrations on the photodegradation yields of Low-density polyethylene (LDPE) and polyvinyl chloride was investigated. The surface properties of the nanocomposite was investigated by the XRD, SEM and FTIR analysis. For maximum photodegradation yields of Low-density polyethylene (LDPE) and polyvinyl chloride (99% and 97% , respectively) the optimum operational conditions were 22 W/m2 UV power, 60 min photodegradation duration, Ph= 7, 35 ^{o}C temperature , 6 mg/l Fe-ZnO nanocomposite and 800 mg/l microplastic concentration.

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.

M. Salinas[1], E. Munoz-Serrano[2], F. Tavares[3], H. Martínez[1,] M. Toledo[1], M.C. Gutierrez[1], A.F. Chica[1], J.A. Siles[1]*& M.A. Martín[1]

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[3]Department of Mechanics Continuous Media and Theory of Structures, Escuela Politécnica Superior, University of Córdoba (Spain).

Towards zero-emission systems: Intelligent control of odour derived from urban solid waste management plants

The reduction of negative impacts associated to the generation of residual substances is nowadays one of the main purposes to be achieved at European and global level, so that the implementation of the best available techniques for waste managing is being promoted. In this context, it is essential to reduce the odorous impact derived from urban waste management. Citizens usually complain about the presence of urban solid waste management plants (USWP) near their homes, especially due to the generation of bad odors in composting areas in the waste plant facilities. In fact, gaseous emissions derived from waste, in addition to being odorous and reducing well-being of nearby populations, might be harmful for the environment (green-house gases) and human health. However, as far as odoriferous contamination is concerned, the regulations are widely diffused and, in some cases, non-existent, with local authorities eventually facing social protests due to odor problems.

The overall objective of this study was the evaluation of the efficacy of an innovative system to reduce the odorous impact derived from USWPs, based on the use of misting absorption devices at the event of odor peaks, in critical areas. Two pilot scale misting devices were built and evaluated for such a purpose, with water flowrate, pressure requirements and mist drop size being the main differentiating variables, among others. Different mixtures of volatile chemical compounds (ethanol, ammonia, acetic acid, caproic acid and butyric acid) were used as representative waste odorous sources from different typology of urban residues. The odor concentration in the emitting point and at different distances from the misting devices was quantified through dynamic olfactometry (source) and field olfactometry (immission odor concentration) after odorants passed through the misting system, which allowed the efficacy of the odor control strategy to be quantified. Climatic conditions were also monitored (temperature, ambient moisture, wind speed and direction, etc.) and the evaluation focusedon zones of higher odor concentration and maximal dispersion. The main results obtained showed that the misting systems were efficient in the removal of odorous impact under the study conditions. Specifically, odor immission concentrations within the range of 500-2000 ou_E/m^3 were quantified around the odorant sources, with complete odor removal efficacy being achieved at 4 m from the misting system leading to drop size of 10-50 µm, and at 6 m when such a variable was >70 µm.

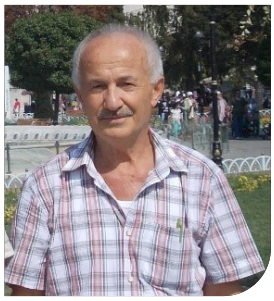
Subsequent steps of this applied research are focused on the creation of a net of intelligent sensorization systems to detect odorous compounds with low detection limit and activate the misting devices at annoying odor thresholds. Such digital technologies and innovative infrastructures could allow the protection of natural resources, the improvement of quality of life of society as a whole and the promotion of "*Smart Cities*".

Audience Take Away Notes

- The study could allow the audience to become aware of the importance of correct management of urban solid waste as one of the main residual substrates generated worldwide, as well as the need to develop efficient tools for quantifying and minimizing the odorous impact.
- Job niches related to waste management are increasingly abundant and knowledge on the reduction of the odorous impact of different residual fractions is essential for their correct valorization in different contexts, both at urban and industrial levels.
- Definitely. It is an environmental, social and economic problem directly related to the achievement of sustainable development goals. Consequently, a wide range of ambitious research lines can be carried out within the topic.
- Absolutely, due to urban and industrial waste managers frequently demand the research and development of solutions for the evaluation and minimization of odors derived from waste management.
- Yes, understanding the characterization of waste, including its composition and the odoriferous emissions it generates, is essential for developing effective strategies to reduce the environmental impact of waste management.
- Specially remarkable is the improvement of the quality of life of citizens and the promotion of sustainability within the frame of circular economy.

Biography

Dr. Siles studied Environmental Sciences at the University of Córdoba (UCO, Spain) and graduated as MS in 2005. He then joined the research group RNM-271 at the Department of Chemical Engineering (UCO). He received his PhD degree in 2010 at the same Institution and was awarded the Extraordinary Doctoral Award. After 1.5 year of research stays at Oxford (UK), Southampton (UK) and Rey Juan Carlos (Spain) Universities, he obtained the position of a Substitute Professor at UCO and promoted to its current position as Professor of Chemical Engineering. He is co-author of more than 80 research articles in SCI(E) journals.



Osman Adiguzel
Firat University, Turkey

Dual Memory Characteristics and Crystallographic Transformations in Shape Memory Alloys

Shape memory alloys take place in a class of advanced smart materials by exhibiting dual memory characteristics, shape memory effect and superelasticity in the β-phase region with chemical composition. Shape memory effect is initiated with thermomechanical processes 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, and this behavior can be called thermoelasticity.This phenomenon is governed by crystallographic transformations, thermal and stress induced martensitic transformations. Thermal induced martensitic transformation occurs on cooling with cooperative movement of atoms in <110 > -type directions on {110} - type plane of austenite matrix, along with lattice twinning and ordered parent phase structures turn into the twinned martensite structures, and twinned structures turn into detwinned martensite structures by means of stress induced martensitic transformations with deformation. Atomic movements are confined to the nearest atom distances, and martensitic transformations have diffusionless character. Superelasticity is performed in only mechanical manner with stressing and releasing the material in elasticity limit at a constant temperature in the parent austenite phase region, and shape recovery occurs immediately upon releasing, by exhibiting elastic material behavior. Superelasticity is performed in non-linear way, stressing, and releasing paths are different at the stress-strain diagram, and cycling loop refers to the energy dissipation. Superelasticity is also result of stress induced martensitic transformation, and the ordered parent phase structures turn into the detwinned martensite structures with stressing. It is important that lattice twinning and detwinning reactions play important role in martensitic transformations. These alloys are functional materials with these properties and used in many fields from biomedical application to the building industry.Lattice twinning and detwinning reactions play important role in crystallographic transformations and driven by inhomogeneous lattice invariant shear. Copper based alloys exhibit this property in metastable β-phase region, which has bcc-based structures. Lattice twinning and lattice invariant shearare not uniform in these alloys, and the ordered parent phase structures undergo the non-conventional layered structures with martensitic transformation. These layered structures can be described by different unit cells as 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice.
In the present contribution, x-ray and electron diffraction studies were carried out on ternary copper based CuZnAl and CuAlMn alloys. X-ray diffraction profiles and electron diffraction patterns exhibit super lattice reflections. Critical transformation temperatures of these alloys are over the room temperature, and the specimens were aged at room temperature, and a series of x-ray diffractograms were taken during aging. X-ray diffractograms taken in a long-time interval show that locations and intensities of diffraction peaks change with the aging time at room temperature, and this result refers to the redistribution of atoms in diffusive manner.

Keywords: Shape memory effect, martensitic transformation, thermoelasticity, superelasticity, twinning, detwinning

Audience Take Away Notes

Shape memory effect is a multidisciplinary subject, and I will introduce the basic term and definition at the beginning of my

Talk, with which the audience will have the background information, and they can easily understand experimental results, which I introduce at the experimental session of my Talk.

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 were focused on shape memory effect in shape memory alloys. His academic life started following graduation by attending an assistant to Dicle University in January 1975. He became professor in 1996 at Firat University in Turkey, and retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He supervised 5 PhD- theses and 3 M. Sc- theses and published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international level with contribution. He served the program chair or conference chair/co-chair in some of these activities. Also, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Additionally, he joined over 180 online conferences in the same way in pandemic period of 2020-2023. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

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The Mechanism of Low-Temperature Nuclear Fusion,Generalizing the Ideology of Muonic Catalysis

Semi-classically, by analogy with the Bohr model for the hydrogen molecule, the muon catalysis reaction can be interpreted as a consequence of the attraction of a pair of protons to a muon rotating in a ring orbit, the plane of which is perpendicular to the line connecting the protons. Since the mass of a muon is 207 times greater than the mass of an electron, an estimate based on electrostatics shows that the radius of the muon orbit $R_\mu \approx 10^{-13}$ m is of the order of the interproton distance. As shown in [1, 2], this scale can be compared with the maximum value of the radius of strong interaction during the exchange of nucleons by π^0 – mesons. But then the repulsion of protons can be overcome without their tunneling.

The report proposes an interpretation of the observed low - temperature nuclear reactions based on a model that generalizes the muon catalysis variant. In the generalized model, the catalytic functions of the muon are performed by CRN - activators, which are ring orbits with N compact massive electron (ee) - pairs [1, 3]. The spins in (ee) - pairs are opposite, and the attraction is due to the contact interaction [4], which dominates on the scales (10^{-14} - 10^{-15}) m. The pair rotates and has an angular momentum ħ. It is assumed that the bombardment ofsubstancesby a stream of electrons (or current discharges in a matter)is accompanied by an increase in the number of (ee) - pairs, and with a sufficient amount N of (ee) - pairs, CRN-activators are formed. We emphasize that the CRN - activator, located междуядрамисзарядами q_1 и q_2 (дляопределенностисчитаем $q_1 < q_2$). The charge is expressed in units of elementary charge. Of course, the condition $q_1 \geq 1$ is satisfied. Then, the value of N corresponds to the smallest integer satisfying the inequality

$$N > q_1 \, x\left[1 - 1/(1+\sqrt{1/x})\right]^2/2, \quad x = q_2/q_1. \quad (1)$$

In addition to the condition (1) necessary for bringing nuclei closer together, the synthesis reactions of massive nuclei also require the absorption of (ee) - pairs, which ensures the fulfillment of the law of conservation of electric charge and the condition of reaction exothermicity. Preliminary enrichment of the electron shells (occupying deep circumnuclear orbitals) of interacting atoms with massive (ee) - pairs facilitates the synthesis reactions. It is clear that for the addition of a hydrogen nucleus, the participation of CR1 - activator or a quasi-neutron [5], is sufficient. It is important that the synthesis of massive nuclei can proceed autocatalytically in several stages, when the formation of a new nucleus with a large charge and mass is accompanied by the synthesis of CRN-activators with an increased N value [6]. It is also important to emphasize that the capture of (ee) - pairs by electron shells modifies the chemical properties of atoms, opening a new direction in materials science. The existence of modified atoms is supported by mass spectroscopy data [7].

Audience Take Away Notes

- The audience will receive unique fundamental information necessary for current scientific research, applied development, pedagogical and educational activities.
- Listeners of the report will learn about:

1. Existence of compact massive electron pairs;
2. quasimolecular model of cold nuclear fusion;
3. on the features of the synthesis of massive nuclei;
4. on the modification of chemical properties of atoms that have massive electron pairs in their electron shells.

Biography:

Dr. Kashchenko studied Physics at the Ural Polytechnic Institute, USSR and graduated as engineer in 1971. In 1974 he received the degree of Candidate of Physical and Mathematical Sciences. In 1987 he received the degree of Doctor of Physical and Mathematical Sciences, and in 1990 the title of Professor. From 1980 to the present, he has been the head of the Department of Physics at the Ural State Forest Engineering University. He developed a dynamic theory of martensitic transformations and proposed a conceptual solution to the problem of low-temperature nuclear reactions. He published 4 monographs and about 200 articles.

Luis F. Isernia-Trebols
Universidad de Oriente, Venezuela.

Effect of the location of active acid sites on the internal and external surfaces of different zeolites and active carbons based on petroleum delayed coke over the catalytic hydrolysis of starch.

The catalytic hydrolysis of starch was studied by iodine-spectrophotometric quantification at 600 nm on activated carbons based on delayed petroleum coke and different zeolites, using starch concentrations close to 1.10^{-5} g/mL on approximately 0.0164 g of catalyst at 150 °C. The catalytic tests evidenced a pseudo-first-order kinetic and the overall higher activity of the activated carbons compared to the zeolites studied. In general, the activity in both types of solids increased with the external surface area, and in the activated carbons, with the increase in the density of acid sites. However, the density of acid sites did not show a specific effect on the activity of the zeolites studied. The distinctive behavior of the zeolites may be due to the higher proportion of acidic active sites inside their micropores, which are almost inaccessible to the long polymer chains of starch, hindering their conversion. On the other hand, in activated carbons, the results suggest the presence of a significant fraction of acid sites on the external surface, where starch polymer chains are directly adsorbed with their glycosidic bonds arranged directly on the acidic active sites.

Audience Take Away Notes

- The results demonstrate the usefulness of iodine spectrophotometry for monitoring starch hydrolysis progress on different catalysts. The results also reveal the utility of methylene blue adsorption for determining surface area and assessing its impact on catalyst activity, improving the understanding of physical and chemical adsorption phenomena, as well as acidity on solids. These approaches provide alternative analysis methods for educators and research laboratories that lack access to relatively expensive techniques such as N_2 adsorption at 77 K on surface area or HPLC chromatography for determining kinetic behavior. Furthermore, knowledge about the effect of the location of active sites on the internal and external surfaces of different microporous catalysts such as zeolites or activated carbons is a fundamental aid in predicting catalytic behavior with respect to large polymeric biomolecular substrates such as starch or cellulose.

- Starch hydrolysis is an important process used in various industries, including food, pharmaceuticals, and bioethanol production. This product is extremely important as a source of renewable energy, which can contribute to reducing dependence on fossil fuels and greenhouse gas emissions. Starch hydrolysis involves breaking down its molecules into simpler sugars, such as glucose and maltose, which can be used as a basis for chemical synthesis, such as the industrial production of acetic, fumaric, or lactic acid.

- Acid catalysts are preferred over enzymatic ones in industrial starch hydrolysis due to their activity, yield, and relatively low cost. Generally, inorganic acids such as hydrochloric acid (HCl) and sulfuric acid (H_2SO_4) are used to hydrolyze carbohydrates to D-glucose. However, their corrosive nature and the difficulties separating the reaction product mixture drive the search for heterogeneous solid catalysts that are less corrosive and easy to separate and reuse. Nevertheless, studies regarding the use of solid acid catalysts are relatively scarce compared to enzymes

and inorganic acids. For example, zeolites are interesting solids due to their acidity (caused by framework and extra-framework aluminum species), shape selectivity (associated with their porosity), remarkable stability under extreme conditions, and environmentally friendly nature. Activated carbons are also notable catalysts and adsorbents. They can be obtained by thermal treatment (also called “physical treatment”) of organic precursors such as sugar, wood, charcoal, or petroleum coke, among others, between 873 and 1073 K, in the presence of CO_2, steam, noble gases, or N_2, or by treatment with various chemical reagents. Petroleum coke is a potentially toxic byproduct of petroleum refining, composed primarily of highly condensed carbon species. One way to address the quantities of petroleum coke resulting from heavy oil refining is to convert it into environmentally friendly, higher-value products, such as activated carbons.

.**Biography**

I have a Chemistry Doctorate (2004) from the Universidad de los Andes, Venezuela. I am currently University Professor since 1990 at the “Universidad de Oriente” (UDO-Venezuela), and Coordinator of the Molecular Sieves Laboratory, since 2007. I have worked on developing new approaches to studying structured zeolites applied to petrochemical and environmental matters and the preparation/ evaluation of catalysts based on activated carbons derived from petroleum coke. Moreover, I have published fifteen peer-review articles in national and international journals. The work with graduate students has provided me experience in coordination and leadership in scientific environments. In this context, I also acquired the ability to devise solutions to experimental problems where creativity is necessary.

Orlando Elguera
D.Sc. with Major in Analytical and Inorganic Chemistry- Universidade de São Paulo (Brazil
B.Sc. with Major in Chemical Engineering- Universidad Nacional de Ingeniería (Perú).

Review of Research Topics for Scaling-up of Sonochemical Reactors (Sono-reactors)

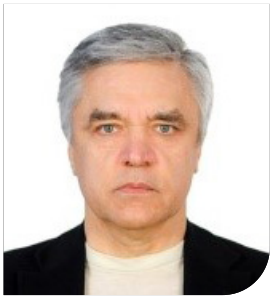
This study is aimed to review the topics of chemical engineering to take in consideration for the scaling-up of reactors, in order to perform processes based on the application of the sonochemistry at industrial level. Sonochemistry is an emergent technology, defined as chemistry made with ultrasound. The characteristic ultrasound frequencies are in the range of 1-10MHz, and in particular for sonochemistry in the sub-range 16-100 KHz. Chemical effects of ultrasound exist when there are changes in the path-ways of reactions, yields and/or selectivities of the products due to the ultrasonic activation. At laboratory level, the sonochemistry has shown fantastic results, because it is based on the phenomenon of acoustic cavitation in liquids, thus, producing very high temperatures (some thousands of Kelvin degrees) and high pressures (some hundreds of atmospheres) during very short times (from tenths to hundreds of microseconds). Cavitation is the phenomenon with the most important effect for intensification of physical and chemical processing. Under these conditions, the yields of sonochemical reactions increase drastically, and their selectivities are improved, thus generating new mechanisms of reaction involving inorganic and organic syntheses. It is not easy to reproduce experimental results of quantification of sonochemical intensity, which is significant for the efficient scaling-up of sonochemical reactors (sono-reactors) for the progress of industrial applications of sonochemistry. This technology has application at industrial level for the treatment of waste-water and black-water. Sonochemistry can be considered as Green Chemistry, presenting the following advantages: low waste, low consumption of materials and energy with optimized use of non- renewable resources and use of renewable energies. Few studies were aimed about optimum design and scaling-up of sonochemical reactors. The implementation of sonochemistry at the industrial level will be feasible when the use of cavitational energy can be adequately controlled.

Audience Take Away Notes

- It is expected that this review can collaborate in the diffusion and development of this emergent technology, due to the advantages that possess: 1) Enhancement of the yields of chemical reactions significantly, 2) Improvement of selectivities, 3) Generation of new reaction pathways.
- This technology has applications at industrial level for the treatment of wastewater.
- Sonochemistry can be considered as Green Chemistry.

Biography

D.Sc./B.Sc. Orlando Elguera studied Chemical Engineering at the National University of Engineering (Lima-Peru) with Master's studies in Chemistry Sciences at the National University of Engineering (Lima-Peru), and with Doctorate of Science with Major in Analytical and Inorganic Chemistry at the University of São Paulo (São Paulo-Brazil). He performed as Analyst of the Laboratory of samples of Geochemical Exploration and Inorganic Compounds at SGS del Perú S.A.C (almost 5 years). He has experience in the following method of analysis: Atomic Absorption Spectrometry, Inductively Coupled Plasma Optical Emission- Mass Spectrometry and X-ray Fluorescence. He has published 9 research articles in journals.



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Antibody-Proteases as Translational Biomarkers, Targets andPotential Tools of the Next Step Generation to be applied forBiodesign-driven Biotech and Personalized and Precision Medical Practice

Biomarkers as being a part of the ligand-receptor tandems have induced an impulse to prompt the development of an upgraded concept of the targeted therapy. So, the identification, impact and implementation of diagnostic, predictive and prognostic biomarkers of the next step generation becomes the Holy Grail of platforms, algorithms and protocols, which are the crucial for ***Personalized & Precision Medicine (PPM).***

High impact of Ab-proteases can be used to monitor both ***clinical*** and ***subclinical*** courses of chronic autoimmune inflammation to predict stepwise transformations of the course, starting from the pre-illness and to prognosticate the clinical illness finally. This information can allow to design the algorithms for combinatorial (preventive, prophylactic, therapeutic and rehabilitative) treatment, whilst developing unique tools for individually therapy for a number of diseases, such as a group of autoimmune diseases which holds a particular position.

Among the best-validated canonical biomarkers are autoimmunity-related ones (including antibodies/Abs) to predict and prognosticate risks of the chronification, complications and thus disabling. The latter is so much valuable and important since chronic autoimmune inflammation course is structured to consist from different stages including subclinical and clinical ones.

According to classical conception, Abs are specific proteins produced by the immune systems with exclusive function of Ag binding. But Abs against chemically stable analogues modelling the transition states of chemical reaction, can catalyse many different reactions, and were thus called catalytic Abs (***catAbs***) or ***abzymes*** (derived from Ab and enzymes), which thus to belong to Abs with a feature of ***functionality***.

Abs endowed with enzymatic properties including DNA- and RNA-hydrolyzing Abs (DNA and RNA-abzymes) and ***Ab proteases***, have been isolated from the serum of patients with different systemic autoimmune conditions. Ab-proteases, in turn, have been reported in patients with autoimmune thyroiditis (AIT), autoimmune myocarditis (AIM) and multiple sclerosis (MS), respectively.

Disease-associated abzymes may have been "induced" by the Ag implicated in the disease. Secondly, the increased occurrence of abzymes in autoimmune pathology may result from the loss of repressive control over abzyme-producing clones generated spontaneously under physiological conditions. A third explanation for the origin of abzymes in pathological conditions is based on idiotypic network and exacerbated self-recognition in autoimmune disorder. In this sense, Ab-proteases as the second stage of the discoveries in the area mentioned, would represent Abs to provide the additional but highly targeted proteolytic effects. It is known that proteases precisely control a wide variety of physiological processes and thus are important drug targets.

Meanwhile, canonical autoAbs play neither predictive nor discriminative role to affect subclinical (symptom-free) stages of autoimmune conditions. So, there is urgently needed for biomarkers, which could clarify pathology, monitor disease progression, response to treatment, and prognosis in the autoimmune inflammation. Overall, OMICS-related approaches can develop different therapeutic and diagnostic aspects of autoimmune conditions, from biomarker discovery to PPM.

Regarding abzymes, their phenomenal property mentioned is buried in the Fab-fragment of the Ig molecule and is appearing to sound as a functional property of the Ab molecule. In this sense, Ab-proteases as a significant portion of the big family of abzymes represent Abs endowed with a capacity to provide targeted proteolytic effect.

The activity of Ab-proteases being identified in AIM, AIT and MS patients was first registered in the patients and persons-at-risk at the subclinical stages 1-2 years prior to the clinical illness. And the activity of the Ab-proteases revealed significant correlation with scales of autoimmune inflammation and the disability of the patients as well.

Moreover, sequence-specific Ab-proteases being studied in MS patients and persons-at-risk, have proved to be greatly informative as biomarkers to monitor chronic autoimmune diseases at both subclinical and clinical stages! Therefore, the proposed predictive value of the targeted Ab-proteases for the development of the above-mentioned autoimmune disorders is being challenged! So, the activity of Ab-proteases and its dynamics tested would confirm a high subclinical and predictive value of the tools as applicable for monitoring protocols!

The primary translational potential of Ab-proteases and thus of this knowledge is in the rational design of new therapeutics to exploit the role of the key pathways in influencing disease. Of tremendous value are Ab-proteases directly affecting remodelling of tissues with multilevel architectonics (for instance, myelin or cardiac muscle). By changing sequence specificity one may reach reduction of a density of the negative proteolytic effects within the myelin sheath and thus minimizing scales of demyelination.

The traditional goal of Ab engineering is to combine various Ab domains to generate customized Abs that show specialized binding properties, optimal half-lives and desirable effector functions. Abs can be engineered to make proteins of higher affinity or smaller molecular variants that retain or change the functional properties of the original Ab. In this context, targeted Ab-mediated proteolysis could thus be applied to isolate from Ig molecules catalytic domains containing segments to exert proteolytic activity and then be used as therapeutic modifiers. Ab-based therapeutics have entered the central stage of drug discovery as a result of a major shift in focus of many biotech and biopharma companies. And as the outcome of the latest initiatives, modified recombinant Abs have been designed to be more cytotoxic to enhance effector functions (bivalent Abs), whilst integrating canonical cytotoxic and upgraded catalysing (proteolytic) features. So, Ab-protease engineering would offer the ability to enhance or alter their sequence-specific activity to expand the clinical utility of the absolutely new tools.

Ab-proteases can be programmed and reprogrammed to suit the needs of the body metabolism or be designed for the development of principally new catalysts with no natural counterparts. So, further studies on Ab-mediated MBP degradation and other targeted Ab-mediated proteolysis may provide biomarkers of new generations and thus a supplementary tool for assessing the disease progression and predicting disability of the patients and persons-at-risks.And the new approach is needed to secure artificial or edited Ab-proteases as unique translational probes to diagnose, to monitor, to control and to treat and rehabilitate autoimmune conditions patients at clinical stages and to prevent the disorder at subclinical stages in persons-at-risks to secure the efficacy of preventive, prophylactic and restorative manipulations.

Biography

Sergey Suchkov graduated from Astrakhan State Medical University and awarded with MD, then in 1985 maintained his PhD at the Sechenov University and in 2001, maintained his Doctorship Degree at the Nat Inst of Immunology, Russia. From 1987 through 1989, he was at Koltzov Inst of Developmental Biology. From 1989 through 1995, he was a Head of the Lab of Clin Immunology, Helmholtz Eye Res Institute in Moscow. From 1995 through 2004, a Chair of the Dept for Clin Immunology, MONIKI. Dr Suchkov has been trained at: NIH; Wills Eye Hospital, PA, USA; Univ of Florida in Gainesville; UCSF, S-F, CA, USA; Johns Hopkins University, Baltimore, MD, USA. He was an Exe Secretary-in-Chief of the Edit Board, ***Biomedical Science***, an Int Journal published jointly by the USSR Academy of Sciences and the Royal Society of Chemistry, UK.

At present, Dr Sergey Suchkov is a Professor of the Russian University of Medicine, and the Russian Academy of Natural Sciences, Moscow, Russia. He is a member of the: New York Academy of Sciences, American Chemical Society (ACS), American Heart Association (AHA), 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); PMC (Personalized Medicine Coalition), Washington, USA.

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Heterogeneous Catalytic Systems for Nitrogen-Based Fertilizer Production

The production of nitrogen-based fertilizers constitutes a fundamental aspect of contemporary agricultural practices and global food security, historically dependent on energy-demanding methodologies such as the Haber–Bosch process. Recent innovations in heterogeneous catalytic systems have facilitated the emergence of more sustainable and energy-efficient alternatives. This presentation offers a thorough examination of the most recent advancements in heterogeneous catalysts utilized for nitrogen fixation and ammonia synthesis. It explores innovative catalyst materials, encompassing transition metals, metal oxides, and supported metal–nitride complexes, which demonstrate enhanced catalytic activity under moderate reaction conditions. The study underscores the pivotal significance of structural and electronic properties in the optimization of catalyst performance and elaborates on how operando spectroscopic techniques and computational modeling are crucial for clarifying reaction mechanisms and the formation of dynamic active sites. Moreover, the presentation assesses the scalability challenges and prospective solutions for the incorporation of these catalytic systems into the industrial production of nitrogen-based fertilizers, with a focus on catalyst stability, economic viability, and the mitigation of greenhouse gas emissions. This synthesis of foundational research and emerging pilot studies accentuates the transformative potential of heterogeneous catalysis in realizing a more sustainable and efficient paradigm for fertilizer production.

Keywords: Heterogeneous catalysis; Nitrogen fixation; Ammonia synthesis; Green chemistry; Sustainable fertilizer.

Biography

Dr. Ali Yetgin completed his Bachelor of Science in molecular biology and genetics and his Master of Science in biotechnology from Izmir Institute of Technology. He worked as a researcher at Dokuz Eylül University Microbiology Laboratory. So far, it authored in totaling 73 publications, including 1 book, 3 book chapter, 28 articles and 41 conference papers. He works as an R&D Specialist at Toros Agri company and fulfills the task of national/international project proposal submission and editor of the Innovation / R&D bulletin. He also finished doctoral thesis at Cukurova University on the development of microbial fertilizers.

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Needs of Ruthenium complexes as anticancer drugs

After the discovery of the anticancer properties of cisplatin1 in the sixties by Rosenberg, a large number of metal derivatives have been synthesized and assessed as therapeutic agents for cancer treatment.2 Nevertheless, still now cisplatin and its parent analogues are among the most widely used chemotherapeutic agents3 despite of some important drawbacks such as drug resistance.4 To avoid this and other important problems new others metal complexes have been investigated.5 Among the new cytotoxic compounds found, ruthenium complexes are the most promising6 and two of them, NAMI-A7 and KP10198 were entered in clinical trials for the treatment of respectively metastatic and colorectal cancers.

Complexes [RuCp(L–κN)(L1L2)] (L = adenine, guanine, theophylline, derivatives of thiotheophylline; L1, L2 = PPh3, PTA, methyl-PTA) were synthesized and characterized by elemental analysis, infrared and NMR spectroscopy (PTA = 1,3,5-triaza-7-phosphaadamantane). Some crystal structures of them were also determined by single crystal X- ray diffraction. The antiproliferative activities of the complexes on cisplatin-sensitive T2 and cisplatin-resistant SKOV3 cell lines have also been evaluated. Theoretical studies were preformed to elucidate how some ligands are coordinated to the metal.9-10

Biography

Dr. Lazhar Hajji studied Chemistry at Tunis University, Tunisia and graduated as Engineer in 2000. He then worked in the Institute of physicochemical Research and passed two years in the Analytical Chemistry Service, Lyon-France. After then he joined the research group pf Prof. Romerosa in the University of Almeria-Spain. He received his PhD degree in 2009 at the same University. Finally, he is a research engineer in the University of Tunis and in the Minister of Public Health. He has published 6 research articles in SCI(E) journals and will publish more important articles.

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April 23, 2025

POSTERS

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Enhanced Hydrogen Generation via Atomically Dispersed CoCu Catalysts Supported on Carbon Nanotubes for Ammonia Borane Hydrolysis

This study presents the synthesis and characterization of atomically dispersed CoCu active sites supported on carbon nanotubes (CNTs) for the hydrolysis of ammonia borane (AB). Addressing the challenges of hydrogen storage and release, we demonstrate that CoCu bimetallic catalysts exhibit enhanced catalytic activity and stability compared to their monometallic counterparts. The CoCu catalyst was synthesized using a one-pot pyrolysis method, resulting in a high metal loading and exceptional performance in hydrogen generation. The catalyst demonstrated a remarkable turnover frequency (TOF) and maintained its activity over multiple cycles, indicating strong resistance to agglomeration, with a max generation rate of 42,306 $mL \cdot g_{cat}^{-1} \cdot min^{-1}$ and TOF of 42 min^{-1} were obtained. Characterization techniques, including X-ray absorption spectroscopy and high-angle annular dark field scanning transmission electron microscopy, revealed the structural and electronic properties of the active sites. Density functional theory modeling elucidated the mechanisms behind the synergistic effects of CoCu pairs, providing insights into the design of high-performance catalysts for hydrogen release. This work advances the understanding of non-precious metal catalysts and contributes to the development of efficient hydrogen storage solutions, supporting the transition towards a hydrogen economy.

Audience Take Away Notes

- Catalyst Design: Researchers and engineers can utilize the findings on CoCu bimetallic catalysts to develop novel, efficient catalysts for hydrogen production, particularly in ammonia borane hydrolysis, which can be adapted for various applications in fuel cells and energy storage.
- Material Selection: The insights into the stability and activity of atomically dispersed catalysts will inform material selection for hydrogen storage solutions, guiding the choice of non-precious metals over costly precious metals.
- Process Optimization: The understanding of the mechanisms behind the synergistic effects of CoCu pairs can lead to optimized catalytic processes, enhancing hydrogen generation rates and reducing energy inputs in industrial applications.
- Sustainability Strategies: The knowledge gained will support efforts towards sustainable hydrogen economy frameworks, providing strategies for implementing safer, more compact, and less energy-intensive hydrogen storage technologies.
- Further Research Directions: The study highlights areas for future research, encouraging scientists to investigate other non-precious metal combinations and their catalytic properties, potentially leading to breakthrough technologies in hydrogen production and storage.

- Enhanced Research Opportunities: Faculty and researchers can build upon this work to explore new avenues in catalyst development, potentially leading to groundbreaking discoveries in hydrogen storage and production.
- Curriculum Development: Educators can incorporate findings into their teaching, enriching courses on catalysis,

materials science, and renewable energy technologies, thus preparing students for future challenges in sustainable engineering.

- Practical Solutions for Industry: Designers and engineers working in energy sectors can leverage the insights to create more efficient hydrogen storage systems, making their designs safer and more compact, which is crucial for advancing fuel cell technologies.
- Increased Efficiency: By utilizing atomically dispersed catalysts, professionals can enhance the efficiency of hydrogen generation processes, leading to reduced operational costs and improved performance in industrial applications.
- Improved Design Accuracy: The detailed understanding of the CoCu synergy and its effects on catalytic performance can lead to more accurate modeling and simulations, ultimately refining the design process for new catalysts.
- Sustainability Goals: This research aligns with global sustainability initiatives, providing actionable strategies to reduce reliance on precious metals, thereby promoting environmentally friendly practices in catalyst production.
- Interdisciplinary Collaboration: The findings encourage collaboration across disciplines—chemistry, materials science, and engineering—fostering innovation and cross-pollination of ideas that can lead to comprehensive solutions.
- Regulatory Compliance: Industries focused on hydrogen production can utilize these findings to meet regulatory standards for emissions and safety, thereby facilitating smoother operations and compliance with environmental policies.
- Networking and Funding Opportunities: By engaging with this research, faculty and professionals can identify potential collaborations or funding opportunities aimed at advancing hydrogen technologies, enhancing their project viability.

Biography

Dr. Chi-Wing Tsang is currently employed at The Hong Kong Institute of Higher Education (THEi) as the Program Leader for Green Engineering and Sustainability Programme. Dr. Tsang is a Chartered Engineer (UK) and a Fellow of the Institution of Chemical Engineers and the Institute of Materials, Minerals and Mining. He graduated from the Department of Chemistry at The Chinese University of Hong Kong and obtained his doctoral degree. He later completed a Master's degree in Process Engineering and Management at the University of Strathclyde in UK. Dr. Tsang has over 10 years of industry experience, including research and development in energy, energy management, chemical process management at the Research and Development Department of Towngas in Hong Kong, and carbon reduction research at the National Laboratory in Canada. His research areas include the development of hydrogen storage materials, catalytic hydrogen production, synthesis of heterogeneous and homogeneous catalysts, and emission reduction technologies. Since joining THEi in 2016, he has been awarded multiple government-funded research projects on new energy and hydrogen storage materials. He has published articles on new energy, biomass energy, and hydrogen energy. He has served as a guest editor and associate editor for several academic journals, including Materials, Catalysts, Frontiers in Chemical Engineering, and others.

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KEYNOTE FORUM II

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Biogeosystem Technique Methodology in Chemical-Soil-Biological Engineering

Current "Ecosphere – technology" conflict stems from an environmental, agricultural and chemical management outdated technological platform based on a simplified attempt to imitate natural phenomena in technology root case. A standard chemical-technological system hierarchy determines the own technological waste and ecosphere chemical-technological load. Badly controlled soil geophysical system reducesa soil productivity.

A critical reassessing of the land and water use, waste recycling technologies, environment and agronomy practice is needed to eliminate shortcomingsand configure a future sustainable environmentally sound chemical-soil-biological engineering.

Using a heuristic approach to understand an origin of an environmentally soundtechnological development niche, we configured the chemical-soil-biological engineering(CSBE) methodology and Biogeosystem Technique (BGT*) methodology.

The BGT*-CSBE objects are: main product chemical-technological system; devices for improving the geophysical and geochemical properties of soil by synthesizing the structure and architecture of its illuvial layer for the biological-soil recycling of bulk or granular by-product; pulsed intra-soil sequential-discrete devices for recycling of liquid by-product and/or soil moistening and plant nutrition; and an environmentally friendly biological production.

BGT*-CSBEis capable in providing: a main chemical product fully waste-free technology; a dispersed by-products recycling within the synthesized fine-aggregate architecture of the soil inner layer for a plants favorable development; and a food, fodder and row material economic use of the biological production obtained on the synthesized soil.

BGT* applies nature phenomena creating a nature-friendly technical means and technologies for a long-term soil geophysical, chemical, water and biological properties optimization. The BGT* based one time 20–50 cm layer intra-soil milling provides

a stable soil fine multilevel aggregate system improving a soil biome function for up to 40 years. The BGT* based intra-soil pulse continuous-discrete watering reduces a plant water consumption circa 5–20 times compared to the standard irrigation. BGT* based municipal, industrial waste and gasification byproduct intra-soil dispersed recycling in a course of the 20–50 cm soil layer milling provides soil solution equilibria control, heavy metals passivation, environmental safety and plant nutrition. Using BGT* methodology, the yield becomes higher circa 50–80% compared to standard technology. BGT* methodology promotes the soil system continuity, reinforces soil biogeochemical turnover, ensures a reversible carbon intra-soil and aboveground biological sequestration, provides biosphere health and climate system sustainability.

There is a strong need to use a BGT*-CSBE and in their chemical-biological engineering theory and practice.The BGT*-CSBE helps to understand a new world chemical engineering development niche.Ths BGT*-CSBE expands the environment, soil science, agronomy, irrigation, waste recycling fields corresponding new technical equipment design and manufacturing. The BGT*-CSBE provides a practical solution to a friendly environment synthesis and make a designer's job more efficient focusing on the new high level developments and improving the accuracy of a design.The CSBE and BGT* provide new information to assist in a design problem.

BGT*-CSBE is a circular green chemistry waste free environment friendly and biosphere high quality and productivity development platform.

Audience Take Away Notes

- The audience will be able to use BGT*-CSBE in their chemical-biological engineering theory and practice.
- BGT*-CSBE will help the audience to understand a new chemical engineering niche.
- This research could be used to expand the research and teaching in the fields of environment, soil science, agronomy, irrigation, waste recycling and in the fields of corresponding new technical equipment design and manufacturing.
- BGT*-CSBE provide a practical solution to a friendly environment synthesis and make a designer's job focused on the new developments and more efficient.
- BGT*-CSBE provides new information to assist in a design problem.

Biography

Professor Dr Sc (Biol) Valery P. Kalinitchenko.Candidate of Science Degree from Moscow State University, Soil Science Faculty, in 1984. Doctoral of Science Degree from Moscow State University, Soil Science Faculty, in 1991. Don State Agrarian University, Agriculture and Land Reclamation Department Chair, Persianovka, Russia, in 1976-2012. The director of the Institute of Fertility of Soils of South Russia Persianovka, from 2003 till now, and the leading researcher in the All-Russian Phytopathology Research Institute, Big Vyazemy, Russia, from 2016 till now.

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Solution of the millennium problem concerning the Navier-Stokes equations

The theory of wave scattering by many small impedance particles of arbitrary shapes is developed. The basic assumptions are: where a is the characteristic size of particles, d is the smallest distance between the neighboring particles, is the wavelength. This theory allows one to give a recipe for creating materials with a desired refraction coefficient. One can create material with negative refraction: the group velocity in this material is directed opposite to the phase velocity. One can create a material with a desired wave focusing property. Quantum-mechanical scattering by many potentials with small supports is considered. Equation is derived for the EM field in the medium in which many small impedance particles are embedded. Similar results are obtained in [6] for heat transfer in the media in which many small particles are distributed. The theory presented in this talk is developed in the author's monographs [1], [7], [9], [12] and in papers [2]{[6], [8], [10], [11]. Practical realizations of this theory are discussed in [9]. In [9] the problem of creating material with a desired refraction coefficient is discussed in the case when the material is located inside a bounded closed connected surface on which the Dirichlet boundary condition is imposed.

Biography

Alexander G. Ramm is the author of 660 research papers and 13 monographs in analysis, applied mathematics, theoretical numerical analysis, ill-posed and inverse problems, and mathematical physics. He has given many lectures at various Universities throughout the world. He has several professional honors: Distinguished Visiting Professorships in UK, Mexico, Egypt, Mercator Professorship, Plenary talks at many Conferences, Khwarizmi International award. He is a member of editorial boards in many professional Journals. His main fields of expertise are: spectral and scattering theory, inverse and ill-posed problems, theoretical numerical mathematics, tomography, random fields estimation, wave scattering by many small particles and creating materials with a desired refraction coefficient.

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