magnus Group

Joint Event

20th Edition of International Conference on

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY &

5th Edition of International Conference on

GREEN CHEMISTRY AND RENEWABLE ENERGY

JUNE 02-04, 2025 ROME, ITALY

VENUE:

NH Villa Carpegna

Via Pio IV, 6, 00165 Roma RM, Italy

BOOK OF ABSTRACTS

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Catalysis, Chemical Engineering and Technology &

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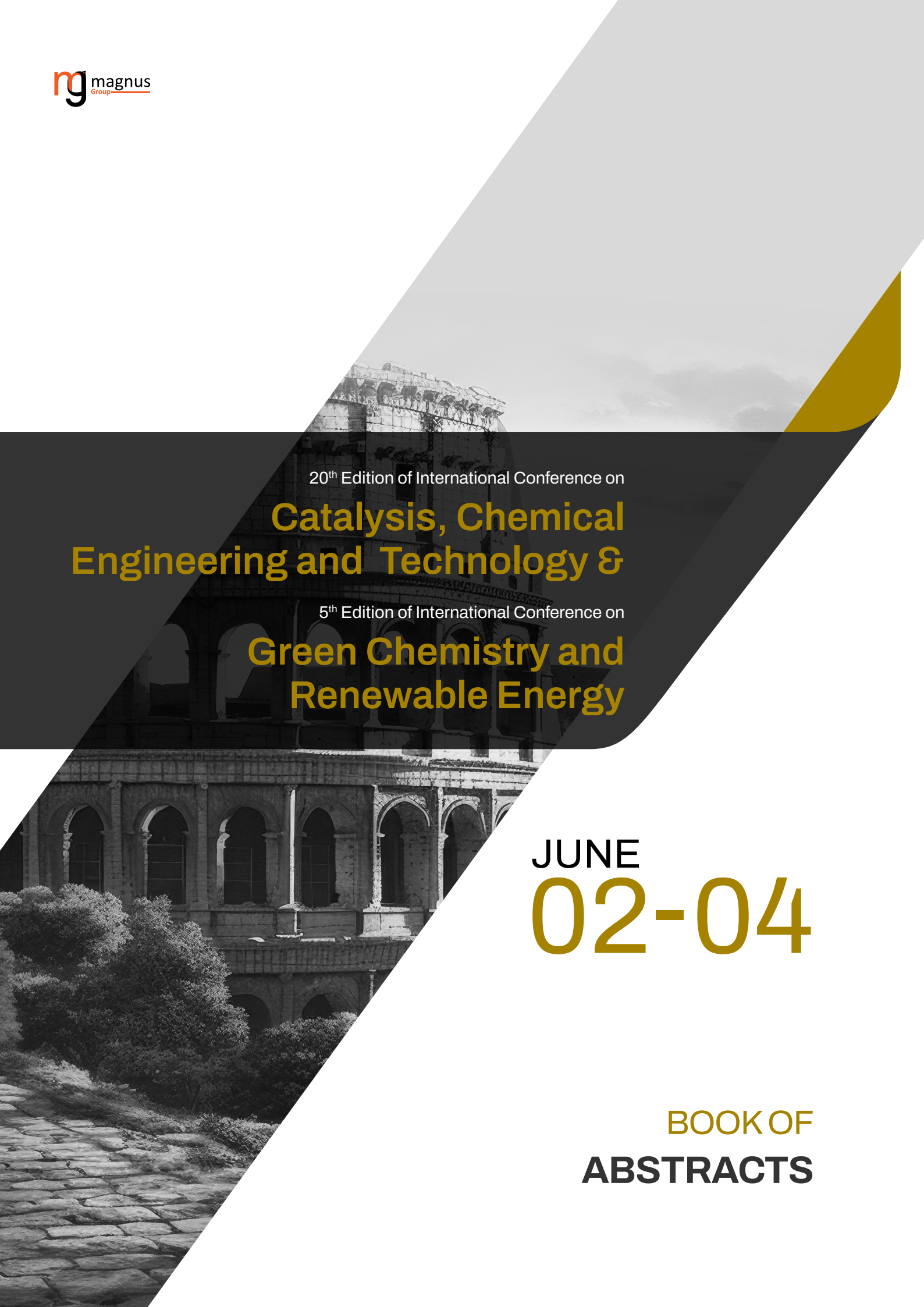
Green Chemistry and Renewable Energy



JUNE

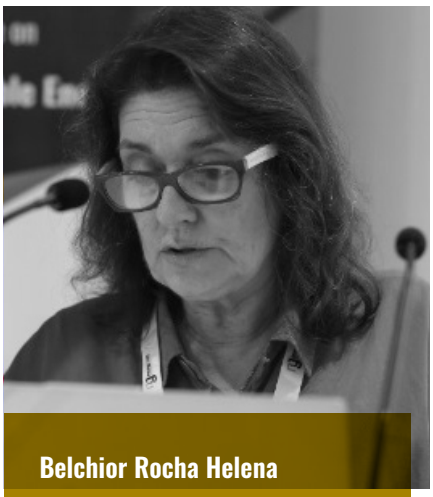
02-04

BOOK OF

ABSTRACTS

Index

Keynote Speakers

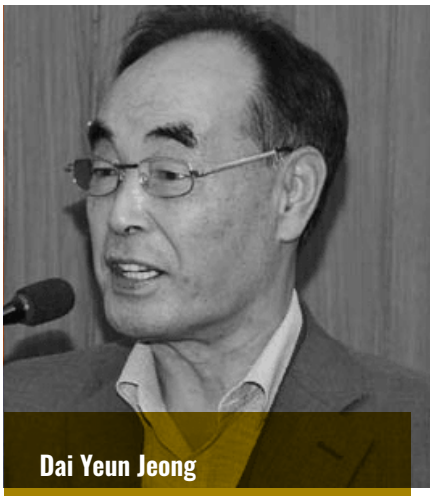


Belchior Rocha Helena

ISCTE - Instituto Universitario de Lisboa, Portugal

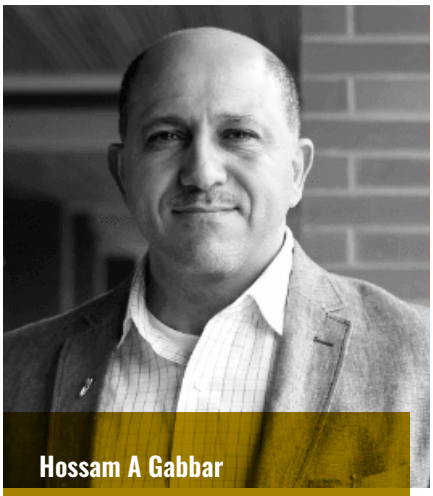
Cristian Ravariu

National University of Science and Technology Politehnica Bucharest, Romania



Dai Yeun Jeong

Asia Climate Change Education Center, South Korea

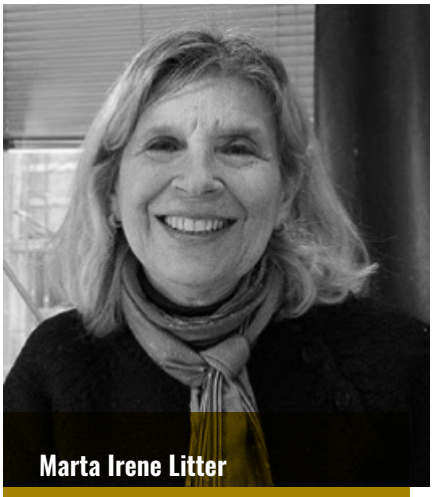


Hossam A Gabbar

Ontario Tech University, Canada

Junwang Tang

Tsinghua University, China



Marta Irene Litter

National University of General San Martin, Argentina

Keynote Speakers

Sergey Suchkov

N.D. Zelinskii Institute for Organic Chemistry of the Russian Academy of Sciences, Moscow, Russia
Centro de Estudios de la Fotosintesis Humana, Aguascalientes, Mexico

Stanislaw Dzwigaj

Sorbonne University, France

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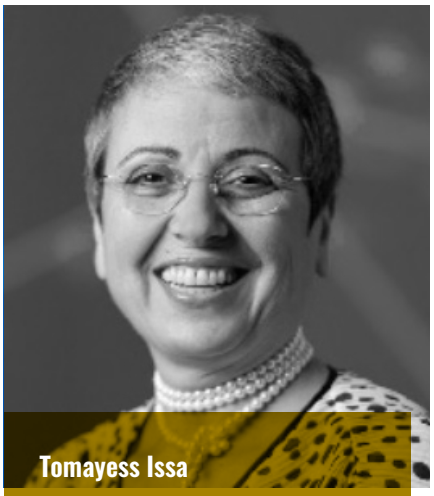

Tomayess Issa

Curtin University, Australia

Yarub Al Douri

European Academy of Sciences, Belgium

Thank You All...

Welcome Message

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

Professor Dr Stanislaw Dzwigaj

Sorbonne University, CNRS, France

Welcome Message

It is a huge honor for me to write a few welcome notes. Despite the expansion of different types of organic semiconductors and a large type of organic transistors, mainly with pentacene and tetracene based, the n-type organic transistors have arisen later and their palette is still restricted. Besides to this, the traditional organic semiconductors applied in electronics possess toxic precursors for manufacturers and environment. Very recent, some research groups have developed organic transistors with nano-materials of very low toxicity, using green organic compounds grafted on core-shell nano-particle, appealing to the green chemistry synthesis routes. Your solutions are very expected at this International Event! Welcomes to Green Chemistry 2025!

Prof. Dr. Cristian Ravariu

Bucharest, Romania

Welcome Message

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 WCED suggested its concept and implication in 1987. 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 achieved as successfully as planned. Its evidences are the facts that we are still faced with serous climate change and natural disasters, all of which are the challenges to humans. This would mean that sustainable development has limitations in its concept and implication.

In such a context, it would be required to examine critically the concept, implications, strategies, and policies, etc. being promoted in order to achieve the true sense of sustainable development in a way to co-exist between humans and nature.

Prof. & Dr. Dai-Yeun Jeong

Jeju National University, South Korea

Welcome Message

I am delighted and honored to welcome you all to the unique and special event of Green Chemistry 2025. Climate change and environmental stressors pose an urgent and increasing mandates upon all of us to promote green chemistry with advanced and clean biotechnologies. The emerging area of green chemistry includes key and potential areas such as green nanotechnology, clean energy sources, hydrogen and alternate fuel, environmental and pollution control, green polymer and materials, green agriculture, renewable energy, clean nuclear and energy technologies, waste management, computational methods, modeling and simulation techniques, and their applications in industries and communities. The event will provide great opportunities to discuss and adapt modern methods, science, systems, and technologies to support the emerging mandates of climate change with cleaner communities, higher productivity, safer products, and improved quality of life. I am confident that the sessions, presentations, and discussions will bring great benefits to all participants with takeaway strategies and technologies to deploy around the world. Together will make the transition to a cleaner and brighter future.

Prof. Dr. Hossam A. Gabbar

Ontario Tech University, Canada

Welcome Message

It is with great pleasure and enthusiasm that we welcome you to the 5th Edition of the International Conference on Green Chemistry and Renewable Energy (Green Chemistry 2025), to be held in the city of Rome, Italy, from June 2-4, 2025.

Building on the success of our previous conferences, Green Chemistry 2025 promises to be an exceptional gathering of leading scientists, researchers, and industry experts from around the globe. Our past editions have set a high standard for excellence, fostering groundbreaking discussions, innovative research presentations, and invaluable networking opportunities. This year, we aim to surpass those standards, offering an even more enriching and inspiring experience.

Rome, with its rich cultural heritage and dynamic atmosphere, provides the perfect backdrop for our conference, we hope you find inspiration not only in the sessions and workshops but also in the vibrant surroundings that Rome has to offer.

We are excited to present a diverse and comprehensive program that addresses the latest advancements and challenges in green chemistry, renewable energy within an interdisciplinary approach. Your participation and contributions are determining to the success of this conference, and we look forward to the insightful discussions and collaborations that will emerge from our time together.

Thank you for joining us in Rome for Green Chemistry 2025. Together, let's continue to drive innovation and sustainability.

Helena Belchior Rocha

ISCTE-Instituto Universitário de Lisboa, Portugal

Welcome Message

It is an honor and pleasure to welcome you to the 21st Edition of the International Conference on Catalysis, Chemical Engineering and Technology. Advanced Oxidation/Reduction Technologies, especially using heterogeneous catalysts and photocatalysis such as titanium dioxide or iron-based nanoparticles represent a relevant issue from the point of view of fundamental and applied science and technology, offering new opportunities for environmental purposes. These technologies are optimal to remove especially recalcitrant pollutants from water such as chlorinated organics, heavy metals and metalloids, which cannot be treated by conventional methods. These low-cost technologies are able to increase the knowledge of young generations and also to offer sustainable ways of controlling pollution in water, air, and soil. I hope you enjoy this relevant Conference.

Prof. Dr. Marta I. Litter

School of Habitat And Sustainability, University of Gral. San Martín, Buenos Aires, Argentina

Welcome Message

It gives us a great pleasure to welcome you to the 20th Edition of International Conference on Catalysis, Chemical Engineering and Technology to be held in Rome, Italy in June 2-4, 2025.

This Global and Unique Event will be one of the great platform is to share our thoughts and exchange ideas on how to chart our journey forward to reach new heights in Design-driven Biotech and affiliated areas of Catalysis and Chemical Engineering.

One of the key missions of this unique Event is to promote interactions between basic researchers, chemists & biologists, biodesigners and bioengineers, applied chemical engineers and bioindustry experts in order to drive the development of innovative solutions for life sciences, biochemical industry and healthcare applications. We keenly understand that the new or upgraded solutions will come from the combination of fundamental knowledge, multidisciplinary development efforts, as well as advances in production communication tools. The Conference will bring together the different communities to discuss new materials concepts and their spatial patterning, modeling and simulation, biological and biomedical functions, and finally applications of bio- and chemical designs. And a synthesis of new active and selective catalysts is a very important challenge.

This Grand Event will bring together the international research communities from various scientific disciplines, including systems biology, materials science, basic and applied chemistry, catalysis, biophysics & biochemistry, bio- and chemical engineering, and healthcare and agricultural science, to discuss new and exciting advances that involve tools, techniques and methodologies of principally new generation. The Conference will provide the ideal forum to stimulate ideas and establish collaborations as well as to initiate intense discussions to secure projects of the newest generations and to feature a highly interactive, stimulating and multidisciplinary Program including workshops, plenary sessions and panel discussions. The event will be really useful in finding the right partners, look at new projects, discover reality, and to interact with other experts, understand their challenges and how they solve problems.

We hope you gain an insight into novel, cutting-edge research and technologies from brilliant experts, exuberant researchers, and talented student communities. WE also hope to see you all in the Grand Tokyo City to enjoy the event along with the exceptional beauty of the ancient and unique oriental municipal beauty. Your presence is an implication towards your commitment to making positive moves in the lives of researchers, scientists, bio- and chemical designers, engineers, and students in your country and throughout the world.

We extend a heartfelt welcome on this occasion and will have an appealing, exciting and unforgettable experience and thank you!

Dr Sergey Suchkov, MD, PhD

N.D. Zelinskii Institute for Organic Chemistry of the Russian Academy of Sciences, Moscow, Russia

Centro de Estudios de la Fotosíntesis Humana, Aguascalientes, México

Welcome Message

I am delighted to welcome you and share some thoughts with you. The widespread use of Information and Communications Technology (ICT) is growing, affecting various aspects of our lives. However, challenges related to the recycling of ICT products and their energy consumption are significant. Immediate action is needed to address these issues for the benefit of current and future generations. Businesses and individuals must take steps to reduce the environmental impact of ICT. As educators, we have a vital role in educating students about sustainability, as they are the future leaders and innovators. They need to change how ICT is developed, produced, and recycled to minimize its environmental impact. In my presentation, I will highlight the importance of sustainability and sustainable design, introducing a New Participative Methodology for Sustainable Design (NPMSD) to tackle these challenges. The effectiveness of this approach was evaluated through an online survey, which underscored the importance of sustainable design practices. Participants emphasized the role of education and awareness in promoting sustainability and sustainable design among designers.

Dr Tomayess Issa

Curtin University, Perth, Australia

ABOUT
MAGNUS GROUP

Magnus Group, a distinguished scientific event organizer, has been at the forefront of fostering knowledge exchange and collaboration since its inception in 2015. With a steadfast commitment to the ethos of Share, receive, grow, Magnus Group has successfully organized over 200 conferences spanning diverse fields, including Healthcare, Medical, Pharmaceutics, Chemistry, Nursing, Agriculture, and Plant Sciences.

The core philosophy of Magnus Group revolves around creating dynamic platforms that facilitate the exchange of cutting-edge research, insights, and innovations within the global scientific community. By bringing together experts, scholars, and professionals from various disciplines, Magnus Group cultivates an environment conducive to intellectual discourse, networking, and interdisciplinary collaboration.

Magnus Group's unwavering dedication to organizing impactful scientific events has positioned it as a key player in the global scientific community. By adhering to the motto of Share, receive, grow, Magnus Group continues to contribute significantly to the advancement of knowledge and the development of innovative solutions in various scientific domains.

ABOUT

CPD Accreditation

Continuing Professional Development (CPD) credits are valuable for Green Chemistry & CCT 2025 attendees as they provide recognition and validation of their ongoing learning and professional development. The number of CPD credits that can be earned is typically based on the number of sessions attended. You have an opportunity to avail 1 CPD credit for each hour of Attendance.

Some benefits of CPD credits include:

Career advancement: CPD credits demonstrate a commitment to ongoing learning and professional development, which can enhance one's reputation and increase chances of career advancement.

Maintenance of professional credentials: Many professions require a minimum number of CPD credits to maintain their certification or license.

Increased knowledge: Attending Green Chemistry & CCT 2025 and earning CPD credits can help attendees stay current with the latest developments and advancements in their field.

Networking opportunities: Green Chemistry & CCT Conference provide opportunities for attendees to network with peers and experts, expanding their professional network and building relationships with potential collaborators.

Note: Each conference attendee will receive 24+ CPD credits.

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

magnus Group

20th Edition of International Conference on

Catalysis, Chemical Engineering and Technology &

5th Edition of International Conference on

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KEYNOTE PRESENTATIONS

Helena Belchior Rocha

ISCTE-Instituto Universitário de Lisboa, Portugal

Empowering communities: Green chemistry and renewable energy for a sustainable development

This presentation explores the intersection of green chemistry and renewable energy, emphasizing their potential to achieve sustainability and improve the resilience of vulnerable communities. The principles of green chemistry and advancements in renewable energy technologies can highlight how these innovations address environmental challenges and promote social equity. Our goal is to understand the synergy between green chemistry and renewable energy and how these innovations can address the unique challenges faced by vulnerable communities. Green chemistry and renewable energy offer powerful tools for promoting sustainability and social equity, reducing pollution, conserving resources, and leading to cost savings. Through case studies and success stories, we will demonstrate the transformative impact of these solutions on communities worldwide, involving community members in the planning and decision-making process can ensure that projects meet local needs and gain broader acceptance. This participatory approach not only enhances the effectiveness of the initiatives but also fosters a sense of ownership and empowerment among community members. The presentation aims to inspire action and advocacy for integrating sustainable practices into community development, ensuring a healthier and more equitable future. Showcasing successful examples and providing practical insights can motivate stakeholders to adopt and support green chemistry and renewable energy solutions. Ultimately, our vision is to create a sustainable future where vulnerable communities are resilient, empowered, and thriving, contributing to a global movement towards environmental sustainability and social justice.

Keywords: Community Development, Participatory Approach, Green Energy, Renewable Energy, Sustainability.

Biography

Helena Belchior Rocha has a PhD in Social Work, is an Assistant professor at ISCTE-University Institute of Lisbon in the Department of Political Science and Public Policies and deputy director of the Transversal Skills Laboratory. Integrated researcher at CIES, Centre for Research and Studies in Sociology, linked to national and international research projects, namely 2 from Marie Curie Actions. Author of papers and communications at national and international congresses, in the areas of social work theory and methodology, environment, sustainability, community Intervention, ethics, human rights, social policies and Well-being, education and soft skills. Member of the Editorial Board of national/ international journals.

Cristian Ravariu

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EduSciArt SRL Company, Str, Iovita nr. 2, Bucharest, Romania

Using green chemistry routes to fabricate green n-type organic semiconductors for the transistor construction

Traditionally, Organic Thin Film Transistors (OTFT) possess p-type Semiconductors made by pentacene or tetracene, usual organic materials in electronics with toxic precursors for manufacturers and environment. Much later, the organic n-type semiconductors were applied in organic transistor fabrication: Fullerene C60, dioctyl-Perylene Tetra-Carboxylic Diimide (PTCDI-C_8H_{17}) or hexa-deca-fluoro-copper-phthalocyanine (F16CuPc) and the list continues with multiple compounds based on Polycyclic Aromatic Hydrocarbons (PAH). Even pentacene combined with special metals used for source and drain contacts, in special environmental conditions, is used for n-type OTFT.

Our group reported the fabrication of an n-type semiconductor, with very low toxicity for organic transistors, using Sulpho-Salicylic Acid (SSA) grafted on ferrite core-shell (Fe_3O_4-SSA), appealing to the green synthesis routes.

The toxicity of the PAH compounds is indicated by their lethal dose LD50 between 14 μg/kg to 90 μg/kg. The extracted lethal dose within a mices sample was established to 700 mg/kg, for SSA. This value indicates much lower toxicity of SSA than that of PAH.

Biography

Prof. C. Ravariu studied Microelectronics at the Polytechnic University of Bucharest, Romania then, worked as scientific researcher first 5 years at Institute of Microtechnology, Bucharest, then joined the Polytechnic University of Bucharest. Since 2013, Prof. C. Ravariu obtained the position of Full Professor at the Polytechnic University of Bucharest, Faculty of Electronics, Romania. Has published more than 250 research articles. Since 2014, Prof Ravariu is Chairman of the Romanian IEEE Electron Devices Chapter and his main interest is in nano-bio-devices, organic semiconductors for electronic devices and biomedical research.

The n-type character of the Fe_3O_4-SSA compound, as donor of electron, was demonstrated by 2 methods: (i) By simulations with Hyperchem molecular modeling program, indicating the normalized values at the elementary electric charge. We observed that sulphonate group, SO_3H, possesses net negative electronic charge density of -0.298, so it is negative. (ii) by construction of an OTFT, based on Fe_3O_4-SSA semiconductor and monitoring its main device parameters: Threshold voltage VT=+5 V, conduction current I_{ON}=16nA and ratio I_{ON}/I_{OFF}=500. The measured parameters, especially the threshold voltage takes a positive value to trigger the electrons accumulation current, demonstrating an n-type OTFT with accumulation channel, rich in electrons, at positive gate voltage.

Prof. Dr. Dai-Yeun Jeong

Asia Climate Change Education Center, Jeju-si, Jeju Special Self-Governing Province, South Korea

Emeritus Prof. at Jeju National University, Jeju-si, Jeju Special Self-Governing Province, South Korea

The roles and capacity building of NGOs as agents responding to climate change

Climate change is one of the most serious environmental problems impacting on nature and humans at a global level. The major agents responding to climate change are government, enterprise, NGO, citizen, and UNFCCC (United Nations Framework Convention on Climate Change). Each agent implements different role and strategy in responding to climate change.

The objectives of this paper are to present the major roles of NGOs in responding to climate change and what capacity they should build in order to implement efficiently and effectively the major roles. In relation to the objectives, this paper will be composed of six parts as below.

Part I: The concept of climate change will be reviewed. This is because the concept of a reality is a thought or idea on the reality, and leads researchers to their direction and contents of the reality. This means what climate change is and we have to respond to climate change, etc. are different according to how to define the concept of climate change.

Part II: Although the concept of climate change is generally agreed upon, there are some hot debates on the reality of climate change. The examples include that climate change is a real reality or not, and what are the causes of climate change, etc. According to what side our perspectives are on the hot debates by person, the approaches to climate change are different. This is why we have to review the hot

Biography

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 (South Korea). Received BA and MA Degree in Sociology from Korea University, and PhD in Environmental Sociology from University of Queensland (Australia). And 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 University of Sheffield in UK, the President of Asia-Pacific Sociological Association, a Delegate of South Korean Government to UNFCCC and OECD Environmental Meeting, etc. Dr. Dai-Yeun Jeong has published 13 books including Environmental Sociology, and has conducted 100 environment-related research projects funded by domestic and international organizations.

debates before we move on to the main theme of this presentation.

Part III: The roles of the four major agents in responding to climate change (government, enterprise, citizen, and UNFCCC) will be explained before the roles of NGOs. This is for improving better understanding about the roles of NGSs at a comparative basis with other agents.

Part IV: The major roles of NGSs as the agents responding to climate will be explained in terms of two dimensions. One is the role of pressure group towards government and enterprise, and the other one is the role of educator to citizen. And then, the contribution of NGOs' roles to solving climate change at domestic and/or global level will be explained. Finally, desirable means for NGOs to perform the roles will be explained.

Part V: The major sectors for NGOs to build the capacity necessary for performing their roles will be examined. The examples include rational argument, improvement of professional knowledge, and cooperation with mass media, etc.

Part VI: The individual roles by the major agents responding to climate change will be effective as a response strategy to climate change. However, the cooperative activities among the major agents in an integrated framework would be more effective. In this contest, as the concluding remarks, the efficient and effective approach to the integrated framework will be discussed with all attendees at this conference.

Hossam A.Gabbar, Professor, P.Eng., Fellow IET (FIET), Distinguished Lecturer IEEE NPSS, Director of Advanced Plasma Engineering Lab (APEL)

Department of Energy and Nuclear Engineering,
Faculty of Engineering and Applied Science,
Ontario Tech University, Oshawa, Ontario,
Canada

Advances in plasma-based waste treatment for sustainable communities

This talk presents advanced approaches for plasma-based waste treatment. Different designs of plasma torches and generation systems are discussed, including RF, DC, and microwave plasma, are analysed and compared for waste-to-energy applications. Novel plasma torch design is proposed to support different scales of waste treatment. Process engineering techniques for gasification and pyrolysis process are illustrated with waste characterization. The proposed approaches showed reduced greenhouse gas emissions and improved lifecycle performance. Plasma systems are utilized for nuclear waste treatment for low, intermediate, and high radioactive waste. Process design is discussed for plasma torch that can reduce the volume of radioactive waste. Potential approaches are explored for mass separation that could be utilized for high-level radioactive waste. Simulation methods and experimental setups demonstrate lab-scale process technologies for plasma-based waste treatment.

Biography

Dr. Gabbar is a full Professor in the Faculty of Energy Systems and Nuclear Science, and cross appointed in the Faculty of Engineering and Applied Science, at Ontario Tech University (UOIT), where he has established the Energy Safety and Control Lab (ESCL), Smart Energy Systems Lab, and Advanced Plasma Engineering Lab. He is the recipient of the Senior Research Excellence Aware for 2016, UOIT. Dr. Gabbar is recognized among the top 2% of worldwide scientists with high citation in the area of energy. He is a Distinguished Lecturer of IEEE NPSS, and he is a Fellow IET (FIET) and is leading national and international research in the areas of smart energy grids, energy safety and control systems, and waste-to-energy using advanced plasma technologies. Dr. Gabbar obtained his B.Sc. degree in 1988 with first class of honor from the Faculty of Engineering, Alexandria University (Egypt). In 2001, he obtained his Ph.D. degree from Okayama University (Japan). From 2001 till 2004, he joined Tokyo Institute of Technology (Japan), as a research associate. From 2004 till 2008, he joined Okayama University (Japan) as an Associate Professor, in the Division of Industrial Innovation Sciences. From 2007 till 2008, he was a Visiting Professor at the University of Toronto. He also worked as process control, safety, and automation specialist in energy and oil & gas industries. Dr. Gabbar has more than 290 publications, including patents, books / chapters, journal, and conference papers.

Prof. Junwang Tang

Department of Chemical Engineering, Tsinghua University, Beijing China 100084

From photocatalysis to photon-phonon co-driven catalysis for inert molecules activation

Photon-driven small molecules activation, eg. H_2O splitting, is scientifically and industrially of significance as it promises an efficient pathway for green H_2 production. However it is kinetically very challenging due to a multi-electron process. For green chemicals synthesis, other inert molecules activation (e.g. N_2, CO_2 and CH_4 etc) are equally important while rather challenging.

Our early study on charge dynamics in inorganic catalysts reveals that the current low solar to fuel/chemical conversion efficiency is due to both fast charge recombination and sluggish oxidation reaction, we thus developed effective material strategies to improve the activities of catalysts. Typically, we found that photon-phonon codriven process over single atom catalysts could dramatially improve H2 production. Then the first polymer-based Z-sheme for H_2O splitting was demonstrated by us. Such progress aslo stimulated us to store green H_2 in NH_3 by photon-driven activation of both H_2O and N_2. Furthermore, we coupled photons with phonons to co-drive catalytic methane conversion to C_2 over Au loaded TiO_2, achieving the benchmark results in this area. Such photon-phonon co-driven catalysis was again demonstrated for methane to formaldehyde synthesis.

Biography

Prof. Junwang (John) Tang is a Member of the Academy of Europe, a Royal Society Leverhulme Trust Senior Research Fellow, Fellow of the European Academy of Sciences, Fellow of the Royal Society of Chemistry, Fellow of IMMM and Honorary Fellow of CCS. Had been the Director of UCL Materials Hub and Chair of Materials Chemistry and Engineering in the department of Chemical Engineering at UCL, UK. He is currently the Founding Director of Industrial Catalysis Center in the Department of Chemical Engineering and Chair Professor of Materials Chemistry and Catalysis at Tsinghua University, China and Visiting Professor at UCL, UK. Tang has pioneered in coupling photons with phonons for small molecule (H_2O, CO_2, N_2, CH_4 etc.) activation to produce zero-carbon fuels and green chemicals.

Biography

Marta I. Litter

Habitat and Sustainability School, National University of General San Martin-CONICET, San Martin, Buenos Aires province, Argentina

Prof. Litter is Dr. in Chemistry (Buenos Aires University, Argentina), with postdoctoral studies (University of Arizona, USA) and a Senior Researcher at the National Research Council and Full Professor at the National University of San Martín (Argentina). Has more than 250 publications in journals and books. Prof. Litter received several prizes such as the Prize for Latin American Women in Chemistry (2021), the Houssay Prize (2022), the Konex Platinum Prize (2023) and the CIPOA Senior Researcher Award in the fields of CIPOA (2024). Also, a Member of TWAS, ACAL, and President of the Argentine Academy of Environmental Sciences.

Use of iron nanomaterials for the treatment of metals, metalloids and emergent contaminants in water

Iron-based nanomaterials are increasingly used in environmental applications. Different types of iron-based nanomaterials, namely, zerovalent iron nanoparticles, nanoparticles of iron oxides, and nanoparticles prepared from iron salts and natural extracts by green procedures, are briefly mentioned in this presentation, together with their preparation, characterization, and applications on the treatment of pollutants in water, with emphasis on works performed in the last 10 years. In terms of preparation, top-down procedures such as mechanical milling, nanolithography, laser ablation, sputtering, and thermal decomposition, and bottom-up methods such as chemical synthesis, sol-gel, spinning, Chemical Vapor Deposition (CVD), pyrolysis, and biosynthesis are possible for nanoparticle production. The most commonly used nanomaterials are inorganic nanoparticles based on metals and metal oxides and, among them, iron-based materials have been widely used in the removal of pollutants in water. Among pollutants, heavy metals and metalloids (e.g., Hg, Pb, Cr, Cu, As, Ni, Zn, Cd, and Ag), halogenated organics, nitroaromatics, pesticides, dyes, antibiotics, halogenated aromatics, phenolic compounds, PCBs, nitrate, and some radioisotopes have been successfully treated; antibacterial activity against Gram-positive and negative bacteria is also reported. In some cases, iron-based nanoparticles have been combined with H_2O_2 in Fenton processes. In this presentation, examples of treatment of metals and metalloids and other emergent contaminants are specially discussed. The advantages of using these materials and the need for their improvement to extend their deployment are remarked.

Sergey Suchkov[1,2*], Roger D. Kamm[5], Daniel Scherman[6], Shawn Murphy[3,4], David Smith[7], Hiroyuki Abe5, Holland Cheng[8]

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Personalized and Precision Medicine (PPM) as a unique healthcare model via design-driven bio-and chemical engineering view of biotech

A new healthcare-related systems approach resulted in a new trend in the healthcare services, namely, ***personalized and precision medicine (PPM)***. In this sense, despite breakthroughs in research, the translation of discoveries into therapies for patients has not kept pace with healthcare need. It would be extremely useful to integrate data harvesting from different databanks for applications such as prediction and personalization of further treatment to thus provide more tailored measures for the patients and persons-at-risk resulting in improved

Biography

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

outcomes and more cost effective use of the latest health care resources including diagnostic (companion ones), preventive and therapeutic (targeted molecular and cellular) etc. The latter delves into the selection of bioremediation strategies, highlighting the critical role of harmonizing nature's mechanisms with PPM-guided engineering. It explores the design and optimization of bioremediation systems, emphasizing reactor design, process control, and resource efficiency.

Bio-designers, bioengineers and chemical engineers, bio-manufacturers and biomarket experts are beginning to realize the promise of PPM, translating to direct benefit to patients or persons-at-risk. Moreover, chemical and biological engineers are now using OMICS tools and the knowledge gained with them to tackle grand challenges facing society–such as the need for new medicines to fight disease and prevent pandemics, and the barriers preventing expansion of modern biomanufacturing across the world. And across worldwide research and throughout the bioindustries, scientific breakthroughs have been the launching point for principal bioproduct developments in the translational trajectory.

At bio- and chemical engineering being co-partnered to make biotech upgraded, we are working hard on issues affecting society where chemistry and its applied subareas play a crucial role. And the integrated skills of bio- and chemical engineers are uniquely suited to developing next-generation solutions to persistent health challenges. In this context, the healthcare bioindustry is focused on improving the quality of medical treatments by developing minimally invasive techniques for diagnosis and including with the help of new advances in the field of nanotechnology-driven bio- and chemical engineering. The latter are becoming an introduction to upgraded aspects of biotech, which will be the concern of the bio- and/or chemical engineer, with an emphasis on design tasks.

In this sense, scaling up from a laboratory reaction to a bioindustrial process is the main challenge for bio- and chemical engineers. This is a complicated optimization

American Chemical Society (ACS), USA; American Heart Association (AHA), USA; European Association for Medical Education (AMEE), Dundee, UK; EPMA (European Association for Predictive, Preventive and Personalized Medicine), Brussels, EU; ARVO (American Association for Research in Vision and Ophthalmology); ISER (International Society for Eye Research); Personalized Medicine Coalition (PMC), Washington, DC, USA.

problem at many levels: Environmental impact, intellectual and transdisciplinary resources and cost must be minimized and the quality and process safety maximized. And strategic alliances and the collaborative work in this area already includes initiatives with polymeric biomaterials, nucleic acids, microfluidics and other tools that offer valuable information at the cellular and molecular levels to develop a more tailored and personalized approach. Of particular interest is design-driven nanotechnology research at the biointerface, including nanoparticles developed to detect pre-early cancer biomarkers; 'smart surfaces' mimicking conditions in the body and encouraging high rates of stem cell production; and the engineering of cells to produce the building blocks.Bio- and chemical engineering integrate basic science, mathematics, and engineering principles in a coherent manner that equips the engineers to tackle a remarkable variety of challenges. So, partnering and forming strategic alliances between researchers, bio-designers, bio- and chemical engineers, clinicians, business, regulatory bodies and government can help ensure an optimal development program that leverages the Academia and industry experience and FDA's new and evolving toolkit to speed our way to getting new tools into the innovative markets.

Co-development between innovation-related builders and customers is a key agile principle. And biotech is becoming as much an exciting part of design-driven bio- and chemical engineering today as it is promising for its future. And in the coming wave of innovation in the broad-scope applications, learning rapidly what new bioproduct features work well for clinicians and patients will become even more crucial.

Stanislaw Dzwigaj

Sorbonne Universite, UMR 7197, Laboratoire de Reactivite de Surface

Application of metal single-site zeolite catalysts in heterogeneous catalysis

The metal ions well dispersed at zeolite framework are considered to be active sites of catalytic processes. Therefore, the incorporation of these metals into zeolites as isolated tetrahedral sites appears to be the important task. We have earlier shown that the incorporation of transition metal ions into vacant T-atom sites of framework zeolite is strongly favored when, in the first step, zeolite is dealuminated by treatment with nitric acid solution and then, in the second step, the incorporation of transition metal ions results in the reaction between the cationic metal species of the precursor solution and the SiO-H groups of vacant T-atom sites created by dealumination of zeolite. During my keynote talk the design of single-site zeolite catalysts with transition metal will be described and characterized by different physical techniques both at the macroscopic (XRD, BET, TPR, TEM) and molecular level (FT-IR, NMR, DR UV-Vis, XPS, EPR, XAFS). The application of metal single-site zeolite catalysts in environmental catalysis will be discussed. This two-step postsynthesis method applied in this work allowed obtaining metal single-site zeolite catalysts active in different catalytic processes such as oxidative dehydrogenation of propane into propene, selective catalytic reduction of NOx to N2, production of 1,3-butadiene or hydrogen from renewable sources, including ethanol obtained from biomass. Their catalytic activity strongly depended on the speciation and amount of metal incorporated into zeolite structure as well as their acidity.

Biography

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

Thomas J. J. Muller

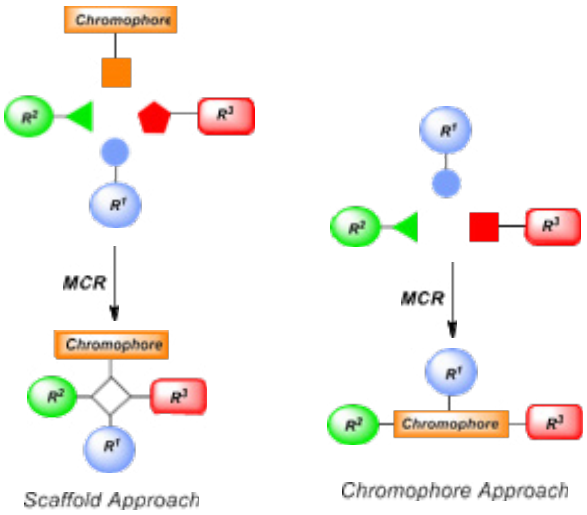
Heinrich-Heine-Universitat Dusseldorf, Math-Nat. Fakultat, Institut fur Organische Chemie und Makromolekulare Chemie, Universitätsstrasse 1, D-40225 Dusseldorf, Germany

One-pot multicomponent syntheses of functional chromophores–synthetic efficiency meets functionality design

One-pot processes have considerably enhanced diversity-oriented syntheses in the past decades and have become an enabling tool for providing myriads of substance libraries, in particular, in pharmaceutical high-throughput screening and lead finding. Over the past two decades, we have paved the way of Multicomponent Reactions (MCR) as a synthetic concept to access functional π-electron systems, such as chromophores, fluorophores, and electrophores, by scaffold and chromophore approaches. Transition metal catalyzed couplings are excellent entries to alkynones, which can be transformed by multi-component and domino processes to various classes of functional fluorescent chromophores in a one- pot fashion (chromophore concept). In the lecture the general concept is introduced and illustrated by the development of ethynyl quinoxalines and aroyl-S, N-ketene acetals, novel classes of polar solid-state and aggregation-induced emissive dyes.

Biography

Thomas J. J. Müller studied chemistry (1984-1989) at the University of München (LMU) (diploma 1989; Ph.D. 1992). After a post-doctoral stay at Stanford University (1993/1994), he developed his independent research at Technical University Darmstadt and LMU (1994-1999; habilitation 2000). After a professorship at the University of Heidelberg (2002-2006) J. J. Müller is a chaired full professor at the University of Düsseldorf since 2006, and since 2019 the spokesman of the Research Training Group 2482 funded by the German Science Foundation (DFG). Since 2021 he is a foreign member of the National Academy of Sciences of Ukraine. His research interests encompass synthetic and physical-organic chemistry of functional chromophores, and the design of novel one-pot reactions, documented in more than 300 publications.



Recent Reviews: L. Biesen, T. J. J. Müller, Chem. Eur. J. 2023, 29, e202302067; L. Brandner, T. J. J. Müller, Front. Chem. 2023, 11, 1124209. L. Biesen, T. J. J. Müller, Adv. Synth. Catal. 2021, 363, 980.

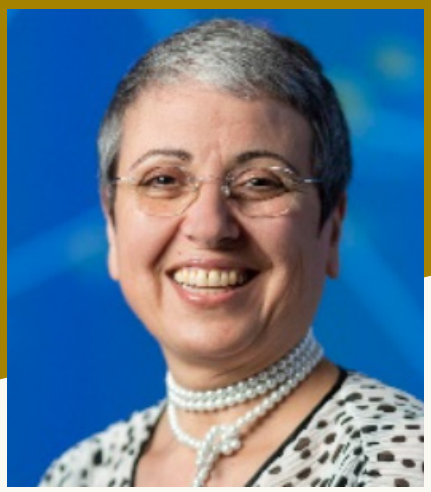
Dr. Tomayess Issa

School of Management and Marketing, Curtin University, Perth, Western Australia, Australia

An overview of Australia's sustainability opportunities and challenges

In the 21st century, 5.45 billion people are using information and communications technology (ICT), which has become a significant instrument for searching, conducting research, communication, entertainment, commerce, and information. Today, the world population exceeds 8.2 billion, and by 2050, it will be more than 9.7 billion. This increase will influence the availability of housing, food, transportation, waste, economic and social issues, employment, the environment, and unsustainable development activities. Therefore, we need to tackle this problem by adopting and implementing sustainability principles by individuals and businesses. There are positive and negative aspects to the adoption and implementation of sustainability by individuals and businesses. However, if the implementation of sustainability is properly planned and executed, users will obtain desired benefits such as brand and reputation enhancement, shareholder satisfaction, human resource efficiency, natural resources conservation, and environmental protection. However, the adoption and implementation of sustainability can have negative consequences in terms of failure, risk and cost. Therefore, to reduce the possibility of these occurring, awareness and training should be made available to individuals and businesses. An online survey was conducted in Australia to examine students' perspectives and awareness toward sustainability. Based on the online survey feedback from 208 Australian respondents, three positive and two negative aspects associated with students' knowledge and understanding of sustainability were identified. Finally, further research will be conducted in the future to examine more diverse groups of stakeholders in order to strengthen the research findings.

Biography



Tomayess has 26 years of teaching experience in higher education in Australia and has supervised students undertaking their PhD, Master of Philosophy, and Master Dissertations. Three of her PhD students received letters of commendation from the Chancellor of Curtin University. Tomayess conducts research locally and globally in the areas of information systems, sustainability, sustainable design, smart technologies, and innovative approaches to teaching and learning. She has authored 29 books and peer-reviewed 58 journals with a high-ranking publisher. Tomayess has been involved in local and global projects and has been awarded several teaching, learning, and research awards on a national and international level.

Prof. Dr. Yarub Al-Douri

Fellow of the European Academy of Sciences

An overview of future nanotechnology

The nanotechnology could deliver world-altering changes in the ways we create, transmit, store, and use energy. The scientists are working to develop super-efficient batteries, low-resistance transmission lines, and cheaper solar cells. However, the likelihood and time frame of these developments is unknown for the moment. The next generation of solar cells is thin film solar cells—flexible sheets of solar panels—that are easier to produce and install, use less material, and are cheaper to manufacture. These sheets can be incorporated into a briefcase that charges your laptop, woven into wearable fabrics that charge your cell phone and iPod, or incorporated into windows that can supply power to high-rise buildings.

In different parts of the world, the people do not have access to safe drinking water. But the new nanofiber water filters can remove bacteria, viruses, heavy metals and organic materials from water. They are re relatively inexpensive and easy to use, so the nanofilter could be widely employed easily. Providing pure drinking water would help prevent disease in many parts of the world, but it would not resolve many basic inequalities.

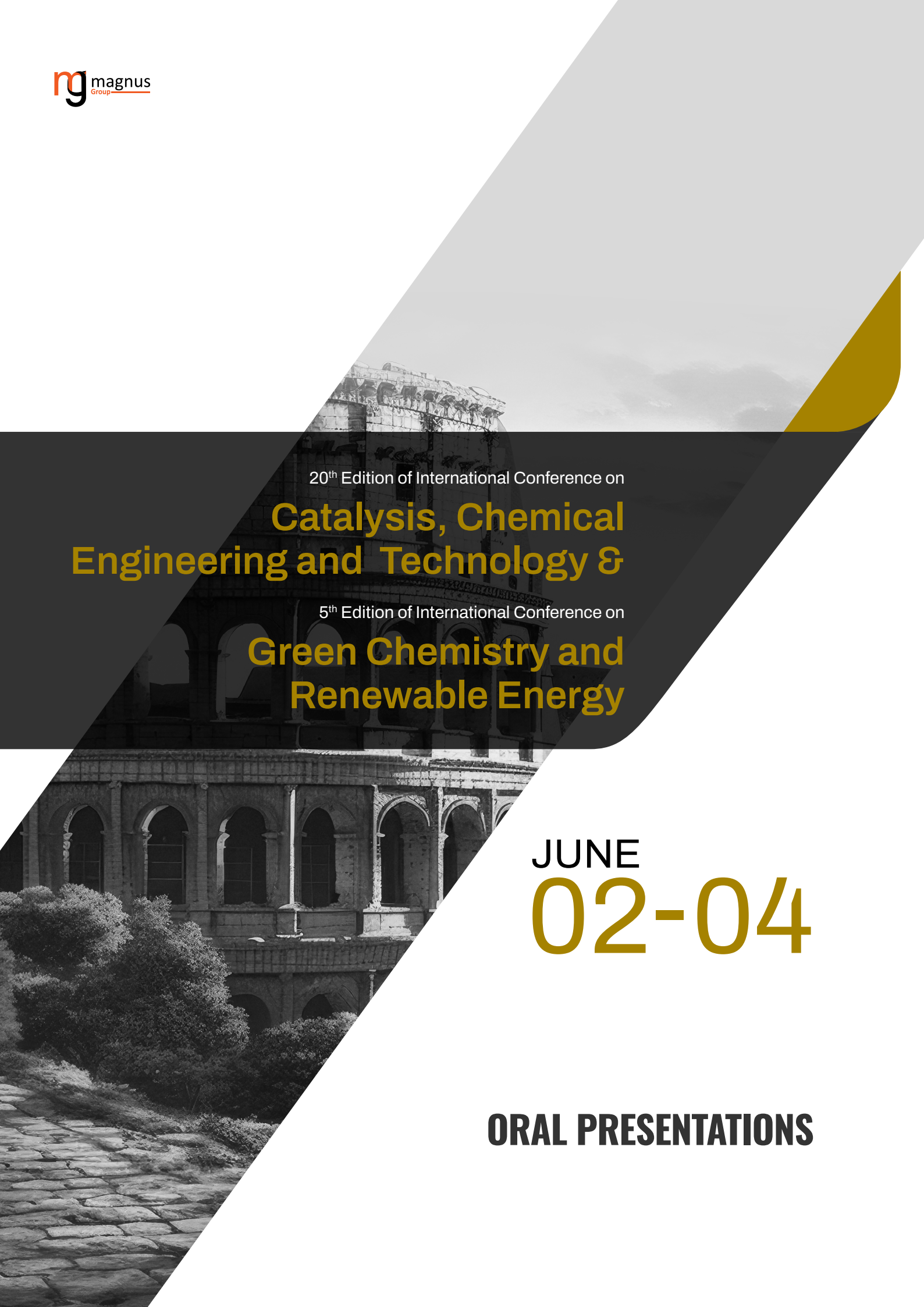
The nanotechnology has unique properties. The electrical properties, durability, strength and activity of nanomaterials are enhanced and engineered to obtain desired features through nanotechnology. Nanotechnology focusses on solar, hydrogen and biomass energy. The nanostructured catalysts are used to increase the efficiency of fuel cells while porous nanomaterials are used for hydrogen storage. The quantum dots and carbon nanotubes increase the energy absorption properties of solar cells. The development of cost-effective renewable energy systems will contribute to the urgent energy goals of our world and reduce the destructive effect of human activities.

Biography

Prof. Dr. Yarub Al-Douri is a Fellow of European Academy of Sciences. Al-Douri is winner of the prestigious Khalifa International Award for Date Palm and Agricultural Innovation 2024. He has initiated Nanotechnology Engineering MSc Program and Nano Computing Laboratory. Has received numerous accolades including winner of IAAM Scientist Award by International Association of Advanced Materials, Sweden 2022, World's Top 2% Scientists by Stanford University, USA 2024, 2023, 2022, 2021 & 2020, World's Top 2% Scientist Career-Long Citation Impact by Stanford University, USA 2020, OeAD Award, Austria 2020, Japan Society for the Promotion of Science (JSPS) Award 2019, Asian Universities Alliance (AUA) Award 2019, the total is 78 awards. Al-Douri is Associate Editor of Nano-Micro Letters (Q1, IF=26.6, Springer), Editor-in-Chief of Experimental and Theoretical NANOTECHNOLOGY (Scopus-indexed), Editor-in-Chief of World Journal of Nano Science and Engineering. His research field focuses on nanotechnology, renewable energy, nanoelectronics, nanomaterials, modelling and simulation, semiconductors, optical studies. Finally, Al-Douri is a

public figure at international media in the UK, Singapore, Malaysia, Qatar and UAE. Al-Douri has more than 905 publications including Citations < 14000, h-index=65 and US$ 5.1M research grants. Finally, Al-Douri is one of the Middle-East, North of Africa, Malaysia and Southeast Asia's most renowned scientists known for his contributions in Nanotechnology and renewable energy, and a public figure at international media in the UK, Singapore, Malaysia, Qatar and UAE.

magnus Group



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Green Chemistry and Renewable Energy

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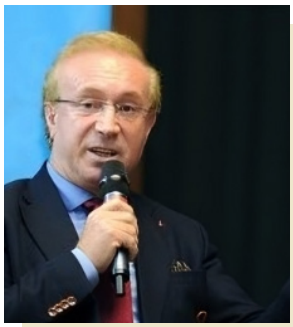


Dr.-Ing. Ahmet Lokurlu

Engineering department, Soliterm GmbH/chief engineer, Aachen, North Rhine Westphalia, Germany

Engineering department, Soliterm GmbH/project engineer, Aachen, North Rhine Westphalia, Germany

Integration of Parabolic Trough Collectors (PTC) in Solid Oxide Electrolysis Cells (SOEC) for green hydrogen production

The global shift towards sustainable energy sources to combat climate change highlights the significance of green hydrogen as a versatile and renewable energy carrier. Solid oxide electrolysis (SOE) emerges as a promising technology for green hydrogen production, offering high efficiency and the ability to use various feedstocks. Unlike traditional methods, SOE directly converts water into hydrogen and oxygen without emitting greenhouse gases.

However, challenges such as high energy consumption and dependence on electricity require innovative solutions. Leveraging renewable energy sources like solar power can enhance the sustainability and economic viability of SOE-based green hydrogen production.

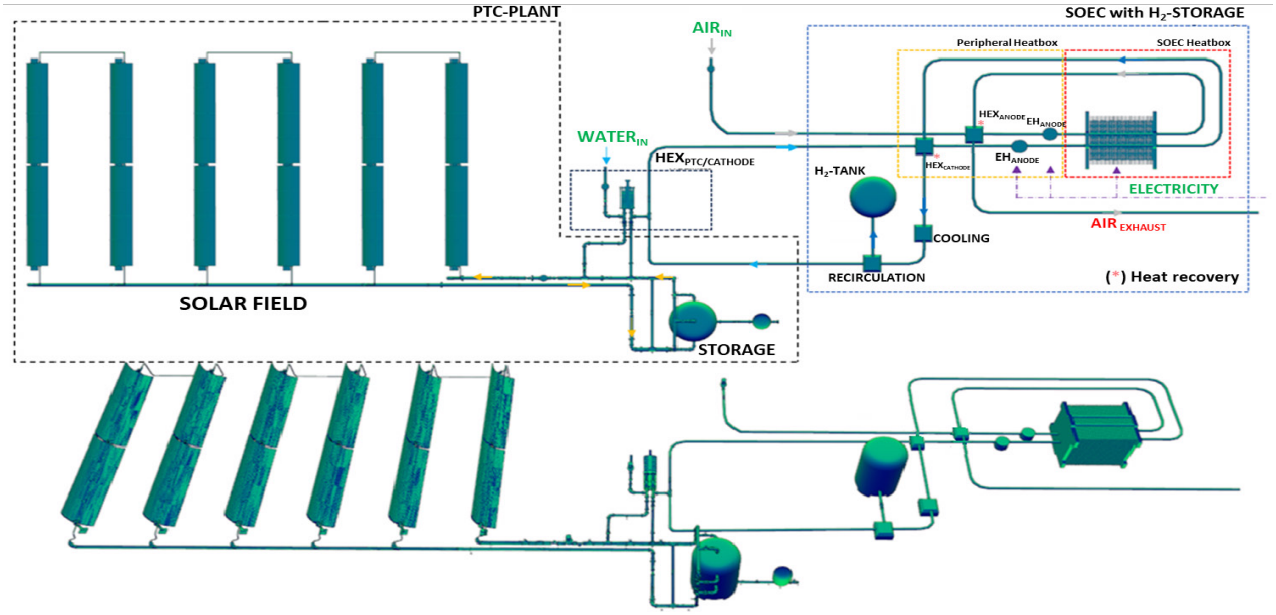
Parabolic Trough Collectors (PTCs) are an excellent choice for integration with Solid Oxide Electrolysis Cells (SOECs) due to their proven ability to efficiently harness and concentrate solar energy into high-temperature heat. This high thermal efficiency makes PTCs well-suited to meet the elevated temperature requirements of SOECs, significantly reducing the reliance on electrical energy. Additionally, PTC technology is scalable, reliable, and has a well-established track record in industrial applications, ensuring feasibility for both small- and large-scale deployments. The ability to integrate thermal storage with PTCs further enhances their appeal by enabling continuous operation during periods of low solar irradiance or nighttime, which is critical for maintaining system efficiency and reliability. This combination of efficiency, scalability, and adaptability makes PTCs an ideal solution for sustainable and cost-effective green hydrogen production.

In this paper, we explore the integration of high-temperature solar thermal systems with SOE as a means to address the energy-intensive nature of the process. We examine the principles and advantages of both SOE and high-temperature solar thermal technologies, discuss the challenges associated with their integration, and propose strategies for optimizing system performance.

Through techno-economic analysis and performance modelling, we aim to demonstrate the feasibility and potential benefits of coupling solar thermal energy with SOE for green hydrogen production. By doing so, we contribute to the advancement of sustainable energy technologies and accelerate the transition towards a low-carbon hydrogen economy.

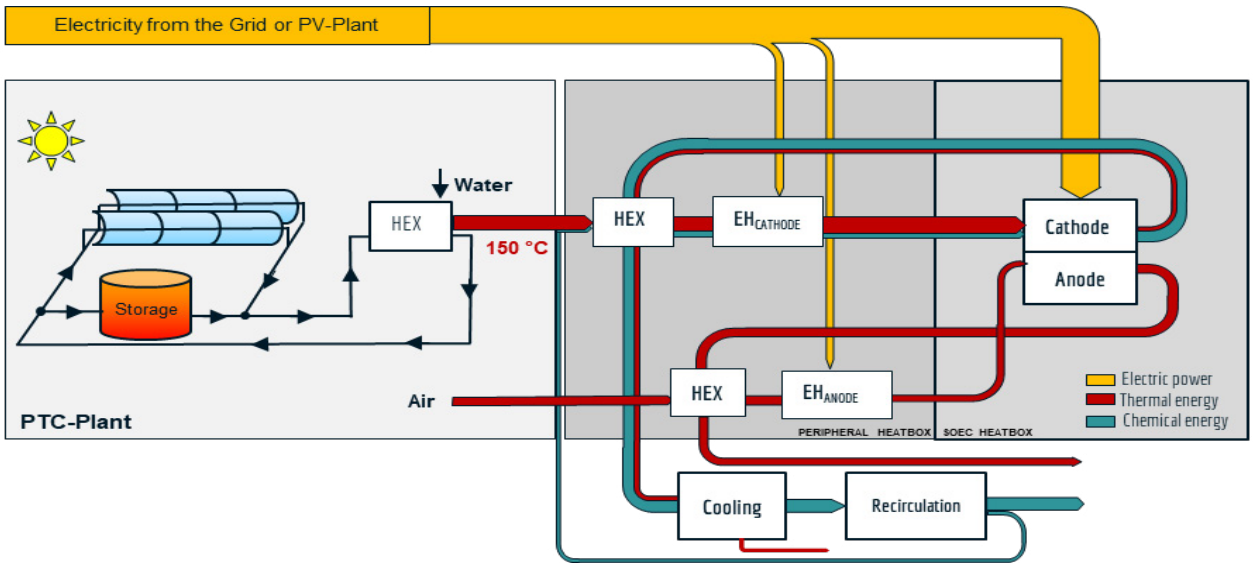
The following illustration delineates the integration of the PTC (Parabolic Trough Collector) system within the overarching framework, focusing solely on the principal components.

Heat harnessed from the solar collectors is directed into the system through a tailored heat exchange mechanism positioned at the cathode, thereby augmenting the overall electrical system efficiency.



This illustration provides a conceptual overview of how the integrated system would function under real operating conditions, showcasing the interaction between the PTC and SOEC components.

For a clearer understanding of the energy flow and balance within the system, the accompanying Sankey diagram offers an overall depiction of the thermal and electrical contributions and their distribution throughout the process.



This Figure serves as a large-scale extrapolation based on data obtained from the researched article provided by Fraunhofer IKTS, augmented by our own calculations derived from the state-of-the-art analysis.

The presentation will focus on the integration framework where PTC systems are coupled with SOECs through tailored heat exchangers. This innovative setup channels solar-derived thermal energy directly into the electrolysis process, significantly reducing electricity consumption.

For example, a system utilizing 170 PTCs with a reflector diameter of 1.8 m can fully meet the thermal demand during the summer months, leading to the definition of a collector field size with a nominal capacity of 850 kWth and a peak capacity of 1.1 MWt and supported by a 180 m^3 thermal storage unit to ensure continuous operation at night. This integration enables an annual solar thermal coverage of 67%, marking a significant improvement in system sustainability. We also explored an alternative approach focusing on supplying demand solely during sunlight hours, with conventional methods utilized during low or no Direct Normal Irradiance (DNI) periods or at night. This strategy involves 80 PTC 1800 collectors with a nominal capacity of 400 kW and a peak capacity of 510 kW, generating 875 MWh of clean thermal energy, capable of covering 86% of the demand during sunlight hours only, and achieving an overall demand coverage of approximately 33%. This option includes a small buffer storage of up to 15 m^3.

In addition to outlining the technical aspects, the presentation will provide a comprehensive techno-economic analysis to illustrate the integration's efficiency gains and environmental benefits. By leveraging solar energy and optimizing heat recovery within the SOEC system, this approach minimizes operational costs and carbon emissions. The findings underline the transformative potential of integrating PTCs with SOECs, offering a scalable and commercially viable pathway for large-scale green hydrogen production.

This presentation will not only showcase the cutting-edge advancements in renewable hydrogen technologies but also position this integration strategy as a pivotal step in achieving a carbon-neutral energy future. It is designed to engage and inspire stakeholders by demonstrating the technical feasibility, economic advantages, and environmental impact of this innovative approach, making a compelling case for its adoption in the global transition towards clean and renewable energy sources.

Biography

Dr.-Ing. Ahmet Lokurlu studied Energy and Process Engineering at the University of Essen and RWTH Aachen, where he earned his doctorate (Dr.-Ing.) in 1998. He worked as a scientist in fuel cell development at Forschungszentrum Jülich for over 13 years. Since 2006, Dr. Lokurlu has been the CEO of Soliterm Group, a leader in concentrated solar thermal systems, solar-based cooling, and industrial steam generation. Under his leadership, Soliterm has received numerous prestigious awards, including the Energy Globe Award and the European Solar Prize. Recognized by Time Magazine as a "Hero of the Environment," he has also appeared in various TV programs highlighting his innovative contributions to sustainable energy.

Amarendra Kumar Gupta* and Sunil Kumar Thamida

[1]Department of Chemical Engineering, IIT Tirupati, Tirupati, Andhra Pradesh, India

[2]Department of Chemical Engineering, IIT Tirupati, Tirupati, Andhra Pradesh, India

Design and optimization of a thermal air sterilizer prototype for airborne pathogen deactivation: A CFD Approach

Airborne pathogens, such as Mycobacterium tuberculosis and SARS-CoV-2, pose significant health risks due to their ability to remain suspended in air for extended periods. Traditional air sterilization technologies, such as HEPA filters and UV light, exhibit limitations in deactivating pathogens or ensuring safety and cost-efficiency. This study presents the development and optimization of a thermal air sterilizer using computational fluid dynamics (CFD). The prototype incorporates dry heat sterilization with a recycling conduit and adjustable temperature settings to target a wide range of pathogens. Simulations were conducted to analyse airflow, temperature distribution, and particle residence time using the COMSOL Multiphysics platform. Extended surface grids, static pressure head variations, and circular geometries were evaluated to enhance the residence time and efficiency of microbial deactivation. Results show that circular grid designs and a static pressure head of 15 Pa provide optimal residence time and particle vaporization, achieving nearly 100% efficiency. The proposed system demonstrates a promising solution for mitigating airborne health risks in high-risk and confined environments.

Biography

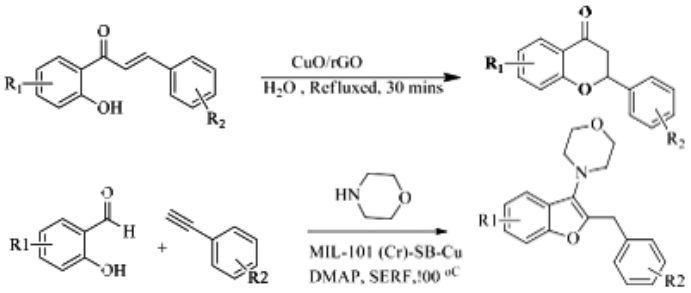
Amarendra Kumar Gupta is a PhD research scholar in the Department of Chemical Engineering at IIT Tirupati, specializing in Computational Fluid Dynamics (CFD) simulations, turbulent flow, and heat transfer. His research focuses on developing and optimizing thermal air sterilizers for indoor spaces, with the goal of improving air quality and sterilization efficiency. Through advanced numerical simulations, he aims to better understand complex fluid dynamics and thermal behavior in these systems.

Dr. Amarta Kumar Pal

Department of Chemistry, North Eastern Hill University, Shillong-793022, Meghalaya, India

Approaches towards the development of green and sustainable protocols for the synthesis of organic molecules

Millions of reactions have been carried out to synthesize various organic molecules. Among those reactions, very few are green and sustainable. Catalysis is one of the 12 green chemistry principles. There are drawbacks in homogeneous and heterogeneous catalysis, which can be rectified by nanocatalysis. Nowadays, nanocatalysis is one of the important chapters in overall catalysis. Due to their high surface-to-volume ratio, nanoparticles act as homogeneous catalysts. On the other hand, insolubility in almost all solvents rendered them as heterogeneous catalysts. The only disadvantage is agglomeration. This can also be overcome by using stabilizers. Many stabilizers are known, but graphene, graphite oxide, graphitic carbon titride, and metal organic framework are very useful due to their nontoxic nature, high thermal and chemical stabilities, etc. Moreover, recovery and reusability are easy. They not only act as support materials but also behave as catalysts in several transformative or synthetic reactions. Many functional groups are present on their surfaces, so post synthetic modifications are quite easy. So, any synthesis using these types of catalysts can be regarded as almost green and sustainable.



Biography

Dr. Amarta Kumar Pal acquired his master's degree in chemistry from the University of Calcutta in 2001. Then, joined in Prof. K. C. Majumder's group to pursue his Ph.D. degree. Received his Ph.D. in 2007 and went to Taiwan for his post-doctoral study. He spent around one year at Academia Sinica, Taiwan in Prof. C. H. Lin's laboratory. In 2009, joined as an Assistant Professor at the Department of Chemistry, in North- Eastern Hill University. And, was promoted to Associate Professor in 2021. Dr. Amarta produced eight Ph.D. students and published more than fifty-five publications in international peer-reviewed journals. His research interests are the development of green and sustainable methods for the synthesis of biologically important heterocyclic molecules and the making of carbon-carbon and carbon-heteroatom bonds.

Anthony Fasulo*, Daniel Foucher, Guerino Sacripante

Biology and Chemistry Department, Toronto Metropolitan University, Toronto, Ontario, Canada

Valorization of alginic acid from Sargassum for bioplastics

The growing demand for sustainable alternatives to petroleum-derived plastics has spurred interest in biopolymers, such as sodium alginate, derived from the brown algae known as Sargassum. This study examines two complementary strategies for vaporizing alginates for bioplastic applications by investigating the effects of plasticizers on alginate-based materials and evaluating the impact of methylation and acetylation on the properties of alginic acid. The effect of a Glycerol Silicate (GS) plasticizer on the mechanical, thermal, and hydrophobic properties of Sodium Alginate (NaAlg) and Calcium Alginate (CaAlg) films was evaluated. NaAlg and CaAlg films showed poor mechanical properties, and plasticizing with GS up to 25 wt%. CaAlg achieved the highest tensile strength, while NaAlg's elongation at break increased by about 10-fold. TGA showed reduced thermal stability for NaAlg but maintained stability for CaAlg. Hydrophobicity decreased for NaAlg and initially increased for CaAlg before becoming hydrophilic at higher GS levels. GS effectively enhances alginate films for sustainable bioplastics. Functionalization of alginic acid (from sodium alginate) through methyl esterification followed by acetylation, resulted in novel methyl alginate acetate, resulting in enhanced hydrophobicity and improved film-forming properties for packaging applications. These modifications extend the versatility of alginate-based materials and align with the sustainability goals of reducing global reliance on petroleum-based plastics.

Biography

Anthony Fasulo studied Biochemistry and Molecular Biology at Trent University and graduated with his Honours Bachelor of Science (H.BSc) in 2021. During his final year, he was an undergraduate thesis student working with Dr. Shegufa Shetranjiwalla on chitosan-epoxy-glycerol-silicate biohybrids, where their work was later published in 2023. Then joined the research group of Dr. Daniel Foucher and Dr. Guerino Sacripante in 2023 at Toronto Metropolitan University, where his research focuses on utilizing sodium alginate derived from seaweed for biofilms. He is expecting to graduate in 2025.

Dr. Ayan Chatterjee
Associate Professor and Associate Dean School of Health Science and Technology
Medhavi Skills University, Sikkim, India

Climate change and its vulnerability mapping–A case study from West Bengal in the context of raising ambient temperature

Human resources' physical work capacity is impacted by unfavorable thermal working conditions. The goal of the current study is to evaluate the physiological strain that various paddy cultivation tasks place on human resources in relation to the temperature conditions that exist in the open-air workplace at three distinct times of the day throughout the year. The current study was conducted in the West Bengali villages of Krishnaganj, Hooghly district, and Subdivision Arambagh. The participants' physiological and physical parameters were assessed. The following were calculated: heart rate peak, net cardiac cost, estimated energy expenditure, and cardio vascular strain index; indicators of physiological strain; and wet bulb globe temperature index, corrected effective temperature, discomfort index, and predicted four-hour sweat rate. The current study's findings showed that workers performing various tasks during the paddy-cultivation season suffered from "heavy" to "extremely heavy" physiological strain. In terms of environmental heat indices, the environmental condition above the recommended threshold values making the task strenuous for the human resources. From the present study it may be concluded that, use of mechanical devices may reduce the physiological strain for the human resources.

Keywords: Heat Indices, Thermal Comfort, Task, Fitness, Climate Vulnerability, Adaptation

Biography

Dr. Ayan Chatterjee is currently working as Associate Professor and Associate Dean of School of Health Science and Technology, Medhavi Skills University, Sikkim, India. Dr. Ayan completed his PhD degree from University of Calcutta. He also has a Six-month Diploma in Social Work and Community Service from School of Social Work and Community Service, National Council of Education, Bengal. Dr. Ayan successfully completed a Certificate course in Science Communication and Media Practice conducted by Indian Science News Association, Kolkata; the course is supported by DST, Government of India, and Vigyan Prasar. He authored 104 full length research papers; among them 44 as first author in Peer Reviewed Journals, Conference Proceedings and as Book Chapters and also presented papers in International and National Conferences held at IIT Bombay, IIT Guwahati, ISI Kolkata, ISI Giridih, Jadavpur University, University of Calcutta, Vidyasagar University, Indian Institute of Social Welfare and Business Management Kolkata, NIT Jalandhar, Aligarh Muslim University, University of North Bengal, College of Engineering Trivandrum, Diamond Harbour Womens' University, University of Gour Banga. Dr. Ayan also authored of two Books. And received Springer Sponsored Young Researcher Award for presentation of Papers at the 16th International Conference on Humanizing Work and Work Environment (HWWE 2018), Trivandrum, India. Dr. Ayan also received Young Scientist Best Oral Presentation award for the presentation of paper at the second international

conference on Environmental, Agricultural, Chemical and Biological Sciences (ICEACBS 2021). Dr. Ayan supervised sixteen dissertations for Post Graduate students and fifteen dissertations for Undergraduate students. He also has teaching experience in Human Physiology, Biochemistry and allied subjects at Undergraduate, Postgraduate and Diploma level for 12 years 06 months. He also served as Member of Editorial Board of three UGC CARE listed journals and Reviewer of three Scopus indexed and three UGC CARE listed journals. Dr. Ayan also served as Editor of Five Books of different publication house (Elsevier, Springer Nature, IGI Global USA). Recently Dr. Ayan appointed as an International Adviser in Research Publication for the organization of 1PHYSED. PH Training and Development Services, Philippines.

Ayoub Boualli[1*] Abdoullah Bimoussa[1], Yassine Laamari[1], Mourad Fawzi[1], My Youssef Ait Itto[1], Hamid Morjani[2], Aziz Auhmani[1]

[1]Cadi Ayyad University, UCA, Faculty of Sciences Semlalia, Laboratory of Molecular Chemistry, P.O. Box 2390, Marrakech 40001, Morocco

[2]BioSpectroscopie Translationnelle, BioSpecT - EA7506, UFR de Pharmacie, Université de Reims Champagne-Ardenne, 51 Rue Cognacq Jay, 51096, Reims Cedex, France.

Contribution to the valorization of *Tetraclinis articulata (Thuya)* wood sawdust: Hemisynthesis and anticancer activity of natural and hemisynthetic products

Objectives: The initial phase of this study involves isolating and characterizing the primary constituents of biomass derived from the plant. The subsequent phase focuses on the chemical modification of these isolated natural components to synthesize new pentagonal heterocyclic compounds, including thiazolidinones, thiadiazoles, thiazolines, isoxazoles, and 1,2,3-triazoles, which are recognized for their anticancer activities.

Methods: To achieve our objectives, we will employ a comprehensive approach. First, we will extract the chemical compounds present in the sawdust of the plant wood. Next, we will conduct hemisynthesis reactions to produce new compounds. These compounds will be characterized using advanced analytical techniques, such as NMR spectroscopy and chromatography. Finally, we will evaluate their anticancer activity.

Results: The outcomes of this research could have significant implications. Primarily, we aim to add value to an often-overlooked industrial byproduct by proposing a sustainable and environmentally friendly application, thereby contributing to climate change mitigation. Furthermore, the identification of new natural or hemisynthetic products with anticancer activity could pave the way for the development of more effective and less toxic anticancer drugs.

Keywords: Abietane diterpenes, 1,2,3-Triazole, Thiazolidinone, Hybrid compounds, Molecular docking, Cytotoxic activity

Biography

Ayoub Boualli is a third-year PhD candidate in organic chemistry at the Faculty of Sciences Semlalia, Marrakech. His research focuses on the valorization of medicinal plants and the functionalization of terpenic compounds isolated from these plants. He is particularly involved in the valorization of Tetraclinis articulata (thuya) wood sawdust, exploring the hemisynthesis and anticancer activity of natural and hemisynthetic products. With expertise in organic synthesis and hemisynthesis, Ayoub contributes to advancing medicinal chemistry and the development of bioactive molecules.

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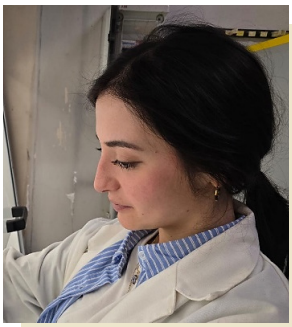
Developing innovative apolar gels based on cellulose derivatives for cleaning metal artworks

The use of organic solvents, particularly those of a non-polar nature, is a common practice during cleaning operations in the restoration of polychrome artworks and metallic artifacts. However, these solvents pose significant risks to the health of operators and the environment. This study explores the formulation of innovative gels based on non-polar solvents and cellulose derivatives, proposing a safe and effective method for cleaning metallic artworks. The study is focused on a toxic apolar solvent, ligroin, identified as one of the most widely used solvents in the cultural heritage treatments, and some “green” alternatives such as Methyl Myristate and Isopropyl Palmitate. The main challenge lies in overcoming the chemical incompatibility between non-polar solvents and polar thickening agents like cellulose ethers. To address this problem, the research was based on a Hydrophilic–Lipophilic Balance (HLB) system and Hansen Solubility Parameters (HSPs) to select appropriate surfactants, ensuring the stability and effectiveness of the formulated gels. Stability, viscosity, and solvent release capacity of gels were analyzed using static light multiple scattering (Turbiscan), viscometry, and Thermogravimetric Analysis (TGA). The efficacy of cleaning in comparison with ligroin liquid was evaluated on a metal specimen treated with various apolar protective coatings used commonly in the restoration of metallic artifacts, such as microcrystalline waxes (Reswax, Soter), acrylic resins (Paraloid B44), and protective varnishes (Incral, Regalrez). Multispectral analysis, digital optical microscopy, FTIR spectroscopy, and spectrocolorimetry allowed for the assessment of the gels’ ability to remove the different protective coatings, the degree of cleaning achieved, and the presence of any residues. The results obtained highlight the ability of the formulated gels to effectively remove protective coatings from metallic artifacts. Cetyl alcohol proved to be the most versatile surfactant to realize a stable and efficient gel. The gels based on Methyl Myristate and Isopropyl Palmitate showed promising results as “green” alternatives to ligroin, although in some cases, they exhibited less selectivity in the removal of protective coatings.

Biography

Camilla Zaratti studied Technologies for the Conservation and Restoration of Cultural Heritage at Sapienza University of Rome, earning both her bachelor's and master’s degrees with honors. Zaratti is currently a PhD student at the University of Rome "Tor Vergata," focusing on nanomaterials for cultural heritage applications. Collaborates with YOCOCU, contributing to scientific publications and presenting at international conferences. Her research emphasizes sustainable methods in art restoration, including the use of green solvents and advanced materials. Camilla Zaratti has co-authored several articles in international journals in the field of heritage science.



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Prediction of green solvent applicability in cultural heritage using hansen solubility parameters, Cremonesi method and integrated toxicity index

The transition toward sustainable conservation practices requires a scientifically ground approach to substituting traditional solvent systems with green alternatives. This study aims to facilitate the adoption of green solvents by restoration professionals by systematically evaluating their chemical compatibility and toxicological safety. By integrating Hansen Solubility Parameters (HSP), Relative Energy Difference (RED), and the Integrated Toxicity Index (ITI), we identified green solvents with high potential for replacing Cremonesi mixtures. The analysis revealed that ether-based solvents, such as 2,5-dimethyltetrahydrofuran and cyclopentyl methyl ether, exhibit high chemical affinity with Cremonesi mixtures, while esters and Fatty Acid Methyl Esters (FAMEs) offer a balanced combination of solubility and low toxicity. However, the study also underscores significant gaps in safety data (SDS) for many innovative solvents, highlighting the need for further toxicological evaluation before widespread implementation.

Biography

Camilla Zaratti studied Technologies for the Conservation and Restoration of Cultural Heritage at Sapienza University of Rome, earning both her bachelor's and master's degrees with honors. Zaratti is currently a PhD student at the University of Rome "Tor Vergata," focusing on nanomaterials for cultural heritage applications. Collaborates with YOCOCU, contributing to scientific publications and presenting at international conferences. Her research emphasizes sustainable methods in art restoration, including the use of green solvents and advanced materials. Camilla Zaratti has co-authored several articles in international journals in the field of heritage science.

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Sustainable solutions for end-of-life bifacial photovoltaic panels: Paving the way for circular economy

The disposal of End-of-Life (EOL) Photovoltaic (PV) solar panels presents environmental challenges due to hazardous materials and structural complexity. This study introduces an advanced recycling method specifically designed for bifacial solar panels, which lack back sheet polymers like PVF, PET, or PVDF, and instead use Ethylene-Vinyl Acetate (EVA) as the sole encapsulant. The process begins with mechanical removal of the junction box, followed by shredding the panels into fragments. These are processed through an eddy current separator to extract the aluminum frame. The residual material undergoes vortex processing, converting the glass into a valuable product called SolarCrete for construction applications. Silicon wafers, encapsulated with EVA, are then subjected to a low-temperature thermal process to recover solar cells and copper tape. This method recovers solar cells, copper tape, and polymerized oil. The absence of fluorinated compounds in EVA, composed of hydrogen, carbon, and oxygen, enhances environmental safety and simplifies recycling. Using a modified pyrolysis reactor, the EVA layer degrades under inert conditions, minimizing emissions and producing polymerized oil. Characterized by Thermogravimetric Analysis (TGA) and Fourier-transform infrared spectroscopy (FT-IR), the oil meets ASTM and Australian diesel standards and can be repurposed as a lubricant. Oil yield optimization was achieved using Response Surface Methodology (RSM) and Box-Behnken Design (BBD). Optimal parameters—a heating rate of 8.92°C/min, a hold time of 31.82 minutes, and a maximum temperature of 528.22°C—resulted in a yield of 57.53%. This recycling approach aligns with circular economy principles, enabling the reuse of recovered materials in manufacturing new solar panels and maximizing resource efficiency. By addressing critical waste management challenges, this study advances the sustainability of solar energy systems globally.

Biography

Dr. Chitra Sulkan recently completed her dual PhD through a collaborative program between ACSIR, India, and RMIT University, Australia, under the guidance of Dr. Sushil Kumar (Chief Scientist at CSIR-NPL, India) and Associate Professor Rebecca Yang (RMIT University). Her research focused on innovative approaches to the recycling and upcycling of solar panels. Holding a joint PhD from these esteemed institutions, Dr. Sulkan has made significant contributions to the field, publishing several papers in renowned scientific journals. Currently, she serves as the Lead Research and Technology at Elecsome Pty Ltd, where she is spearheading cutting-edge research on the sustainable upcycling of end-of-life solar panels.

Mathieu Schopfer, David Martinet, Christoph Ellert*
Institute of System Engineering, HEI-Vs, Sion, Switzerland

Plasma-chemical recycling of household

Increasing mass of non-recycled plastic waste is one of the major environmental issue in developed and developing countries. While the fraction of collected plastic waste is steadily increasing, the selection, treatment and recycling is still a major issue in particular for mixed or even combined materials. Besides technical issues the cost balance of complex processes is negative, as in most cases the valorisation is based on the revenues generated by the energetic content of the (mostly) hydrocarbons. Therefore, the green chemistry group develops a plasma process which converts plastic waste into chemical feedstock of higher economic value than the basic energetic equivalent, e.g. acetylene or ethylene.

In this presentation, the opportunities and issues of this method will be described. So far, first results show that the treatment of most common plastic waste fractions (Polyethylene PE, polypropylene PP, Polystyrene PS, Polyethylene-Terephthalate PET) may result in more than 50% conversion of plastic waste into high-value chemical feedstock gases. This opens up the opportunity for a closed life cycle of plastic, by replacing the resources of fossil origine, i.e. high temperature and/or catalytic cracking of crude oil or natural gas, which is commonly used to generate acetylene and ethylene as precursors of the relevant monomer, by the plastic waste itself.

Biography

Dr. Christoph Ellert completed a PhD at the University of Freiburg, Germany, in 1995, specializing in the optical spectroscopy of mass-selected metal clusters. From 1996 to 1999, he held a Feodor-Lynen Fellowship at NRC Ottawa, Canada, and a Marie-Curie Postdoctoral Stipend at CEA Grenoble & Paris, France, where he focused on the interaction of intense femtosecond laser fields with atoms, molecules, and clusters. Between 2000 and 2010, Dr. Ellert contributed to the development of plasma reactors and thin film deposition technologies (TiNOx, silicon) for the solar industry, securing several patents and publishing more than 30 research articles. Since 2010, Dr. Christoph has been at HES-SO Valais-Wallis in Sion, Switzerland, where he focuses on plasma technology and its applications, particularly the integration of photovoltaic systems with green hydrogen applications.

Collin G. Joseph

Sonophotochemistry Research Group, Faculty of Science and Natural Resources, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah &

Industrial Chemistry Programme, Faculty of Science and Natural Resources, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah

Detergent wastewater treatment using catalytic and non-catalytic ozone gas: Current updates and future directions

Laundry detergent wastewater is a potential renewable resource that can be recycled and reused in order to mitigate water scarcity. The treatment of laundry detergent wastewater is very challenging because of its multicomponent composition, large discharge volumes to the environment resulting from increasing usage of detergent as the global population grows, and ineffectiveness of conventional treatment technologies. Ozonation as one of the most effective Advanced Oxidation Processes (AOPs) has shown tremendous potential in the treatment and reclamation of laundry detergent wastewater.

Complete mineralization of the water contaminants by molecular ozone is not economical due to the high ozone generation cost and other limitations such as pH dependence, short lifetime of ozone, low ozone solubility in aqueous solution and mass transfer limitations. Strategies such as modification of ozonation processes including combination with hydrogen peroxide (peroxone process) and catalytic ozonation have received much attention. The effectiveness of the ozonation process can be further enhanced by photocatalytic ozonation resulting in higher rate of pollutants mineralization. This presentation reviews the recent studies on ozonation treatment of surfactant containing laundry wastewater generated from various sources including domestic, industrial, commercial or public premises. Important remarks on the ozonation treatment of laundry detergent wastewater and suggestions for future applications of this technology will also be presented.

Graphical Abstract:

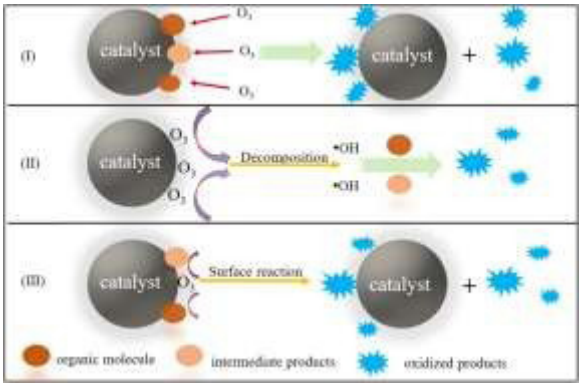

Figure Caption: The mechanisms of heterogeneous catalytic ozonation.

Keywords: Ozonation Treatment, Advanced Oxidation Process (AOP), Detergent, Laundry Wastewater, Surfactants.

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Biography

Dr. Collin G. Joseph is a Professional Chemist and an Associate Professor in PhD. (Nottingham, UK) Chem. Eng., FMIC, ACS in the Industrial Chemistry Program of Universiti Malaysia Sabah, which he joined as an academician in 2003. He obtained his PhD in Chemical Engineering from the University of Nottingham, UK in 2011 and to-date he has received several Excellence and Service awards as well as research and innovation Gold Medals in MTE, ITEX and PEREKA research competitions. He is an accomplished researcher and author in the field of Adsorbent Technology, Sonophotochemistry and Ozone Chemistry research. In 2014, he established the Sonophotochemistry Research Group and has served as the Head of Sonophotochemistry Research Group ever since. He served as the Head of the Industrial Chemistry Programme from 2020-2023 at the Faculty of Science and Natural Resources, Universiti Malaysia Sabah. Due to his outstanding accomplishments in the field of Chemistry, he has been invited by many Tier 1 journals to serve as a reviewer under various publishers such as Elsevier B.V, Springer and Taylor & Francis. He is also frequently invited as a speaker and keynote speaker at international conferences and as research collaborators with local and international universities. He sits on the Editorial board of the Malaysian Journal of Chemistry (ISSN: 2550-1658), as a Review Editor on the Editorial Board of Photocatalysis (Frontiers of Chemistry (ISSN: 2296-2646)) and serves as a Guest Editor for Catalysts (ISSN 2073-4344). His current (22-11-2024) Google Scholar h-index is 20 with 2670 citations. Due to his outstanding contributions to the Malaysian Institute of Chemistry, he was awarded Fellowship of the Malaysian Institute of Chemistry (highest award) in 2021. He is also a member of the American Chemical Society and Majlis Profesor Negara. He serves as a volunteer and committee member (Life-time member) with MERCY Malaysia and the UMS4WDVC, carrying out various community-based services in contribution to the state and people of Sabah, Malaysia.

Dae Dong Sung
Department of Advanced Materials Chemistry, Samse Medical Center, Korea University Sejong Campus, Korea

New methods for identifying in vivo biomedical reaction mechanisms

Recently, biomedicine has made great advances in anti-aging and disease treatment. There are still many difficulties in accurately identifying the process by which the human body ages and the causes of chronic diseases. The field of chemical reaction mechanism tools has made a significant contribution to the field of biomedicine. Among the areas of biomedicine, reaction mechanism tools are making a groundbreaking contribution to treating the anti-aging field, which aims to realize the dream of gene scissor therapy and life extension. Understanding of reaction mechanisms is an important role in identifying and resolving the results of measurements of analysis of cellular heterogeneity in gene expression. Although the latest physiological measurements are used to identify the diseases and to provide a lot of measurement data, there are many difficulties in accurately determining the cause of the disease, diagnosing and finally treating it. Recently, new technologies have been used as variant of flow cytometry based on fluorescence, light scattering and separation techniques to sort cells and to confirm the results of measurements. These tools are based on molecular spectroscopy. Laser capture microdissection based on mass spectrometry is helpful to identification that is coupled to a microscope and focused on a tissue. Molecular mass spectrometry is widely applied in RNA sequencing tool based on headspace solid-phase microextraction/gas chromatography-mass spectrometry. Inflammation is one of the major causes of cellular senescence. Inflammatory aging is characterized by increased levels in the proinflammatory factors in the cells. Senescent cells secrete molecules that promote chronic inflammation and organ deterioration, contributing to chronic diseases and aging. The cell changes lead to the aging of the cells. Utilizing the separation techniques based on mass spectrometry in the field of biomedicine can help in understanding and applying treatments for a multitude of different disease or diverse types of cancer and even expand upon efficient and reliable diagnosis in clinical settings. However, despite the use of these technologies, interpretation of the measured results is very difficult. Chemical reaction mechanisms, especially nucleophilic substitution reaction mechanism tools are applied to accurately interpret these measurement results to determine the cause of chronic diseases and develop treatments. Aniline and its derivatives serve as important molecules in biomedicine. Understanding the reaction mechanism of anilines helps to accurately understand the base reactions of DNA in our body cells. How the length of telomeres at the ends of DNA in our body's cells increases or decreases can be understood by applying the reaction mechanism of aniline and its derivatives. Using the nucleophilic reaction mechanism tools of aniline and their derivatives in the field of biomedicine are available to understand and to apply also treatments for multitude of different diseases like Alzheimer's disease and divers types of cancer, and to expand on efficient and reliable diagnosis in clinical treatments.

Biography

Professor Dae Dong Sung studied chemistry at Dong-A University as BS and MS and Princeton University as Ph.D, then joined the research group of Professor Donald Bethel at Liverpool University as the Royal Society Fellow of Chemistry UK. He joined the research group of Professor Hideo Tomioka at Mie University Japan as visiting Professor and worked at Dong-A University and Korea University in the field of physical organic chemistry. Now Professor Dae Dong has been contributing to the development of new drugs and anti-aging drugs that can be applied to the treatment of chronic diseases in the biomedicine area. Has been published more than 240 research articles in SCI journals and has given more than 70 invited oral presentations at international academic conferences.

Darshit S. Upadhyay
Mechanical Engineering Department, Nirma University, Ahmedabad, Gujarat, India

Evaluation of an improved biomass cookstove performance and the traditional stoves of India: A comparative study

The cooking process has made easily digestible and richly nutritious food available to homo-sapiens. This has enabled humans to spare time to pursue higher purposes besides food acquisition. A predominant source of heat for food reparation has been the biomass conventionally. The availability of fuels like natural and petroleum gases and electricity-based devices in modern times has replaced biomass-based cooking for the affluent section of society. Still, a large chunk of the population depends on biomass as their primary fuel source for cooking purposes for various reasons, including the lack of last-mile supply chain infrastructure and the inability of hinterland people to afford them. The traditional biomass cookstoves have been pretty ineffective in terms of combustion efficiency and produce a lot of harmful emissions. Indoor pollution as the result of the use of traditional cookstoves has been responsible for chronic and severe repository illnesses, especially in women and children. In addition, the time and effort (resources) put in by the people for procuring the fuel biomass is ample. This also results in the loss of green cover of the trees when cut for firewood purposes.

The 3.5 kWth top-lit updraft micro biomass gasifier-based cookstove is designed as per the stoichiometric calculation. The stove is prepared by mild steel 3 mm thick sheet. Grate and ash-pit are added to collect char and ash particles after the combustion process of the feedstock. The shape of the combustion chamber is cylindrical, whereas the shape of the ash pit is rectangular. In this stove, combustion is divided into two processes. Bottom air vents are gasified with sub-stoichiometric air and carbonaceous feedstock, which generates producer gas. This gas reaches secondary holes where combustion has occurred due to the natural draft. To increase the draft, the inner shape of the stove was prepared with a continuously decreasing diameter as the air went upwards. The secondary air gets heated by providing the annular space in the periphery of the inner part of the stove. This preheating of secondary air improves the thermal efficiency of the stove. It also works as a natural thermal insulation jacket, decreasing heat losses through the stove surface and avoiding needing separate insulation material augmentation. With the combination of intelligent utilization of natural draft and novel geometry, the complete combustion of biomass is achieved, resulting in a highly efficient combustion process and minimal harmful emissions.

Experiments were conducted with wood as a feedstock with a traditional three-brick stove and an improved biomass cookstove. Different parameters, such as Specific fuel consumption, PM, fuel consumption, firepower, useful firepower, gas emission, etc., were investigated in this study.

Biography

Dr. Darshit S Upadhyay has been an Assistant Professor in the Mechanical Engineering Department since 2012, completed MTech in Thermal Engineering and PhD from Nirma University in 2012 and 2020, respectively. Has more than 15 SCI-indexed journal publications, 3 designs and presented more than 20 papers at international conferences. Dr. Darshit has received different project grants as PI/Co-PI from Department of Science and Technology (DST), Gujarat Council on Science and Technology (GUJCOST), and Nirma University. Also, received travel grants to attend international conferences in the USA and Canada. He has received the ISTE national and state awards.

Delia Teresa Sponza

Environmental Engineering Department, Dokuz Eylül University, İzmir Turkey

Photocatalytic hydrogen energy recovery from sulfide-containing wastewater using thiol-UiO-66/$Mn_{0.5}Cd_{0.5}S$ nanocomposites

The worldwide environmental pollution and energy crisis have become two main challenges currently. To this end, we aim to build a win–win strategy of clean hydrogen energy recovery with simultaneous environmental detoxification by treating sulfide-containing wastewater in a non-hazardous manner. In this study, we designed a heterostructure photocatalyst with in situ growth of MnCdS nanoparticles on thiol-functionalized UiO-66-based materials (UiOS-MCS). A series of characterization analyses showed that UiOS-MCS nanocomposites held favorable properties of efficient charge separation and migration, which thanked to well-matched band structure and tight interfacial contacts via thiol-linked bonds that greatly facilitated the transfer of photogenerated charge carriers. The optimal nanocomposite of 0.5 UiOS-MCS exhibited excellent photocatalytic activity under visible light irradiation, with an impressive hydrogen evolution of 3179.36 μmol g^{-1} h^{-1} and a significant removal of sulfide contaminants in the wastewater of about 90%, selectively generating valuable oxidation product of monomeric sulfur. The mechanism analysis demonstrated that the main photoactive species required for hydrogen production by photoreduction (electrons) and sulfide removal by photooxidation (holes) were independent of each other, and that the electron-hole division of collaboration ensured an efficient and synergistic redox reaction. This work offers a promising strategy for the recovery of energy stored in wastewater and environmental remediation.

Biography

Prof. Dr. Delia Teresa Sponza is currently working as a professor at Dokuz Eylül University, Department of Environmental Engineering. Scientific study topics are; Environmental engineering microbiology, Environmental engineering ecology, Treatment of fluidized bed and activated sludge systems, Nutrient removal, Activated sludge microbiology, Environmental health, Industrial toxicity and toxicity studies, The effect of heavy metals on microorganisms, Treatment of toxic compounds by anaerobic/aerobic sequential processes, Anaerobic treatment of organic chemicals that cause industrial toxicity and wastewater containing them, Anaerobic treatability of wastewater containing dyes, Treatment of antibiotics with anaerobic and aerobic sequential systems, Anaerobic and aerobic treatment of domestic organic wastes with different industrial treatment sludges, Treatment of polyaromatic compounds with bio-surfactants in anaerobic and aerobic environments, Treatment of petrochemical, Textile and olive processing industry wastewater by sonication, Treatment of olive processing industry wastewater with nanoparticles and the toxicity of nanoparticles. She has many international publications with an H index of 42 and 6000 citations.

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Direct air capture cost reduction and market development via process intensification. Establishing the DAC insetting concept

Direct Air Capture (DAC) technologies are anticipated to achieve megaton-scale by 2030 and gigaton-scale by 2050. However, current capture costs and pace of development cast doubt on DAC's readiness to contribute to the environmental goals in the 2030s. This study introduces an innovative framework to reduce capture costs and facilitate the widespread deployment of DAC technologies. First, an extensive review of the current state of DAC deployment is conducted, followed by an analysis of the DAC market outlook. Secondly, the methodology involves the techno-economic assessment of our case study, the integration of absorption-based DAC systems with urea manufacturing. As a result, two First-Of-A-kind (FOAK) DAC plant designs based on process intensification are formulated (DAC-to-urea). FOAK costs are projected into the future by outlining distinct deployment scenarios using the learning rates principle. Estimates from the optimistic deployment case indicate that low renewable electricity prices and ambitious learning rates lead to competitive DAC-based urea prices (589-710 $/t urea), while achieving promising capture costs (158-248 $/t CO_2). In that context, renewable ammonia generation acts as the primary bottleneck for sustainable urea production employing air-captured CO_2. This outcome strengthens DAC-CO_2 role as a chemical feedstock for high-demand commodities in future sustainable economies. However, results derived from the delayed deployment scenarios (280-590 $/t CO_2) align with innovative cost assessment approaches from the literature. Findings highlight the dependency of DAC cost predictions on elevated learning rates and immense increases in capacity.

Biography

Albert Pujol studied chemical engineering at Universitat Politècnica de Catalunya, Barcelona, in 2014. After graduating, Mr Albert Pujol was hired as a production and quality engineer by Europastry S/A in Barcelona. In January of 2020 he began a new chapter as an R&D engineer at LEITAT Technological centre. Albert Pujol had his master's degree on Chemical Engineering at Aarhus University, 2022. He gained knowledge on renewable energy systems, energy conversion and catalytic processes. Albert Pujol developed a research project with the Power-to-Gas (PtG) research group that contributed to the elaboration of his Master´s Thesis based on the modelling of a methanation reactor in a PtG system. In November 2022, he joined the green fuels and energy department of the Danish engineering consultancy firm COWI. In collaboration with Aalborg University, Albert is developing his doctoral thesis in Direct Air Capture Systems. The PhD project focuses on the integration of large-scale Direct Air Capture (DAC) systems in energy systems. The focal point consists of decreasing the energy requirements and the overall cost of capture by integrating DAC into Power-to-X and CO2 utilisation systems.

Eleonora Di Salvo[1*], Giuseppe Diego Puglia[2], Shashank Saini[2], Antonio Alecci[3], Maurizio Ambrosino[4], Domenico Cicchella[4], Nicola Cicero[1,2]

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Investigating specialized metabolism as an integral factor to improve oxidative stress resilience in native plants exposed to metalloid naturally contaminated soils

The phenomenon of Global Climate Change (GCC) has resulted in alterations to the frequency of climate change, leading to the manifestation of significantly more severe environmental disruptions in comparison to those observed in the past. The presence of abiotic stresses, such as drought, heat, salt, or heavy metals and metalloids, including Arsenic (As), serves to exacerbate the effects of GCC. Flavonoids, a prominent group of secondary metabolites, possess a variety of functions in plants, including the capacity to protect against abiotic and biotic stresses through their antioxidant activity. However, the function of flavonoids in naturally tolerant wild plants growing in stressful soils remains to be fully elucidated through experimental means. Soils developed on the volcanic substrate, which constitutes a substantial portion of the Campanian region and the Etna (Sicily) surroundings, are characterized by a high concentration of neo-formed amorphous alumino-silicates and organo-mineral compounds, exhibiting a remarkable binding capacity for trace metals, such as As. It is noteworthy that several species from the Brassica genus hold significant agronomic and economic value as heavy metal accumulators. This is exemplified by *Brassica rapa* (B. rapa), which has been documented to exhibit notable tolerance to As-rich soils. This study explores the heavy metal tolerance and accumulation capabilities of different parts of. B. rapa cultivated in hydroponic systems, with a particular focus on the presence of heavy metal, oxidative stress damage and soil contamination. Hydroponics offers a controlled, resource-efficient platform to optimize phytoremediation potential while minimizing soil depletion and secondary contamination. However, the role of flavonoids in the oxidative stress tolerance of B. rapa remains to be elucidated. The tolerance mechanisms, as adaptive traits, evolved in this species can become a knowledge milestone for future phytoremediation. In the present project, through untargeted transcriptome and metabolome approaches, the role of flavonoids as ROS scavengers within the tolerance strategy of wild B. rapa naturally growing in soils affected by arsenic is investigated. This is assessed through geochemical approaches, by performing transcriptome and metabolome profiling analyses. The RES2OX project has been funded by the Italian Ministry of Research and University in the PRIN: PROGETTI DI RICERCA DI RILEVANTE INTERESSE NAZIONALE–2022 PNRR Call. It

includes three research partners from the National the University of Messina, Research Council of Italy and the University of Sannio.

Biography

Dr. Eleonora Di Salvo obtained her Bachelor's degree in Biology from the University of Messina in 2016. From 2017 to 2019, she was awarded a research grant at the National Research Council in Messina. In 2019, she secured a Ph.D. position at the University of Messina and successfully earned her Ph.D. in Food Inspection in early 2023. Up to now she is the author of more than 36 full-text articles published in international scientific journals, several abstracts for international meetings, participation in international conferences with awards won for best presentation and book chapters. Since 2023, Dr. Di Salvo has been engaged as a postdoctoral researcher at the University of Messina focusing on food chemistry, microbiology, heavy metals and environmental toxicity and their close relationship with human health.

Elsa Justino*, Helena Belchior-Rocha

Political Science and Public Policies Department, Iscte-University Institute of Lisbon/ CIES, Lisbon, Portugal

Empowering human rights through green chemistry and renewable energy in a climate-challenged world

The confluence of green chemistry and renewable energy presents a significant opportunity to address the dual challenges posed by climate change and human rights. As the global community grapples with the escalating impacts of climate change, the imperative for sustainable and equitable solutions becomes increasingly urgent. This abstract explores the transformative potential of green chemistry and renewable energy technologies in fostering a future where human rights are upheld, and environmental sustainability is achieved.

Green chemistry, with its emphasis on minimizing hazardous substances and promoting the utilization of renewable feedstocks, provides a framework for the development of processes and products that are environmentally benign. Green chemistry contributes to the mitigation of climate change and the preservation of natural resources by reducing the ecological footprint of chemical manufacturing. Consequently, this supports the realization of fundamental human rights, such as the right to a healthy environment, clean water, and air.

Renewable energy technologies, including solar, wind, and bioenergy, play a pivotal role in the transition away from fossil fuels and the reduction of greenhouse gas emissions. The implementation of these technologies not only addresses the underlying causes of climate change but also fosters energy security and accessibility. Consequently, the provision of affordable and clean energy through renewable technologies can alleviate energy poverty, enhance economic opportunities, and improve the quality of life for millions of individuals globally.

However, the integration of green chemistry and renewable energy into mainstream practices faces several challenges, including technological barriers, economic constraints, and the need for supportive policies and regulations. Overcoming these obstacles requires a concerted effort from governments, industry, and civil society to foster innovation, invest in research and development, and implement policies that incentivize sustainable practices.

Biography

Elsa Justino, holds a PhD in Social Work, with a master's degree and a degree in the same area. Also, an assistant professor at the Department of Political Science and Public Policies at the University Institute of Lisbon (ISCTE-IUL) and an integrated research member at the Centre for Research and Studies in Sociology (CIES/Iscte-IUL).

BSc. Flavia Gutiérrez Muiña*, Brenda Alcántar-Vázquez

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SiO_2-amino adsorbents from geothermal silica waste with potential application in direct CO_2 air capture

Direct CO_2 air Capture (DAC) has become a key strategy to address climate change as its implementation can contribute to a decrease in the concentration of this greenhouse gas in the atmosphere, which, until November 2024, had an upward trend of 423.85 ppm. Unlike other methods, such as post-combustion, direct capture aims to extract CO_2 directly from ambient air, so working at low gas concentrations at atmospheric conditions is necessary. Most DAC techniques are based on sorption processes in which ambient air flows over a sorbent that selectively removes carbon dioxide. The sorbents used in DAC must have important characteristics, such as high adsorption capacity, good selectivity, easy regeneration, low energy penalty, adequate adsorption-desorption kinetics, excellent chemical stability and low cost. In this way, amine functionalization of porous materials has been proposed to improve the CO_2 adsorption capacity and selectivity, while the use of waste to obtain economically viable adsorbents has been investigated. Thus, this research aims to develop an efficient SiO_2-amine adsorbent material for direct CO_2 air capture from geothermal silica waste. The wastes used as a source of silica come from two Mexican geothermal power plants (Cerro Prieto and Humeros). Once the silica samples were characterized by XRF, SEM and N_2 adsorption, the functionalization with TEPA, PEHA and PEI (20 wt%) was carried out by impregnation. The obtained SiO_2-amine materials were characterized by N_2 adsorption, FT-IR and TG analysis. Moreover, CO_2 capture tests were carried out with 400 ppm of CO_2 and temperatures between 25 and 35°C. The highest CO_2 adsorption was 2.87 wt% (0.65 mmoles/g) obtained with the material prepared using Cerro Prieto silica waste treated with citric acid and impregnated with 20% TEPA (30°C). Finally, the stability evaluation of this material over 10 consecutive adsorption-desorption cycles shows a mass loss of 2.24%, which is mainly related to the decomposition of the amines with increasing temperature during desorption.

Biography

Flavia Gutiérrez Muiña studied Meteorology at the University of Havana, Cuba and graduated in 2020. Then, joined the Environmental Impact Department of the Energy Information Management and Development Center (CUBAENERGIA). During her stay at CUBAENERGY, she participated in the international collaborative project "Habana Ciudad Solar", led by CUBASOLAR, and published two articles as lead author in the Cuban Journal of Meteorology. Moreover, in December 2021, she participated in the Meteorology Congress in Havana, Cuba. Since August 2023, Flavia Gutiérrez has been studying for a Master's in Environmental Engineering at the Universidad Nacional Autónoma de México (UNAM). Participated in the 1st International Congress on Environmental Engineering (CIAMB), held in June 2024 in Mexico City.

Girijesh Kumar Verma

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DMAP catalyzed heterocycle synthesis

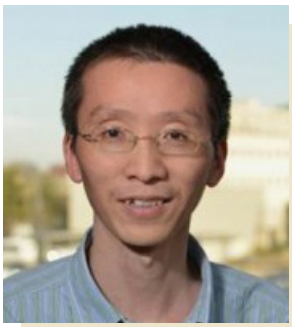
4-(Dimethylamino)Pyridine (DMAP) is a highly versatile and widely used nucleophilic organic catalyst, renowned for its ability to facilitate a broad spectrum of chemical transformations. Among organic catalysts, DMAP stands out due to its unique combination of nucleophilic and basic properties, which enable it to activate a wide variety of electrophiles. Its catalytic efficiency was first demonstrated by Litvinenko and colleagues, who reported that DMAP-catalyzed benzoylation of 3-chloroaniline occurred at a rate 104 times faster than when pyridine was used.1 Subsequent foundational work by Steglich and Hofle further showcased DMAP's utility by employing it as a catalyst for the acylation of 1-methylcyclohexanol, establishing its role as a key reagent in organic synthesis.

DMAP's broad applicability stems from its capacity to activate acyl groups and facilitate nucleophilic attack. This makes it indispensable in a wide range of reactions, including acylation, alkylation, benzoylation, and esterification. Its catalytic activity extends to more complex transformations, such as the Dakin-West reaction, Baylis-Hillman reaction, and various cyclization reactions. DMAP has also been employed in reactions that involve carbamoylation, phosphorylation, sulfonamidation, and silylation, highlighting its versatility in activating different substrates under mild conditions. Additionally, it plays a crucial role in rearrangements and in the synthesis of electrophilic alkenes. Its adaptability has even found applications in specialized areas such as the synthesis of heroin and electrophilic alkenes.

In this context, DMAP's utility in the synthesis of heterocycles is particularly noteworthy. For example, it facilitates the formation of thiophene derivatives, 4 naphtho[2,3-b]thiophenes,5 and 1,3- thiazolidin-4-ones. 6,7 these heterocycles are of immense significance due to their applications in pharmaceuticals, materials science, and agrochemicals. DMAP enables these reactions under mild conditions, ensuring high efficiency and selectivity. This makes it a powerful tool in the synthesis of structurally complex molecules, allowing researchers to explore novel pathways and create advanced materials.

Biography

Dr. Verma studied chemistry at DDU Gorakhpur University, Gorakhpur, India and secured his M. Sc. degree in 2007, then joined the research group of Prof. M. S. Singh at Banaras Hindu University, Varanasi and received a Ph. D. degree in 2015. Dr. Verma joined the group of Prof. D. S. Rawat at Delhi University as Dr. D. S. Kothari Post Doctoral Fellow and worked there for three years (2015-2018) and successfully completed his project on C-H activation chemistry. After this he worked for nearly two years in industry and then joined DDU Gorakhpur University, Gorakhpur as Assistant Professor in 2022. Has been published more than 25 research articles in SCI journals, a review article and three book chapters on his name.



Haibo Ge

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Distal functionalization via transition metal catalysis

The ubiquitous presence of sp3 C–H bonds in natural feedstock makes them inexpensive, easily accessible, and attractive synthons for the preparation of common and/or complex molecular frameworks in biologically active natural products, pharmaceutics, agrochemicals, and materials. However, the inertness of these bonds due to the high bond dissociation energies and low polarity difference between the carbon and hydrogen atoms makes them challenging reaction partners. Moreover, the desired site-selectivity is often an issue in reactions with multiple analogous sp^3 C–H bonds. To overcome these problems, transition metal-catalyzed C–H functionalization has been developed with the assistance of various well-designed directing groups which can coordinate to a metal center to deliver it on a targeted C–H bond through an appropriate spatial arrangement, enabling C–H activation via the formation of a cyclometalated species. However, the requirement of often additional steps for the construction of the directing groups and their subsequent removal after the desired operation severely hampers the efficacy and compatibility of the reactions. A promising solution would be the utilization of a transient ligand which can bind to the substrate and coordinate to the metal center in a reversible fashion. In this way, the directing group is installed, sp^3 C–H functionalization occurs, and the directing group is then removed in situ without affecting the substrate function after the catalysis is finished. Overall, the whole process occurs in a single reaction pot. Herein, we are presenting our studies on transition metal-catalyzed transient directing group-enabled C–H functionalization reaction.

Biography

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

Hillary Kasedde Kasim Kumakech*, John Baptist Kirabira

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Design and modeling of an energy village for rural off grid communities in Uganda

Rural energy planning needs an integrated technical, economic, and social model for sustainability. In this work, a rural energy village concept was adopted. BidiBidi rural off grid settlement in Northwestern part of Uganda was chosen as a case study. Development of the energy village involved characterization of the settlement for energy uses, potential and formulation of optimal energy supply option. From household surveys, total energy demand for cooking, electrical appliances, and water pumping were 3,610 MWh/year with peak load of 410 kW, respectively. Renewable energy potential indicated average hourly wind speed of 2.6 m/s, average solar irradiation for an 8-hour sunshine hour of 0.7 kW/m^2 and biogas potential of 246x106 m^3/year. Optimal generation capacity for solar and biogas systems using MATLAB optimization modelling were 341.4 kW and 225.0 kW, respectively. Considering energy cost of 0.10 $/kWh and 0.15 $/kWh for systems operation at 100%, 75%, 50% and 30% capacities, payback period, NPV and Cost Benefit Ratio (CBR) were calculated. A positive NPV for 17 years project lifespan and CBR values greater than 1 showed economic feasibility of the project. Moreover, the average Levelized Cost of Energy (LCOE) was 0.031 $/kWh over the entire project lifespan. Harnessing hybrid renewable energy systems for the zone can meet energy demands of the households.

Keywords: Energy Village, Rural communities, Energy Demand, Renewable Sources, Modeling and Simulation, Hybrid Energy Systems.

Biography

Dr. Hillary Kasedde is a Senior Lecturer and researcher in the Department of Mechanical Engineering in the School of Engineering at the College of Engineering, Design, Art and Technology, Makerere University, Kampala with a specialization in materials science and engineering and sustainable energy engineering. Dr. Hillary obtained his PhD in 2016 from KTH Royal Institute of Technology, Stockholm, Sweden. His research interests are in the fields of materials science and engineering, chemical engineering separation processes, mineral resource and mining engineering, renewable energy conversion, energy recovery, and the environment, energy systems modelling and simulation. He has published more than 40 research articles.

Eng. Dr. John Baptist Kirabira is a professor and current chair in the Department of Mechanical Engineering at Makerere University Kampala, Uganda. His research interests include materials science and energy systems.

Dr. Hossam A. Tieama
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Understanding membrane fouling and chemical cleaning performance for cleaning agents, a review article

A reverse osmosis membrane is an essential product for handling water and wastewater. There are three other types of membranes, categorized by membrane pore size, widely used for commercial purposes: Microfiltration (MF), Ultrafiltration (UF), Nanofiltration (NF). These four membrane types are widely used to meet the objectives of the drinking water rules and guidelines of water and wastewater treatment. A reverse osmosis membrane is also used for processing desalted and/or Ultrapure Water (UPW) for various industrial and other uses, such as making up water from power plants, manufacturing of electronic chips, food industry, pharmaceutical, medical, and others. The cleaning process is complicated by being foulant dependent. If calcium carbonate scaling is a problem, the elements can be cleaned by just lowering the pH of the feed water for a few hours. If colloidal fouling occurs, a detergent with phosphate should be used. If bacteria fouling occurs, a biocide must be added to the cleaning solution. How do you know what type of fouling you have? Without destroying the element, the only way to tell is by knowing the system thoroughly. Records of the feed water analysis, membrane pressure differential, water flux, salt passage, and applied pressure must be kept so that slight differences can be detected. Manufacturers are very specific in recommending cleaning solutions, and for good reason. Cleaning is an area where membranes exhibit their differences. A solution that works for cleaning one membrane may damage another. Special attention must be paid to the recommended cleaning solutions, especially when using membranes from different manufacturers, or of different composition in one system. Various substances present in the inlet water of a water treatment system can cause surface contamination of the reverse osmosis membrane, such as hydrated metal oxides, calcium precipitates, organic matter, and microorganisms. Prolonged operation or substandard pretreatment can cause fouling on the membrane surface, which can affect system productivity and even cause irreversible damage to the membrane elements. Therefore, chemical cleaning of the reverse osmosis membrane is an essential process in production.

Biography

Dr. Hossam Ahmed Tieama studied Chemistry at Alexandria University, Egypt and graduated in 2000, then joined the research group of Polymer Chemistry and obtained his PhD degree in the field of water and waste water treatment applications using modified membranes. Dr. Hossam is currently employed as a utilities general manager at Abu Qir Fertilizers company, and he has got 23 years of experience in the field of water treatment. He has participated in many international conferences and presented many researches in water purification applications using modified membranes. Has been published in several international journals on membranes topics and continuing his research activity at the city of scientific research and technology applications.

Javier Tobajas

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Smart predictive control for sustainable and resilient hybrid microgrids

The decarbonisation of local energy systems requires not only the deployment of renewable energy sources, but also advanced energy management strategies that ensure their optimal, reliable, and sustainable operation. In this context, hybrid microgrids combining photovoltaic generation with distributed storage technologies emerge as a key solution to support the energy transition. This work presents a predictive control framework specifically designed to enhance the sustainability, autonomy, and intelligence of hybrid microgrids integrating lithium-ion batteries and hydrogen-based storage systems.

The proposed control strategy focuses on day-ahead optimisation of energy dispatch over 24-hour horizons. It aims to maximise renewable self-consumption, reduce greenhouse gas emissions, and ensure system autonomy under varying operating conditions. The hybrid storage configuration includes fast-response batteries and a long-duration storage layer based on an electrolyzer and fuel cell, allowing the system to efficiently store surplus solar energy and reuse it in low-generation periods, fully avoiding fossil-based backup systems.

Unlike conventional economic dispatch methods, the control algorithm is built upon a stochastic Model Predictive Control (SMPC) architecture with a multi-scenario formulation. It considers uncertainty in solar generation and potential grid disconnection events, allowing the system to anticipate and adapt to both normal (grid-connected) and critical (islanded) scenarios. A Mixed Logical Dynamic (MLD) model enables the incorporation of logical switching, component-specific constraints, and auxiliary variables to represent system behaviour more realistically.

What differentiates this approach is its emphasis on autonomous and intelligent decision-making. The controller dynamically selects the most appropriate energy sources based on forecasts and internal state, while also minimising operational stress and component degradation. For example, it avoids inefficient start-stop cycles in the hydrogen subsystem by using penalisation terms within the objective function. This proactive behaviour reduces energy waste, prolongs asset life, and enhances the long-term sustainability of the system.

Additionally, the control logic embeds resilience criteria to guarantee the supply to critical loads, such as those in hospitals or public infrastructure, even during extended islanded operation. These constraints ensure that energy resources are allocated not only based on cost, but also on availability, reliability, and environmental impact.

Simulation results using a hospital-type microgrid in MATLAB/Simulink confirm the benefits of this integrated control approach. The system increases renewable self-consumption, reduces curtailment, and maintains a reliable supply during grid outages. The MPC-based controller reacts to forecast deviations and re-optimises dispatch in real time, demonstrating its suitability for real-world scenarios with fluctuating demands and generation. In addition to technical performance, the control system contributes to emissions reduction and energy independence, aligning with climate targets and sustainability goals.

The modularity and scalability of the proposed control architecture make it suitable for deployment in a variety of settings, including critical infrastructure, research campuses, and isolated communities. By combining intelligent automation with renewable integration and storage coordination, this approach enables microgrids to function as fully autonomous, low-emission energy hubs capable of supporting the wider transition to green and resilient energy systems.

Biography

Javier Tobajas is an Industrial Engineer from the University of Castilla-La Mancha. Since 2019, has worked at the Spanish National Hydrogen Centre (CNH_2) as an Electronics Engineer in the Simulation, Control and End Uses Unit. Javier, currently leads the Microgrid Laboratory, focusing on smart grid technologies and hybrid energy storage systems, including batteries, supercapacitors and hydrogen. Also the technical leader and project manager of the European Interreg SUDOE “IMPROVEMENT” project, which developed integrated microgrid solutions to enhance energy efficiency in public buildings, combining thermal, cooling and electrical networks.

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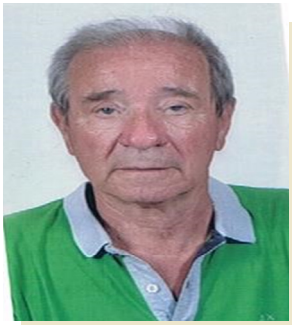
Biobased specialty chemicals for the mineral industry

Minerals play a fundamental role in modern society, providing essential raw materials for infrastructure, technology, and everyday products. From the metals in our smartphones to the minerals used in renewable energy systems, nearly every aspect of modern life depends on these resources.

However, this necessity comes with a dilemma—while the minerals support economic development and technological progress, this also needs to be balanced with society's increased environmental concern and new legislations that turn these concerns into actions. Balancing the need for these resources with sustainable practices is crucial to minimizing harm while ensuring a steady supply of critical materials for the future. The chemicals used in the processing of minerals are one aspect of this industry that makes this dilemma evident. This work focusses on the replacement of fossil-based specialty chemicals commonly used by bio-based specialty chemicals. Our most recent efforts tackle the development of alternative chemicals for the replacement of polyacrylates, which are widely used fossil-based dispersants. More than a dozen samples have been tested, these bio-based alternatives were derived from a variety of sources, such as, CMC-Based (Carboxymethyl Cellulose) dispersants. Standard industry trials were conducted, which include dispersant demand curves and slurry stability tests. Most of the samples failed the initial trials, but the alternatives that showed promising results were submitted to another set of standard trials from the Pulp and Paper industry, our intended final customer for these bio-based mineral slurry alternatives. The results of the two set of trials showed that there are viable bio-based dispersant alternatives to fossil-based polyacrylates. Further work will continue to have these minerals slurries as a standard commercial product.

Biography

Louise McCulloch studied Chemistry at the University of St Andrews, Scotland and graduated as MChem in 2012. She then spent 8 years at Croda, in both England and the Netherlands, where she worked on surfactants for applications ranging from personal care to automotive catalysts. In 2020 she joined the Grinding & Dispersion team at Omya in Switzerland, where she was responsible for dry grinding, before being promoted to team leader in 2024.



Luigi Antonio Pezone
Santa Maria Capua Vetere, Italy

Global cooling is not a cost but the best economic investment of the world's people

Energy development has produced global warming of the planet because the energies produced by humans nuclear, fossil, renewable are not integrated with the natural energy system of the earth, which does not like thermal energy, nor the transport of electrical energy in the terrestrial environment that interferes with the natural electrostatic exchange between the earth's surface and the ionosphere, which through the quantity and intensity of lightning regulates the earth's climate. The study of the best way to neutralize the damage caused by fossil energy, has led the undersigned to understand, that clean electrical energy can be extracted directly from the environment. However, fossil energy cannot be completely eliminated because we also need to produce steel and cast iron that require temperatures of up to 3000 degrees. All the rest of the terrestrial energy can be produced with hydroelectric energy without the hydraulic jump. Which is the only energy that has not been produced on planet Earth. But it is also the only one that does not alter the temperature of the terrestrial environment, both in submerged and compressed version. The first is mainly used to create artificial welling by putting a pump and a turbine in series, which working in series in the direction of the gravitational force would allow to solve the problem of world hunger by extracting carbonates from the ocean floor with the Venturi system and bringing them to the surface in areas far from tsunami dangers (in fact, the current natural welling, which produces fish, occurs only in coastal areas that represent 5% of the ocean surface). While compressed hydroelectricity allows to create fixed and mobile anthropogenic plants, with purifying functions due to the solubilization of air in water, and energy functions due to the exploitation of the static pressure of the air. Therefore, this energy allows to create a sustainable development model, alternative to the current one, reducing the current high nuclear, fossil and renewable energy costs, also eliminating the costs for energy transport. The current state of the art technologies are already sufficient to stop global warming by better distributing only the world's waters that represent the energy vector that produces cold electrical energy with complete recycling that comes out of the plants only when it needs to be used for agriculture, industry and urban uses. Water, which is the ideal energy vector, not only to transmit force, but also natural electromagnetism through natural ionization in H^+ and OH^- ions that we normally use in all organic and inorganic chemical and biological processes of all types. Even chlorophyll photosynthesis uses this energy and without realizing it also in the human and animal body. For this reason. The undersigned has also patented the artificial heart oxygenator of the human blood energetically autonomous. By keeping water in the liquid state and air in the gaseous state in the compressed energy circuit, with a simple heat pump system, humans

could even live in a tent because the energy extracted from the environment costs nothing, since atmospheric air and gravitational force are the energy source, while water is the energy vector and also costs nothing. As I have written in all my articles, on planet Earth, thermodynamics and then nuclear energy were preferred to fluid dynamics to become increasingly more powerful in relation to neighboring countries, without taking into account that nature uses heat only in the nuclei of stars and planets, where biological and animal life do not exist. Where there is life, there is water, air, fluid dynamics and natural electromagnetism, which is perfectly compatible with that produced coldly with electric turbo fans that produce Newton's thrust and in the external walls incorporate induced circuits with circulation of permanent magnets that could simultaneously produce Lorenz's thrust at Earth's temperature to move in the atmosphere and space in any direction, something that is not allowed with temperatures produced with thermal and nuclear energies that would melt the electric coils and permanent magnets in a few seconds.

Biography

Luigi Antonio Pezone is an industrial expert who worked from 1970 to 1986 in the production plants of the automotive industry that are the most technologically updated and as a scientific organization of the Work. From 1987 to 2006, worked as a manager of purification plants and water lifting and distribution in Italy and Tunisia. From 2006 to date, Antonio Pezone has been working as an inventor and has filed forty patents. Of which six are international. He has published about 130 technical and scientific articles on the website Https://www.spawhe.eu which he has partially shared with the following magazines Linkedin, Academia edu, Substak, Medium and many publishers, as can be verified by doing a search on Google and other more common networks.

Kudzai Mutisi, Mabatho Moreroa*

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Co-digestion of abattoir effluent and rumen content for waste management and biogas production–A case study

This study examined the feasibility of utilizing two primary waste types from a local abattoir for waste management and subsequent biogas production. In the study, Wastewater (WW) and Rumen Content (RC) found at a red meat abattoir were used as substrates during Anaerobic Digestion (AD). An Automated Methane Potential Test System (AMPTS III) was employed to digest the substrates at different doses at 35°C. The raw wastewater exhibited a Chemical Oxygen Demand (COD) of 74 g/l, indicating excessively high levels. Following anaerobic digestion, the maximum COD removal was observed at a ratio of 70:30 (RC:WW), achieving a removal rate of 70.3%, which resulted in a COD of 19.3 g/l. The production of biogas was attributed to high RC loadings, wherein a cumulative biogas production of 1791 Nml was produced over 24 days, while biomethane and carbon dioxide were produced at 491.1 and 1299.9 Nml over the same period. The study indicated that the inclusion of RC reduced the rate of pH decline in the digester, suggesting its viability as a material for anaerobic digestion. Typically, anaerobic digestion of raw abattoir wastewater yields biomethane with a purity of up to 96.96%, whilst pure RC yields high amounts of carbon dioxide.

Biography

Dr. Moreroa acquired both a Master's and a Bachelor's degree in Chemical Engineering from the University of Johannesburg. In her Ph.D she studied the biodegradation of Fischer-Trosch effluents. In her research, Dr. Moreroa has published scholarly articles on acid mine drainage, Fischer-Tropsch effluent treatment, kinetic models, and slaughterhouse waste treatment. Dr. Moreroa is a registered candidate technologist with the Engineering Council of South Africa (ECSA). She is presently a researcher at the University of South Africa's Institute for Catalysis and Energy Solutions (ICES), where her research is based on clean energy production from biomass and carbon capture.

Prof. M. H. Fulekar

Senior Professor and Former Dean and Director, School of Environment and Sustainable Development, Central University of Gujarat, Gandhinagar, Gujarat

At present: Senior Professor and Director, Research and Development Cell, Parul University, Vadodara, Gujarat

Biodiesel production from microalgal biomass using bio-nano based approaches

The research presented-investigate microalgal biomass as a potential feedstock for biodiesel production with a particular focus on improving the process steps by using bio-nano based approaches. Total of 10 isolated microalgal strains were screened for the biodiesel potentiality. The lipid content, biomass and lipid productivity, fatty acid profiling and biodiesel quality parameters were the key criteria for screening the potential microalgal strains for biodiesel production. Among the tested strains, Chlorella vulgaris KY435609, Acutodesmus obliquus KY741858, Scenedesmus armatus KY436508 was identified as the most potential strains for biodiesel production and therefore, cultivation of microalgae was carried out in photobioreactor. The biodiesel produced from screened microalgal (A. obliquus, C. vulgaris and S. armatus) strains under the optimum conditions, displayed maximum conversion of methyl ester 98.3%, 97.5% and 97.2% respectively. Fuel properties of microalgae biodiesel obtained in this work were in good agreement with ASTM-6751, EN 1424 and Indian IS-15607 biodiesel standards.

Biodiesel production from microalgae involves: 1) Identification and characterisation of microalgal strains, 2) Screening of lipid-profiling of microalgal strains to assess its potential use for biodiesel production, 3) Cultivation of microalgal strains in photobioreactors, 4) Harvesting of microalgal strains using nanotechnological approaches, 5) Biodiesel production using transesterification process, 6) Qualitative and quantitative analysis of the biodiesel produced-from microalgae. The utilization of natural resources- microalgae for biodiesel production presented in this work would contribute in renewable energy generation solving the energy crises and fulfilling the energy demand if the technology is transferred from pilot scale to industrial production.

Keywords: Biodiesel, Microalgae, Bio-Nano Based Approaches, Egg Shell-Nano Material.

Biography

Madhusudan Hiraman Fulekar, M.Sc. (Chemistry), MPhil. & Ph.D (Environment Science), LLB, MBA (HRD), D.Sc. (Life Science) submitted. He is a Environmentalist and he has worked as a faculty–Delhi Technological University, Delhi and University Department of Chemical Technology, Mumbai. He was also a Professor & Head, Life Sciences (Environmental Biotechnology), University of Mumbai-2002 to 2011 and as Senior Professor & Dean, School of Environment and Sustainable Development, Central University of Gujarat (2011-2019) & Director Central University of Gujarat. He was also Vice-Chancellor (I/C), Central University of Gujarat, Gandhinagar. At present Prof. M. H. Fulekar is working as Senior Professor cum Joint Director (R&D), Center of Research for Development, Parul University, Gujarat, India.

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Studies towards at the synthesis of (+)-adenophorine

Iminosugars are frequently synthesized from carbohydrates as chiral pool starting materials with use of an amination–intermolecular cyclization sequence or an intramolecular reductive amination cyclization anas the key step.

The asymmetric total synthesis of (+)-adenophorine a rare example of a naturally occurring iminosugar bearing a lipophilic substituent at the anomeric position. The absolute configuration of this (+)-iminosugar, isolated from Adenophora spp. by Ikeda and co-workers in 2000, was determined three years later by optical rotation measurements performed on the (–) enantiomer synthesized by Davis et ali.

In our strategy, the configuration of each stereogenic center has to be controlled during the building steps. We wish to construct applying key reactions as reductive amination and organocatalytic reaction.

Biography

Dr. Maria Candeia Kuliakita Sakukuma studied Chemistry at the Higher Institute of Education Sciences, Department of Exact Sciences, 230, Isced-Huíla, Lubango, Angola and graduated. She then joined the research group of Prof. Maurício Victor at Chemistry Institute, Federal University of Bahia, UFBA, in 2014, when received her MS and PhD degree in 2017 at the same institution. After one year postdoctoral fellowship supervised by Dr. Steve Davies working about in Synthetic Methodolgy with Lithium Amide Conjugate Addition and Total Synthesis at the University of Oxford, UK she obtained the position of an Auxiliar Professor where work actually.

Marina Ratova[1*], James Redfern[2], Matthieu Grao[1], Andrew Dean[2] and Peter J. Kelly[1]

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Visible light-active bismuth oxide-based photocatalytic coatings and their potential against biological contaminants

Rapid development of semiconductor photocatalysis over the past few decades resulted in realisation of growing potential of this technique for environmental remediation processes. Indeed, various types of photocatalytic materials are being successfully implemented in construction industry, healthcare settings, water treatment and energy production facilities recently. However, there is also a growing need in development and exploitation of novel photocatalytic materials, as the most widely used one, titanium dioxide, is often not applicable for high throughput processes due to low quantum efficiency and lack of visible light activity.

Bismuth oxide and complex oxides have attracted a considerable amount of researchers' attention over the past few years. With bang gap values ranging from 2.3 to 2.8 eV these materials are typically visible-light active and therefore represent promising candidates for development of efficient solar-responsive photocatalysts. Various types of bismuth complex oxide-based photocatalysts have been reported of being efficient for water purification, green hydrogen production, VOC abatement and microbial inactivation processes.

The present study is focused on bismuth oxide photocatalytic coatings, deposited by magnetron sputtering – physical vapour deposition technique of industrial significance. The bismuth oxide coatings have been deposited, optimised and thoroughly analysed against a variety of environmentally relevant applications, including bacteria/viruses/algae inactivation, water treatment, etc. The combination of high antimicrobial activity under visible light irradiation with non-specific antimicrobial action makes bismuth oxide photocatalyst a promising candidate for application in real-world water treatment systems.

Biography

Dr. Ratova joined the the research group of Prof. Kelly at Manchester Metropolitan University in 2010, where she worked on development testing of photocatalytic coatings. She received her PhD degree in 2013. Upon PhD completion, she spent a year working at Queen's University Belfast as a Research Fellow. In 2014 Dr Ratova returned to MMU, where she is leading the theme of development, testing and implementation of novel photocatalytic materials for environmental remediation. Dr Ratova has published over 50 papers in high-impact peer-reviewed journals.

BSc. Mauricio Orantes Montes[1*], Ignacio Monje-Ramírez[1], María Teresa Orta-Ledesma[1], Isaura Yáñez-Noguez[1], Sharon Belinda Velázquez-Orta[2]

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Intensified microalgal biomass production in HRAP using nutrient-rich wastewater

The dual use of microalgae for phytoremediation and biomass production for sustainable biofuel generation presented a promising alternative. High-rate algae ponds (HRAP) have been removing nutrients for decades, but their full potential in wastewater treatment is not yet exploited. Typically, only inputs such as CO_2 as a carbon source and to control pH, air to remove oxygen and make-up water are added. Meanwhile, the global rise in liquid, gaseous, and solid waste generation posed significant environmental challenges with serious implications for climate change. Converting this waste into bioenergy and valuable bioproducts through recycling or recovery emerged as a viable solution. In this context, integrating wastewater bioremediation with biofuel production from microalgal biomass enabled the transformation of waste into renewable energy sources. This study shows that using waste streams to grow microalgae can improve the cost, sustainability and efficiency of microalgae biofuel systems. The waste streams involved in this process included bovine-origin digestate, OFMSW (Organic Fraction of Municipal Solid Waste) digestate, and human urine. All these mixtures contained wastewater from the university's treatment plant and water from the Xochimilco canals in Mexico City. This strategy aimed to enhance microalgal biomass production. We evaluated the integration of wastewater and waste stream treatment using a microalgal consortium (Desmodesmus sp., Scenedesmus obliquus), which resulted in intensified microalgal biomass production (1.2-1.5 gTSS/L).

Building upon these results, the study focused on exploring alternatives to further increase the production of microalgal biomass and biocompound (carbohydrates, lipids, proteins). The intensification strategies included the liquid fraction from the anaerobic digestion of cow manure and OFMSW, along with human urine. This approach was tested in a 30-liter high-rate microalgae pilot reactor.

Biography

Mauricio Orantes Montes graduated in 2020 with a degree in Industrial Chemical Engineering from the Instituto Politécnico Nacional (IPN) in Mexico City and completed a one-year stay at the Universidad Politécnica de Madrid, Spain. His work focuses on water management and the development of microalgae-based technologies for wastewater treatment. Mauricio have an experience in laboratory quality management and polymers, contributing to sustainability and resource efficiency projects. Also, worked with the National Water Commission (CONAGUA) in Mexico, co-authoring two articles on watershed management in the Valley of Mexico. Currently pursuing a Master's in Environmental Engineering at UNAM's Institute of Engineering.

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Development of a process for producing zirconium rich alkali-resistant glasses containing heavy metals present in fly ashes from municipal solids waste incineration

The objective of this study is to develop a process for producing alkali-resistant zirconiumcontaining glasses for use as a heavy metal retention matrix contained in fly ashes. For this, we have developed 5 glass compositions: Two alkali-resistant model glasses type CEMFIL, V_1 (with zirconium and without heavy metals) and V_2 (with zirconium and heavy metals), then three glasses of fly ashes V_3 (without zirconium and with heavy metals), V_4 (with 30% of V_3, zirconium and heavy metals) and V_5 (with 60% of V_3, zirconium and heavy metals). V_4 and V_5 are obtained using V_3 as raw material and supplementing with SiO_2, ZrO_2 and Na_2O to give them alkali-resistant properties. Differential thermal analysis show a glass transition temperature Tg of 656°C for V_1, 616°C for V_2, 615°C for V_3, 641°C for V_4 and 664°C for V_5. Extremely small peaks of alumina can be observed on the V_1, V_2 and V_3 glasses and peaks of ZrO_2 only on the V_5 glass. Surface analysis of glasses show that they are essentially homogeneous although we note the presence of some heterogeneities: V_1 and V_2 contain small crystals of ZrO_2, V_3 has a slight crystallization of Fe chromite spinel (CrO_4) and V_5 contains large crystals rich in zirconium. This study has shown that all glasses are totally amorphous. Also, alkali-resistant fly ashes glasses V_4 and V_5 are the most resistant to leaching and the least attacked in alkaline medium than CEMFIL type glasses V_1, V_2 and V_3.

Biography

Mrs Mbemba Kiélé Molingo received the PhD degree from the University of Paris-Est (France) in Chemistry specializing in "Geomaterials and Environment" in 2010. And was recruited as a Permanent Teacher in Marien NGOUABI University in Congo at 2012, then assigned to the Faculty of Science and Technology, in the chemistry track. As soon as she took up her post, joined the Plant and Life Chemistry Unit as a home structure for her participation in training and her research development. In 2020, registered with CAMES and was confirmed on the Assistant Professor aptitude list of Marien NGOUABI University. She has published more than 70 research articles in SCI (E) journals.)

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Microwave transformation of high-density polyethylene to hydrogen: The role of cofealox catalyst

High-Density Polyethylene (HDPE) represents a persistent environmental burden due to its exceptional durability. Catalytic decomposition offers a transformative pathway to valorize this waste into valuable energy products. However, the challenge of selective bond cleavage in polymers necessitates tailored catalytic approaches that specifically target C-C and C-H bonds to produce hydrogen and methane as primary outputs. A detailed study was conducted on the microwave catalytic decomposition of high-density polyethylene in an inert argon atmosphere. Three variants of CoFeAlOx catalysts were prepared for the study by sol-gel method with different stoichiometric molar ratios of metals (0:1:2; 0.1:1:2; 0.5:1:2 and 1:1:2 Co:Fe:Al), where FeAlOx served as the support matrix. The FeAlOx matrix provided efficient microwave energy transfer and basic catalytic activity. Cobalt was added to enhance the selectivity of the catalytic decomposition of the polymer chain. This enhanced selectivity led to the efficient conversion of HDPE to a mixture of hydrogen-enriched gases and light hydrocarbons, liquid hydrocarbon fractions, and a solid carbonaceous residue.

The experiments were carried out in a specially-designed microwave reactor equipped with a dual magnetron with a maximum power of 1800 W, which provides a perfectly homogeneous microwave field without the formation of localized hot spots. The temperature regime was meticulously maintained at precisely defined temperatures of 300, 400 and 500°C with precise control by an infrared thermocouple that continuously monitored the temperature and adjusted the magnetron power according to a pre-set temperature program, thus ensuring high process reproducibility. The CoFeAlOx catalyst played a pivotal role in the process due to its distinctive properties, functioning as both an effective microwave energy absorber and a selective decomposition catalyst.

The primary benefit of the method employed is the integration of rapid and effective heating directed at the catalytic centres, accompanied by a reduction in the overall energy consumption of the process. The study yielded novel insights into the mechanisms of microwave-assisted catalytic degradation of polymers, with particular emphasis on the influence of the catalyst composition (especially the Co/Fe ratio) on the selectivity of the overall process. The results obtained represent a significant contribution to the development of advanced methods for the valorisation of waste polymers into valuable chemical feedstocks and alternative fuels, where the synergistic effect of microwave heating and the catalytic properties of the CoFeAlOx material

play a key role. Consequently, the research under discussion opens up new perspectives for the efficient recycling of plastics, with the possibility of producing energetically valuable materials at relatively low temperature requirements.

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Biography

Dr. Michal Vaštyl graduated of Bachelor (2013), Master (2015) and PhD (2018) studies at VSB-TUO in the fields of waste treatment and environmental protection. Since 2018, has been working as a researcher in the Laboratory of Preparation of Nanostructured Materials at IET/VSB-TUO and since 2023 moreover as an academic. Mainly focuses on microwave assisted polymer decomposition, catalyst preparation and VOC adsorption. Dr. Michal has completed postdoctoral fellowships in Peru (2019, conventional pyrolysis) and Canada (2021-2022, microwave pyrolysis of polymers). His research activity includes 7 publications with a total of 42 citations on WoS.

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Eco-friendly synthesized SnO_2@Cu(O,S) nanocomposite catalysts for (Photo-) catalytic removal of selected chemical pollutants

The application of green technology in synthesizing single-phase, heterostructure, and composite heterogeneous catalyst nanomaterials addresses critical environmental challenges while improving synthesis precision, operational efficiency, and cost-effectiveness. In this study, a novel approach was developed using ginger (*Zingiber officinale*) extract as an efficient nucleating agent to precipitate SnO_2, Cu(O,S), and their composites at varying SnO_2 weight percentages. The resulting catalysts were systematically characterized to examine their pure and composite properties. Notably, the presence of larger SnO_2 nanoparticles interspersed among smaller Cu(O,S) nanoparticles enhanced electron delocalization across interfaces due to surface charge disparities, enabling complete Cr(VI) reduction within 16 minutes under dark conditions. Further exposure to broad-spectrum visible light source stimulated electron-hole pair generations, driving the oxidation and reduction of persulfate ions and H_2O to produce sulfate and hydroxyl radicals. Consequently, the photodegradation of methylene blue and tetracycline was achieved within 90 minutes. Overall, the resulting catalyst nanomaterials show great potential in overcoming current limitations, such as reliance on hazardous chemicals, inefficient catalyst preparation methods, and challenges in removing both heavy metal and organic pollutants.

Biography

Dr. Zeleke studied Physical Chemistry at Bahir Dar University, Ethiopia, and graduated with an MSc in 2013. He then joined the research group of Professor Dong-Hau Kuo at the National Taiwan University of Science and Technology, Taiwan in 2016 and received his PhD degree in Materials Science and Engineering in 2019. Currently, he is working as a postdoctoral researcher under the supervision of Professor Witold Kwapinski, University of Limerick, Ireland, and Professor Urška Lavrenčič Štangar, University of Ljubljana, Slovenia under the DOROTHY MSCA COFUND programme, funded by the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 101034345, Research Ireland, Health Research Board (HRB), and Environmental Protection Agency (EPA)-Ireland.

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New sorbents based on natural mineral raw materials of Kazakhstan for aftertreatment of industrial wastewater from heavy metal ions

When purifying water from heavy metal ions, as the most dangerous component of wastewater, the practical task is to select new, cheaper and widespread materials characterized by sufficiently high mechanical strength, chemical resistance and at the same time having a more developed specific surface area and greater porosity. An essential indicator of the quality of filter materials is their resistance to acidic and alkaline environments.

Regional natural materials such as zeolite, diatomite, and vermiculite optimally combine economic profitability and efficient treatment, and are rational for extracting heavy metals from wastewater from metallurgical enterprises. In order to establish the possibilities of using Kazakhstani mineral raw materials for wastewater treatment, the adsorption properties of zeolite, diatomite, and vermiculite rocks for a wide range of heavy metal ions have been studied. Studies have been conducted on the extraction of heavy metals on granular filters with zeolite and diatomite loading, with a mineral content of 90-95%, fractions of 0.5-1.0 mm at a temperature of 3000C - 4000C, the flow rate of the filtered solution is 2.0 m/h. In this case, almost complete extraction of large cations of Pb2+, Fe2+, Ni2+, Mn2+, and Zn2+ is observed. At the end of the experiment, regeneration with a NaCl solution is carried out to restore the sorption capacity of the filters. After desorption, the extraction of iron, cobalt, and nickel from the solution increases by 10-30%, but the extraction of copper, zinc, and cadmium decreases by 5-30%. Sorption of heavy metals from acidic media has been investigated.

The above-mentioned sorbents and their modified forms can be used for selective or group extraction and concentration of metal ions. The kinetic patterns of the cleaning process are investigated to establish the optimal cleaning regime.

The proposed methods of sorbent modification provide the basis for studying the structure, porosity, and sorption capabilities of these natural materials. All three minerals belong to highly porous, structured materials promising for use as stable sorption systems in water treatment and water treatment.

Zeolite has a significant and similar sorption capacity not only for ions of particularly toxic (Hg2+, Cd2+, Pb2+), but also other heavy metals (Cu2+, Co2+, Ni2+, Zn2+, Ba2+, Sr2+) present in natural and wastewater in different quantities [1]. A special role is played by the significant sorption capacity of the studied clinoptilolite samples for lead ion, which makes it possible to use them for wastewater treatment and soil detoxification in the adjacent territories of metallurgical enterprises [2-4].

Diatomite, which is untreated thermally and has high adsorption rates and low permeability values, can be used as an adsorbent for fine wastewater treatment in a stationary mode. The advantage of using diatomite for fine wastewater treatment from metals is the possibility of restoring its adsorption properties after calcination at 300-4000C. Diatomite used for fine wastewater treatment from heavy metal cations can be regenerated or disposed of. Calcined diatomite, which has a relatively high permeability with a sufficiently low adsorption value, can also be used as a filtration material for coarse water purification [5]. It is possible to use diatomite in the form of granules of fractions 0,5-1,0, 0,8-2,0; 1,0-4,0, 2,5-5,0 mm.

The studied zeolite, diatomite, and vermiculite rocks (with an ion-exchange mineral content of up to 95%) are promising for use in wastewater treatment from heavy metal ions. Extraction methods are superior to sorption methods in terms of the efficiency of removing Cu2+, Zn2+, and Fe3+. Therefore, in addition to sorption extraction, a combination of sorption and extraction methods for extracting heavy metals at the post-treatment stage seems to be effective. To extract and concentrate metals, it is proposed to use sorbents of various structures and their modified forms through preliminary thermochemical treatment.

Thus, during water purification and water treatment, the possibility of using natural mineral raw materials (zeolites, diatomites, and their modified forms), whose reserves are sufficient in various regions of Kazakhstan, is shown.

Biography:

Doctor of Chemical Sciences, Professor Saule Kerchaizovna Myrzalieva graduated from the Kazakh State University with a degree in chemistry in 1976. In 1984, she defended her dissertation for the degree of Candidate of Chemical Sciences, and in 2010, Doctor of Chemical Sciences. In 2012, he was awarded the title of professor. Since 2019, he has been working as the head of the Scientific Staff Training Department at the RSE "National Center for Integrated Processing of Mineral Raw Materials of the Republic of Kazakhstan". Under the guidance of Myrzalieva S.K., 3 candidate's and 15 master's theses were defended. The main research areas are issues of chemical technology of inorganic substances, wastewater treatment from oil and refined products, wastewater treatment of industrial enterprises from various pollutants.

Dr Nayana Brahmbhatt

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Algal biomass in agriculture: A green solution for soil enhancement and crop improvement

The increasing demand for sustainable agricultural practices has led to the exploration of alternative resources that can enhance soil fertility and improve crop productivity. Algal biomass, a renewable and environmentally friendly resource, has emerged as a promising solution in this regard. This paper examines the potential of algal biomass in agriculture, focusing on its role in soil enhancement and crop improvement. Algae, particularly macroalgae, are rich in essential nutrients, growth hormones, and bioactive compounds that can positively impact soil health, increase nutrient availability, and promote plant growth. Additionally, algal biomass can be utilized as a natural fertilizer, reducing dependency on chemical fertilizers, which are often associated with environmental degradation and health risks.

The study discusses various methods of integrating algal biomass into agricultural systems, including its use as a soil amendment, biofertilizer, and biostimulant. It also highlights the benefits of algae-based products, such as improved soil structure, enhanced water retention, and increased microbial activity in the soil. Furthermore, the paper explores the potential of algae in mitigating soil degradation and promoting sustainable farming practices. By presenting case studies and current research, this paper aims to provide a comprehensive understanding of the applications of algal biomass in agriculture and its potential to contribute to a more sustainable and eco-friendly agricultural future.

The integration of algal biomass into agriculture presents an innovative approach to addressing the challenges of food security, environmental sustainability, and climate change. This work advocates for further research and development to maximize the benefits of algal biomass and promote its widespread adoption in agricultural systems worldwide.

Biography

Dr. Nayana Brahmbhatt studied Botany at the South Gujarat University, in 1989. She joined M.Sc at the Gujarat University, B.Ed at the North Gujarat University , M.Phil at the Gujarat University, She received her Ph.D degree at the Sardar Patel University. Last 33 years she is working as a Professor at Vitthalbhai Patel & Rajratna P. T. Patel Science College, Sardar Patel University, Anand, Gujarat, India. She has published more than 60 research articles in different Journals. She Achieved two international Award in research field. One for Excellent in research and Best presentation. She conducted two major research project.

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Memory characteristics and crystallography of reversibility in shape memory alloys

Shape memory alloys take place in a class of advanced smart materials by exhibiting a peculiar property, called shape memory effect in the β-phase region with chemical composition. This phenomenon 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 is plastic deformation, due to the soft character of material in low temperature condition, with which strain energy is stored and releases on heating by recovering the original shape. 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 into nearest atom distances, and martensitic transformations have diffusionless character.

These alloys exhibit another property called superelasticity, which 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.

Copper based alloys exhibit this property in metastable β-phase region, which has bcc-based structures. Lattice twinning is 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 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice.

In the present contribution, x-ray diffraction and 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

Biography

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD-degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has been retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last six years (2014-2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Also, he joined over 180 online conferences in the same way in pandemic period of 2020-2023. He supervised 5 PhD-theses and 3 M. Sc-theses. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

Orchidea Maria Lecian

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The multidimensional topological shift of the KRASG12D proteins in catalytic environments and pertinent drugs-targetting

The properties of the KRASG12D proteins are analyzed; the behaviour in catalytic environment is recalled. The proposed Markov Models are reviewed after [F. Liang, Z. Kang, X. Sun, J. Chen, X. Duan, H. He, J. Cheng, Inhibition mechanism of MRTX1133 on KRASG12D: a molecular dynamics simulation and Markov state model study, Journal of Computer-Aided Molecular Design 37, 157 (2023).], from where the advisement for drugs-targetting are scrutinized. The new analytical formulation of the multi-dimensional topological shift of the KRASG12D proteins in catalytic environments is presented; it is proven to fulfill a multidimensional Markov chain, after the application of the Borovkov First-Passage-Times method. Accordingly, the time evolution of the eigenvalues, the errors and the time evolution of the errors is newly analytically written. The modern trends in genomics and in epigenomics and of the drugs-targetting are newly summoned. The numerical simulations to analyse the effects of the drug MRTX1133 on KRASG12D protein are here newly studied. The behaviour of KRASG12D protein catalytic environments is newly reappraised.

The experimental data are newly proven to be consistent with a description of a multidimensional Markov Chain. The close-ness of the newly-found multidimensional chain to that from which the one-dimensional Markov-State-Models of liang et al. Is issued in the Galerking representation is studied; the errors are analytically written. More in detail, the experimental data are demonstrated to exhibit a modification of the mean-first passage time from the first state of the possible one-dimensional models, from which the two-states Markov models are compared within the multidimensional framework. The calculations are performed in the Galerkin representation, is it is straightforward proven that the committors become orthogonal for the considered states: the time evolution of the eigenvalues and those of the errors are thus calculated form Laplace kernel with Radon measure.
The possibility of memory processes in the modifications of the mean-first passage times is excluded.
The analysis is aimed at outlining the characteristics of the First-Passage-Times, which dramatically determine the Markov-chain models of such proteins such as the KRAS as far as the definition of the hidden-Markov models are concerned, i.e. such as pharmaceutical applications.
In the work of Liang et al., the KRAS12G protien is found to be found into different conformational

states, which are numerically analysed to be apt to define 12 different Markov States models.\\ In the work Lu et al. [S. Lu, H. Jang, R. Nussinov, J Zhang, The structural basis of oncogenic mutations G12, G13 and Q61 in small GTPase K-Ras4B, Sci. Rep. 6(1):1-15 (2016).], only one inactive states was considered in the exposition. More in particular, only one inactive state was take into account as far as the description of the catalytic domain in aqueous solutions considered within the framework of KRAS4B mutations.

Biography

Prof. Orchidea Maria Lecian graduated in Theoretical Physics at Sapienza University of Rome and ICRA in 2005 and completed her Phd at Sapienza University and ICRA. She was post-doctoral Fellow at IHES (Bures-sur-Yvette, France), MPI (Potsdam-Golm, Germany) and Sapienza University of Rome. She took part in intensive research prorammes at MPI (Potsdam-Golm, Germany) and The Fields Institute for Research in Mathematical Sciences (Toronto, Canada) and IHES (Bures-sur-Yvette, France). She has been researcher for SAIA- NS'P (The National Scholarship Programme of the Slovak Republic- National

Stipendium Program) as Research grantee and Erasmus Lecturer at Comenius University in Bratislava (Bratislava, Slovakia), Faculty of Mathematics, Physics and Informatics, Department of Theoretical Physics and Physics Education- KTFDF in 2017-2018. She was Visiting Professor at Kursk State University, Faculty of Algebra, Geometry and Didactics of Mathematics Theory (Kursk, Russia) within the Programme Education in Russia for Foreign Nationals of the Ministry of Science and Higher Education of the Russian Federation in 2022-2023.

She was Assistant Professor at Sapienza University of Rome and has been Professor at Sapienza University of Rome, she is member of several Research Consortia. She is author of research papers, conference papers, review papers, invited papers, five books and one book-chapter. She has been in editorial positions of several international Journals.

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Bio-based polyol synthesis from vegetable oils for polyurethane materials in footwear applications

As is well known, polyurethane is a polymer typically derived from non-renewable fossil-based sources, resulting in materials with a high environmental impact. PU is formed by the reaction between a polyol and an isocyanate, and its final properties—such as flexibility, hardness, or thermal resistance—can vary significantly depending on the additives and formulation components used during synthesis. In this context, the main objective of this work is to develop new technologies for the production of bio-based raw materials for polyurethane manufacturing. In particular, it addresses the synthesis of polyols from different vegetable oils.

Bio-polyols have been successfully synthesized through the epoxidation of the carbon-carbon double bonds naturally present in the structure of vegetable oils, followed by epoxide ring-opening reaction. These processes achieved good yields using soybean, linseed, rapeseed, and castor oils. To evaluate the properties of the new polyols and assess their potential forflexible foams applications, the viscosity of the polyols, and their OH index has been determined. Finally, a methodology to obtain flexible foams using different proportions of bio-polyols derived from soybean oil and castor oil was developed and optimized. These new foams show potential for the manufacture of insoles in the footwear industry.

In conclusion, the synthesis of bio-polyols from vegetable oils has been successfully developed and optimized. Furthermore, flexible polyurethane foams have been produced from these polyols for applications in the footwear industry. Thus, the work developed in this project paves the way for the use of new, more sustainable and less polluting formulations in important industries such as footwear, also leading to the implementation of circular economy systems in the sector.

Biography

Dr. Tovillas studied Chemistry at the University of La Rioja (Spain), completing his undergraduate studies in 2016. Subsequently, after finishing a Master's in Chemistry and Biotechnology, joined the Biological Chemistry research group at the University of La Rioja, where he completed his Ph.D. in 2021. Finally, in 2022, he became part of the Sustainability and New Materials team at the Footwear Technology Centre of La Rioja, where Dr. Tovillas currently carries out technical and research functions in various projects related to material recycling and the development of more sustainable and less polluting materials.

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Crystallization processes in Li, M, K | | Cl (M=Nd, Pr) systems: Digital twins of phase diagrams, cross-validation of horizontal and vertical material balances, DTA spectrum simulation

In many cases the chloride ternary systems are used as the catalytic materials. The publication of the graphics for the Phase Diagrams (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. The manual «Development of Technical Specifications for Prototyping Disassemblable T-x-y Diagrams (EXCEL+AutoCAD Technology) of Maria Parfenova et al (Buryat State University, Ulan-Ude, Russia, 2021) may be very useful for this purpose. Two variants (A. Prince and M. Parfenova) of disassemblable PD of the ternary systems are using in this technology: To show all phase regions of PD or their compressed variant–a puzzle with a complex element of the known origin. For the second variant 13 phase regions of the eutectic-type diagram have been transformed into a puzzle of 4 typical phase regions (L+i and L+i+j-with melt, i and i+j–without melt), a unique 3-phase subsolidus region and a complex element with the rest 8 regions. Next opportunity to understand the whole family of this eutectic-type diagram is to show its variants with different degree of the phase regions degeneration (a merging with the edges and side planes of the PD' trigonal prism).

A 3D computer model of an isobaric LiCl-$PrCl_3$-KCl PD with 2 compounds (K_2PrCl_5–incongruently melting and K_3PrCl_6–congruently melting and decomposing above the ternary eutectics) was constructed, the quality of which was estimated by comparison with experimentally obtained isoplethic and isothermal sections, as well as with 33 DTA spectra. The model was corrected accounting for the mutual solubility of lithium and potassium chlorides. 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 was carried out.

For a similar LiCl-$NdCl_3$-KCl PD there were elaborated 2 variants of the 3D computer models: with and without 2 binary compounds: $LiNd_2Cl_7$ and KNd_2Cl_7 incongruently melting and decomposing above the ternary eutectics.

Along with an expansion of the opportunities of computer design, it is pertinent that 3D models of PD (both for real systems and their prototypes) are helpful to recognize the graphic errors in erroneous interpretation of experimental and computational (thermodynamic or ab initio) data.

E.g., within T-x-y diagram with 3-phase equilibrium comprising as few as six phase regions, two binary eutectic points are erroneously connected by two lines, rather than one. The Ag–Cu–Ni PD, comprising in addition 3 new phase regions, namely L_1+L_2, $L_1+L_2+B(C)$, and B+C), is derived from such a diagram. For this diagram it has been shown (likewise erroneously) the Ag+Cu+Ni three-phase subsolidus region, while the phase reaction scheme forbids its existence.

Biography

Maria Parfenova is a Materials CAD Laboratory engineer and Ph.D. student in IPMS SB RAS. 14th Conference for Young Scientists in Ceramics (CYSC-2021), October 20-23, 2021. Novi Sad, Serbia; 10th International Conference on Materials Science (ICMS2021). November 19-20 2021. Ulaanbaatar, Mongolia; III International Scientific and Practical Conference «Society and Science. Problems and Prospects». January 25-28 2022, London, England; 2022 Sustainable Industrial Processing Submit (SIPS-2022), November 27-December 1. Phuket, Thailand; V International Conference "Modeling of synthesis and destruction of advanced materials" (MSDAM-2022) October 12-14, Minsk, Belarus; 18th International Conference on Catalysis, Chemical Engineering and Technology, June 17-19 2024, Paris.

Rachele N. Carafa*, Daniel A. Foucher, Guerino G. Sacripante

Department of Chemistry and Biology, Toronto Metropolitan University, Toronto, Ontario, Canada

Functionalization of lignin-derived monomers for polyurethane production

Lignin, a waste product in the pulp and paper processing of cellulosic fibers, is comprised of a partial aromatic structure which can also be depolymerized into phenolic by-products as monomer precursors for further functionalization and polymerization. The main objective of our research is to make sustainable materials from these lignin-derived monomers, particularly polyurethanes as they are some of the most prevalent polymers that can be made from biobased materials. This work is divided into 3 research foci: In the first part, a series of high molecular weight polyurethanes and polyesters were synthesized from diols derived from lignin phenolics containing the aldehyde functionality. Additional work involved the preparation of polyester polyols from one of these diols at concentrations of 10 wt% and 25 wt% to be used in polyurethane foams. The two polyols prepared from this diol were shown to have higher acid values and hydroxyl numbers than the control polyols, while the foams prepared from the 10 wt% polyol were found to have similar or lower mechanical properties compared to the control foams. The second part involved a one-step synthesis of organic diols from several lignin phenolics to prepare thermoplastic polyurethanes. The diols were synthesized in moderate to high yields, while the polyurethanes revealed different degrees of rigidity or flexibility depending on the diisocyanate source. The last part utilized lignin-derived bisphenols for the synthesis of polyurethanes and non-isocyanate-based polyurethanes. Two bisphenols were prepared from 4-propylguaiacol and eugenol and converted into diols in one step for polyurethane synthesis or cyclic carbonates in two steps for non-isocyanate polyurethane synthesis.

Biography

Rachele Carafa studied Chemistry with the co-operative distinction at Toronto Metropolitan University (formerly Ryerson University) in 2019 while also earning a double minor in Biology and English. Rachele Carafa remained at the same institution for her M.Sc. in Molecular Science under the supervision of Dr. Daniel Foucher and Dr. Andrew McWilliams with a focus on Inorganic Chemistry, graduating in 2021. She is currently in her final year of Ph.D. studies in Molecular Science, working with Dr. Guerino Sacripante and Dr. Daniel Foucher on biobased polymers, where she is expecting to graduate in 2025.

Rahul Hajare

Sandip University, School of Pharmaceutical Science, India

Careful investigation of some biomolecules that might be successful in preventing SARS-CoV-2/COVID-19 using in-silico analysis: Preliminary research

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 highly qualified. He is a postdoc from ICMR Ministry of Health, New Delhi. It is called the Government of India Post Doc. He worked at the prestigious National AIDS Research Institute in Pune. He is a scholar at the Hindu University of America, Florida. He is a master in distinction. He completed his academic work without taking any help from others. He is a scholar of the Vedanta Institute of Kolkata. He is a student intern at the Institute of Indic Wisdom in Hyderabad. Dr. Rahul Hajare is a student of small group of people. 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.

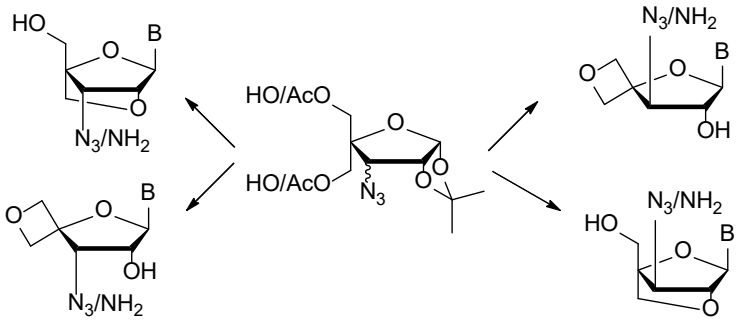
Dr. Rajesh Kumar

Department of Chemistry, R.D.S. College (B.R.A. Bihar University), Muzaffarpur-842002, India

Chemo-enzymatic synthesis of bridged nucleosides

Over two decades, a large number of nucleosides have been synthesized, which demonstrated potent antiviral and antitumour activities and have become cornerstones of treatment for patients with cancer or viral infections. Oligonucleotide-based antisense strategies represent a unique paradigm for the treatment of a wide variety of human diseases. In order to discover new class of nucleoside derivatives with enhanced biological activities, the modifications in the sugar moietiy have been attempted, which provide a remarkable level of control over nucleoside sugar puckering and its biological activity.

Herein, we report; (a) the selective biocatalytic acetylation studies on modified 3′-azido-4′-C-hydroxymethylated sugar derivatives with an aim to develop an efficient and easy method for the synthesis of ribo-azido/amino LNA monomers and xylo-azido/amino spiro-oxetano nucleosides and (b) the selective biocatalytic deacetylation studies on modified 3′-azido-4′-C-acetoxymethylated sugar derivatives with an aim to develop an efficient and easy method for the synthesis of ribo-azido/amino spiro-oxetano nucleosides and xylo-azido/amino LNA monomers.



B = Nucleo Bases (T, U, C & A)

Benefits of my presentation: During presentation, I will explain the use of lipases in academic and industry, apart from this I will also explain novel and greener methodology for the synthesis of modified nucleosides. As I know that nucleosides are valuable component of nucleic acid and it shows different types of activities such as antiviral, anticancer etc.

Biography

Dr. Rajesh Kumar received his Master of Science degree in Chemistry from University of Delhi in 2010 then joined the same department for a Ph.D. and completed his Ph.D in 2017 and during Ph.D, Dr. Kumar visited University of Southern Denmark as a Research Assistant for nine months. After completion of Ph.D, joined as Assistant Professor in Chemistry at B.R.A. Bihar University, India. Has been published more than 45 research papers in reputed national and international journals such as The Journal of Organic Chemistry, Theranostics, Carbohydrate Research, RSC Advances etc. His research interest lies in Nucleic acid chemistry, Biotransformations, Catalysis, Green Chemistry, and heterocyclic chemistry.

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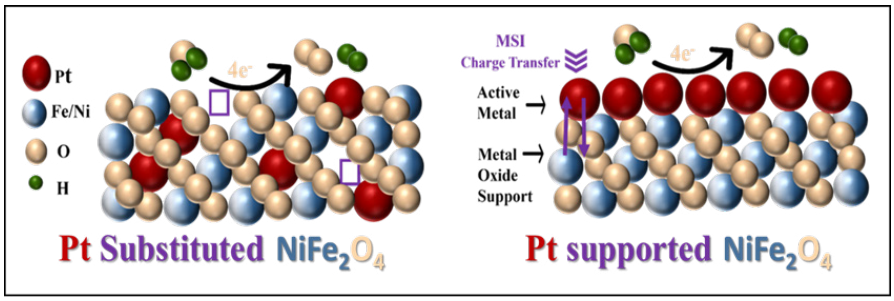
Platinum-incorporated nickel Iron oxide as a high-performance electrocatalyst for the oxygen evolution reaction: Elucidating substitutional and support strategy

Oxygen Evolution Reaction (OER) doesn't directly provide fuel or energy, but it has that much efficiency to facilitate the overall yield of energy conversion, storage, and usage (ECSU) devices [1], [2]. The development of an anodic catalyst (OER) is crucial due to its high overpotential and slower reaction rate compared to the cathodic reaction in water electrolysis, which has emerged as one of the most promising carbon-free solutions for consolidating renewable energy into ECSU technologies [3]. Efficient charge transfer, abundance, and cost-effective nickel iron oxides are imperative for OER studies. In this work, Pt supported and substituted nickel iron oxide compounds have been successfully studied to acquire more activity from nickel iron oxides towards OER. Nickel iron oxide (parent), 0.25, 0.5, and 1% Pt substituted and supported nickel iron oxide were effectively synthesized. XRD, FE-SEM, and HR-TEM analysis displayed high purity and homogenous dispersion of all elements in matrix. Electrochemical studies of cyclic voltammetry depicted that Pt substituted and supported nickel iron oxide compounds does not outperform. To overcome this constraint, the pre-treatments of electrochemical reduction activation (ERA) modified compounds and reconstruction have occurred in a way that helped the oxidation process; it showed excellent results for OER. In case of substituted compounds, lower Pt concentration gave best activity, whereas for supported compounds Pt with higher concentration gave best activity compared to parent one. This has been proved by XPS analysis where its showed regeneration of active sites and generation of oxygen vacancies. This work significantly gave insight of how substituted and supported compound work differently for OER. Highest faradic efficiency was shown by 0.25% Pt substituted and 1% Pt supported nickel iron oxide compound which is in good agreement with other studies.



Biography

Rajeshree has completed her master's degree in Chemistry from S P University, India during 2016 to 2018. Before starting her doctoral studies, she worked as a chemistry educator at A. G. High School in Ahmedabad, India from 2018 to 2021. She has been a doctoral scholar and a teaching assistant at Ahmedabad University since 2021. She is working with Prof. Aditi Singhal in the area of heterogeneous catalysis. Her research focuses on the development of a novel catalysts for the Oxygen Evolution Reaction (OER), a crucial component in the field of sustainable energy. She is the recipient of the SHODH scholarship from the Government of Gujarat, India from 2022-2024.

Reyna Claire C. Dizon

Science and Technology Education Leaders in Learning and Research Davao City, Mindanao, Philippines

Non-toxic one-pot synthesis of carbon quantum dots from pomelo (*Citrus maxima*) peel waste as a polychromatic fluorescent probe for acute and astute detection of Cu^{2+}, K^{+}, Ca^{2+}, Mg^{2+}, & Fe^{2+}

Heavy Metal water contamination is a critical environmental concern. Thus, it has detrimental effects on human health such as cancer, multiple-organ failure and neurodegenerative diseases. Hence, this study explored the potential of the non-toxic synthesis of carbon quantum dots (C Q D s) through microwave-assisted technique from Pomelo (*Citrus maxima*) peels. It also explored the capabilities of CQD as a sensitive and selective detection of Cu^{2+}, K^{+}, Ca^{2+}, Mg^{2+}, and Fe^{2+}. The methods involved collection of the fruit peeling samples, green synthesis of CQD through microwave-assisted technique, and testing its polychromatic fluorescent properties among different heavy metal effluents. Data were collected using the neulog logger light sensor and neulog logger colorimeter. Baseline characterization using UV/Vis and FTIR spectroscopy revealed that CQDs exhibit optimal excitation within the UV-B spectrum and contain hydroxyl and carboxyl groups. Further analysis using XRD, TEM, EDX, and FESEM confirmed the successful synthesis of C QDs. To further analyze the fluorescence yield of CQD, it was tested using Wavelength Dispersive X-ray Fluorescence (WDXRF) conducted at Chulalongkorn University in Bangkok, Thailand. The results showed that the CQD sample is sensitive and selective to the detection of Potassium ion (K^{+}) in Green, Copper ion (Cu^{2+}) in red, Calcium ion (Ca^{2+}) in colour blue and UV Light, Magnesium ion (Mg^{2+}) in UV Light alone and Iron ion (Fe^{2+}) in colour orange. Furthermore, Calcium ion (Ca^{2+}) and Iron ion (Fe^{2+}) can still be distinguished at the very least concentration at 0.5%. This is evident through their distinctive polychromatic fluorescence properties, with these heavy metals showing the most pronounced responses compared to others tested.

Biography

Ms. Reyna Claire C. Dizon studied at Daniel R. Aguinaldo National High School and a member of the Science and Technology Education Leaders in Learning and Research. She won the Regional Science and Technology Fair under physical sciences individual category for two consecutive years and up on her journey for the International Science and Engineering Fair (ISEF) 2025.

Jose. S[1,2*], Shanumon P. S[3], Adithyan .S[3], Thomas .S[1,3], Bera .S[3], Francis .N[4]

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Preparation and characterization of coarse wool reinforced natural rubber green composite

In the reported work, coarse wool fibre was mixed with Natural Rubber (NR) at equal proportion in two roll mixing machine and subsequently wool-NR composite was prepared using a compression moulding machine. The physico-mechanical properties such as tensile strength, areal density, hardness, thermal stability, water diffusion, moisture absorption, etc were analyzed. The composites were further characterized for its surface morphology, curing characteristics, accelerated aging properties, ultraviolet resistance, X-Ray Diffraction analysis (XRD), and Fourier Transform Infrared Spectroscopy (FTIR). The results were compared with bare Vulcanized Rubber (VR). It is inferred that, while adding wool in the NR matrix, the time taken for the vulcanization got considerably reduced. Though the wool–NR composite showed reduction in tensile strength in comparison with VR, the tear strength, hardness, areal density, and Young's modulus were found to be improved. Thermal analysis of the composite depicted that the incorporation of wool fibre has caused an improvement in the thermal stability of the composite in comparison with the vulcanized rubber.

Keywords: Aging, Fibre Composites, Green Composites, Soil Degradation, Vulcanization.

Biography

Seiko Jose is a scientist, working at Central Sheep and Wool Research Institute, Avikanagar, Rajasthan, India. He is specialized in Textile Chemistry and having more than 18 years of experience in textiles. Seiko Jose is having seven years of experience in the cotton, silk, and linen processing industry. In the past eleven years of his research, he has handled many natural fibres like, jute, pineapple leaf fibre, coconut fibre, flax, silk, wool, ramie, etc. Jose contributed to 58 research articles and 19 book chapters. And major research areas are extraction and characterization of natural fibre, utilization of agro residues, textile dyeing and finishing, eco-friendly textile processing, nano technology and fibre composites. His Google citations is more than 1750. Edited 6 books in the field of textiles, and composites with reputed publishers namely Wiley and Elsevier and managed 22 research projects including 17 industrial consultancy works in the national and international level. Currently is holding the position of Editorial board membership in 8 Journals.

Sergey Suchkov[1,2*], Noel Rose[3,4], Aleksandr Gabibov[5], Holland Cheng[6]

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[4]Harvard Medical School and Boston Children's Hospital, Boston, MA, USA

[5]Institute for Bioorganic Chemistry, Russian Academy of Sciences, Moscow, Russia

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Antibody-proteases as a generation of unique biomarkers, potential targets and translational tools towards design-driven bio-and chemical engineering and personalized and precision medical practice

Biomarkers and targets as being crucial parts of the ligand-receptor tandems have induced an impulse to prompt the development of an upgraded concept of the targeted therapy.

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.

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 have been described in autoimmune manifestations for more than a decade in a variety of disorders. Disease-associated abzymes may have been "induced" by the Ag implicated in the disease. Secondly, the increased occurrence of abzymes in 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 disease.

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 identified in autoimmune conditions, was first registered in patients

and persons-at-risk at the subclinical stages 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 have proved to be greatly informative and thus valuable as biomarkers to monitor chronic autoimmune diseases at both subclinical and clinical stages!

Characterization of the mechanisms of catalytic antibodies has provided fundamental insights into the evolution of binding and catalytic functions in nature. The field has also had a broader influence on bio- and chemical engineering – biologists and chemists are increasingly incorporating the biological idea of molecular diversity into their efforts to synthesize molecules with new functions. Thus the field of antibody catalysis has come full circle, starting with the realization that immunological diversity can be programmed to generate new chemical functions, and ending with the understanding that antibodies all along have had a remarkable catalytic role. So the primary translational potential of abzymes 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 architecture. By changing sequence specificity one may reach reduction of a density of the negative proteolytic effects within the damaged tissue and thus minimizing scales of autoimmune inflammation. In this context, targeted Ab-mediated proteolysis could be applied to isolate from Ig molecules catalytic domains directed against autoaggressive epitopes or domains containing segments to exert proteolytic activity and then be used as therapeutic modifiers.
An important goal in the design of catalytic antibodies is the development of general rules relating hapten structure to the corresponding catalytic groups in the antibody combining site.

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 thus an important goal in the design of catalytic antibodies is the development of general rules relating hapten structure to the corresponding catalytic groups in the antibody combining site. In this sense, Ab-proteases can be reprogrammed to suit the standards of healthcare standards. Or could be designed for the development of principally new catalysts with no natural counterparts.

The translational research of abzymes is a brand-new field of enzyme engineering, which provides people with a reasonable way to design proteins suitable for market needs, that is, artificially design and produce enzymes. Utilizing the high specificity of the antibody produced by the immune system, a series of highly specific abzymes can be obtained. The immobilization of abzyme has been successful and will greatly promote the process of industrialization. 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. In the future, catalytic antibodies may provide a new repertoire of tailor-made, enzyme-like, catalysts with possible applications in biology, medicine, and biotechnology.

So 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 was born in the City of Astrakhan, Russia, in a family of dynasty medical doctors. In 1980, graduated from Astrakhan State Medical University and was awarded with MD. In 1985, Suchkov maintained his PhD as a PhD student of the I.M. Sechenov Moscow Medical Academy and Institute of Medical Enzymology. In 2001, Suchkov maintained his Doctor Degree at the National Institute of Immunology, Russia. From 1989 through 1995, Dr. Suchkov was being a Head of the Lab of Clinical Immunology, Helmholtz Eye Research Institute in Moscow. From 1995 through 2004 - a Chair of the Dept for Clinical Immunology, Moscow Clinical Research Institute (MONIKI). In 1993-1996, Dr. Suchkov was a Secretary-in-Chief of the Editorial Board, Biomedical Science, an international journal published jointly by the USSR Academy of Sciences and the Royal Society of Chemistry, UK. At present, Dr. Sergey Suchkov, MD, PhD, is: The Russian University of Medicine, Moscow, Russia. The Russian Academy of Natural Sciences, Moscow, Russia. Dr. Suchkov is a member of the: New York Academy of Sciences, USA. American Chemical Society (ACS), USA; American Heart Association (AHA), USA; European Association for Medical Education (AMEE), Dundee, UK; EPMA (European Association for Predictive, Preventive and Personalized Medicine), Brussels, EU; ARVO (American Association for Research in Vision and Ophthalmology); ISER (International Society for Eye Research); Personalized Medicine Coalition (PMC), Washington, DC, USA.

Suresh C Ameta
Paher University, Udaipur–313001, India

Photocatalysis: An emerging route for waste water treatment

Waste water pollution is increasing all over the globe at a rapid pace. Various pollutants are regularly discharged through the effluents of the chemical based industries into nearby water resources; such as rivers, ponds, lakes, sea, etc. These pollutants can affect the life of human beings, vegetation and aquatic animals adversely. Therefore, it is necessary to degrade or mineralize these pollutants completely in eco-friendly manner. Photocatalysis has emerged as an eco-friendly method for waste water treatment, but it has several disadvantages; fast recombination of electron and hole pairs and minimum or low adsorption in the visible light. These two problems can be overcome, by modifications of existing photocatalysts such as sensitization, doping by metal and non-metals, using cocatalyst, formation of composite, formation of Z-, S-, and double Z-Schemes.

Biography

Prof. Suresh C. Ameta, a distinguished chemist, earned his M.Sc. (Gold Medal, 1970) and Ph.D. (1980) from the University of Udaipur and Vikram University. He has held prominent positions, including Professor & Head of Chemistry at North Gujarat University and M.L. Sukhadia University, and Dean of the Faculty of Science at PAHER University. Currently, serves as Professor of Eminence at Pacific University, Udaipur. Prof. Ameta has been a lifelong advisor to the Indian Chemical Society and served as its President (2000-2001). He has received numerous awards, including the National Teacher Award (2011) and Life Time Achievement Awards from various organizations. With over 450 research papers and 36 books, he has contributed significantly to Green Chemistry, Microwave-Assisted Organic Synthesis, and Photocatalysis. He has completed several major research projects and guided 110 Ph.D. students. Prof. Ameta is a respected speaker and session chair at national and international conferences, having delivered lectures in countries such as Japan, Spain, the USA, and China. He has proposed the Ameta Index, a complementary index to improve the h-index, for which he holds a copyright.

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Natural Deep Eutectic Solvents (NADESs) deconstruction of advanced bioenergy crops to enhance recovery of lipids and sugars

Continuous exploitation of fossil resources and increasing energy consumption have urged the worldwide scientific community to look for a new alternative renewable feedstock for the production of bio-based materials, fuels, and chemicals. In view of this, a newly developed transgenic crop, i.e., oilcane, has been genetically engineered to accumulate vegetative lipids and carbohydrates in their plant tissues, thus can be considered as an alternative feedstock to cater for the enhanced biofuel yield by providing lipids along with cellulosic sugars for largescale biodiesel and bioethanol production. However, these components are entrapped in a highly recalcitrant lignin-carbohydrate matrix, which limits the efficient recovery of these components from transgenic crops for their downstream processing. Thus, Natural Deep Eutectic Solvents (NADES), a combination of Hydrogen Bond Donor (HBD) and Hydrogen Bond Acceptor (HBA), have demonstrated exceptional solvent characteristics, an alternative to conventional organic solvents and benefited with easy preparation, low toxicity, high biodegradability, and high fractionation efficiency. NADES can act as adjuvants for weakening the lignin-carbohydrate recalcitrance matrix at the desired temperature of 100 to 160°C and pretreatment circumstances while enhancing lignin solubilization. Thus, herein, we have synthesized several choline chloride-based NADES using bio-derived precursors, i.e., lactic acid, oxalic acid, glycerol, ethylene glycol, acetic acid by varying the molar ratio of HBD and HBA (1:1, 1:2) at 60 to 80°C and were further employed for the pretreatment of oilcane bagasse for the fractionation of lipids and carbohydrates. Compositional analysis showed that oilcane bagasse is enriched with 3.3% of total lipids and 51% of carbohydrates. The initial study showed that the suitable eutectic combination of NADES, i.e., choline chloride and lactic acid in a 1:1 molar ratio at 60 to 80 °C, could effectively solubilize >80% lignin while enabling high biomass digestibility (>85%), and enhance lipid recovery (>80%). The research findings would further promote the design and fabrication of low-cost, environmentally friendly, biodegradable NADES-assisted pretreatment for enhanced lipid and sugar recovery from transgenic oilcane for renewable production under a circular biorefinery.

Biography

Dr. Tirath received his PhD in Chemistry from the Indian University of Petroleum and Energy Studies. He has more than 10 years of expertise in the field of environmentally friendly biomass processing for the generation of fuels and chemicals at the laboratory and pilot scale while working at the greatest laboratories in the world in India, South Korea, and the United States. Presently, he is working as a post-doctoral research associate at the University of Illinois in Urbana-Champaign, Illinois, USA, where in the majority he is involved in the development of efficient

bioprocess for the conversion of bioenergy crops for chemicals, biofuels, and other bioproducts at CABBI, the fourth Bioenergy Research Center supported by the US Department of Energy. Scientifically, he has contributed >45 publications in peer-reviewed international review journals, co-invented 3 international patents, coauthored 3 books, and served as an editorial board member of three reputed Journals.

BOOK OF ABSTRACTS

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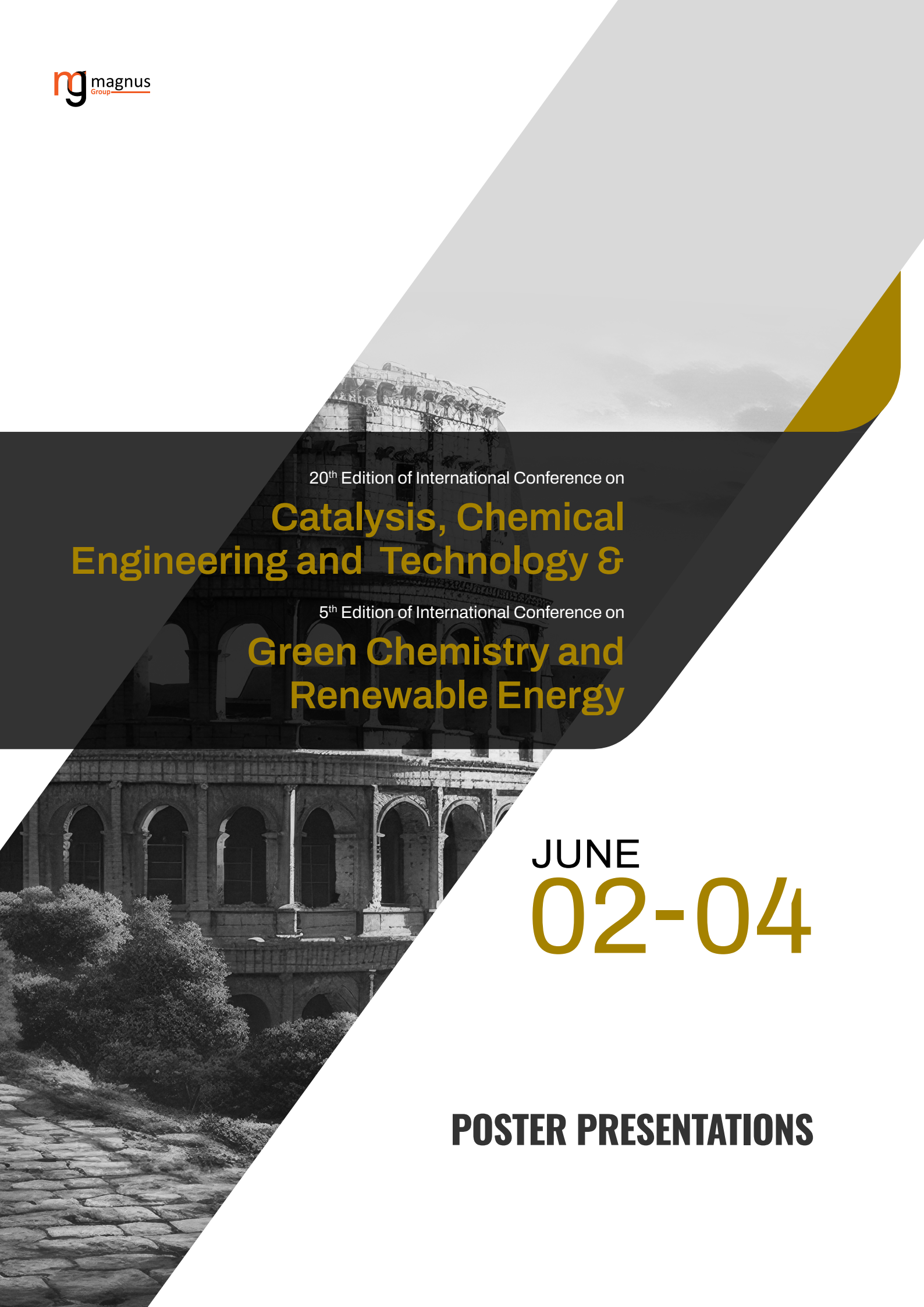
5th Edition of International Conference on

Green Chemistry and Renewable Energy



JUNE

02-04

POSTER PRESENTATIONS

Ayoub Boualli[1*] Abdoullah Bimoussa [1], Oussama taouala [1], Yassine Laamari [1], Mourad Fawzi [1], My Youssef Ait Itto[1], Hamid Morjani [2], Aziz Auhmani[1]

[1]Cadi Ayyad University, UCA, Faculty of Sciences Semlalia, Laboratory of Molecular Chemistry, P.O. Box 2390, Marrakech 40001, Morocco

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Synthesis and anticancer activity of a novel series of chalcone derivatives from Tetraclinis articulata (Thuya)

Objectives: The primary objective of this study is to isolate and characterize the major constituents of biomass derived from *Tetraclinis articulata*. Subsequently, the study aims to chemically modify these isolated natural components to synthesize novel chalcone derivatives, which have been widely recognized for their potential anticancer properties. This approach seeks to explore the structural diversity of chalcones and assess their therapeutic potential in cancer treatment.

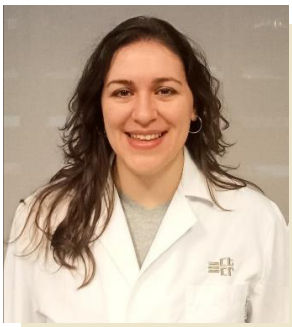
Methods: To accomplish these objectives, a multidisciplinary approach will be employed. Initially, bioactive compounds will be extracted from the sawdust of Tetraclinis articulata using appropriate extraction techniques. The isolated compounds will then undergo hemisynthetic modifications to generate a series of chalcone derivatives. The structural elucidation of these compounds will be performed using advanced spectroscopic techniques, including NMR spectroscopy, mass spectrometry, and chromatography. Finally, their anticancer potential will be evaluated through in vitro cytotoxicity assays against selected cancer cell lines.

Results: The outcomes of this research could have significant implications. Primarily, we aim to add value to an often-overlooked industrial byproduct by proposing a sustainable and environmentally friendly application, thereby contributing to climate change mitigation. Furthermore, the identification of new natural or hemisynthetic products with anticancer activity could pave the way for the development of more effective and less toxic anticancer drugs.

Keywords: Abietane diterpenes, Chalcone, Molecular docking, Cytotoxic activity

Biography

Ayoub Boualli is a third-year PhD candidate in organic chemistry at the Faculty of Sciences Semlalia, Marrakech. His research focuses on the valorization of medicinal plants and the functionalization of terpenic compounds isolated from these plants. He is particularly involved in the valorization of Tetraclinis articulata (thuya) wood sawdust, exploring the hemisynthesis and anticancer activity of natural and hemisynthetic products. With expertise in organic synthesis and hemisynthesis, Ayoub contributes to advancing medicinal chemistry and the development of bioactive molecules.



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Chemical and biological recycling strategies for polyurethane foams: Toward a circular footwear industry

Polyurethane (PU) is a polymer typically derived from non-renewable fossil resources, resulting in end products that are difficult to recycle and highly polluting. In response to these challenges, this work explores innovative strategies for the recycling and valorisation of polyurethane materials within the framework of the Circular Economy. Specifically, it focuses on the development of processes for the recycling of polyurethane materials, widely used in the footwear sector, through chemical and biotechnological recycling approaches.

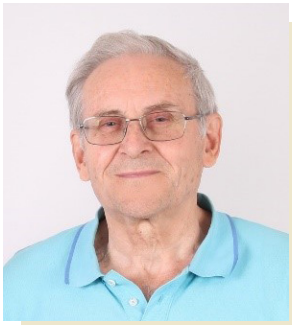
The chemical recycling of polyurethane foams was performed through a glycolysis process using low molecular weight glycols as the glycolytic agent. This technique allows the efficient depolymerisation of PU waste and the recovery of polyols for subsequent reuse in the synthesis of new materials. The effectiveness of the depolymerisation process was evaluated and confirmed by Fourier Transform Infrared Spectroscopy (FTIR) and determination of the hydroxyl number (OH index) of the products obtained, an essential parameter for their potential reuse in obtaining flexible foams.

In parallel, the biological recycling of PU foams was studied using three species of filamentous fungi: Aspergillus fumigatus, Aspergillus flavus and Alternaria alternata. Biodegradation was monitored by evaluating fungal growth and structural changes in the material. This line of research offers promising opportunities to identify optimal conditions and microbial systems capable of enhancing the biodegradation of polyurethane, contributing to more sustainable end-of-life solutions.

In conclusion, the RECIPOL project has successfully developed chemical recycling technologies for polyurethane foam waste, providing recycled polyols that can be reused in the synthesis of new polyurethane materials. At the same time, biological recycling studies using filamentous fungi have demonstrated the potential of fungal biodegradation as a complementary strategy for the valorisation of polyurethane waste. Therefore, the work carried out in this project lays the foundations for the recycling and valorisation of polyurethane waste, contributing to the implementation of circular economy systems in the sector.

Biography

María Iñiguez holds a degree in Chemistry from the University of La Rioja (Spain), where she graduated in 2018. Then, completed a Master's in Chemistry and Biotechnology at the same institution, which allowed her to acquire a solid knowledge base applied to research and technological development. Finally, in 2022, María Iñiguez joined the Sustainability and New Materials team at the Footwear Technology Centre of La Rioja (CTCR), where she currently performs technical and research functions in projects related to material recycling and the development of more sustainable and environmentally friendly solutions.



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Universal mechanism of catalysis of low-temperature nuclear fusion

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. The spins in (ee)-pairs are opposite, and the attraction is due to the contact interaction, 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 of substances by 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 between nuclei, ensure that the nuclei come together to a critical distance, which is necessary for the exchange of mesons between nuclei to begin. In addition 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, 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. 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.

Biography

Dr. Kashchenko studied Physics at the Ural Polytechnic Institute, USSR and graduated as engineer in 197, then In 1974, received the degree of Candidate of Physical and Mathematical Sciences. In 1987, received the degree of Doctor of Physical and Mathematical Sciences, and in 1990 the title of Professor. From 1980 to the present, Dr. Kashchenko has been the head of the Department of Physics at the Ural State Forest Engineering University and developed a dynamic theory of martensitic transformations and proposed a conceptual solution to the problem of low-temperature nuclear reactions. Has been published 4 monographs and about 200 articles.

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Processing of polyethylene into hydrocarbon fuels by catalytic cracking on Pillared Interlayered Clays (PILC)

Resource conservation is an integral part of environmental protection. According to data in 2018, more than 9 million tons of household waste were generated in Ukraine. Currently, improper use of resources has led to significant environmental pollution. One of the significant environmental problems of the urbanized areas of megacities are the storage areas of household and industrial waste, which are a potential source of environmental disaster. One of the effective ways to solve this problem is the pyrolysis of plastic waste of various origins. Synthetic Liquid Fuels (SLF) are complex mixtures of hydrocarbons obtained from raw materials of non-petroleum origin. One of the ways of obtaining SJT is the thermal conversion of raw materials without the participation of oxygen or air (cracking, pyrolysis) to obtain solid, liquid and gaseous products. The liquid product is pyrolysis oil, which is used directly or processed into furnace fuel, individual chemicals and other products. The main factor affecting the speed of pyrolysis and the yield of products is the temperature of the process. Depending on the temperature of the process, low-temperature (up to 673K), medium-temperature (673-873K) and high-temperature (above 873K) are distinguished. The yield of products is also influenced by the presence and selection of a catalytic system, with the help of which the ratio of gaseous and liquid products in the final mixture can also be adjusted. Despite the huge number of works on obtaining liquid fuel, the task of using effective catalytic systems that ensure high product yield in combination with the environmental friendliness of the cracking process and simplified technology for obtaining catalysts remains relevant. The results of research on processing by joint pyrolysis of a mixture of polyethylene in the presence of modified aluminosilicates for the purpose of obtaining liquid transport and boiler fuels, as well as chemical raw materials used in the main organic synthesis, are considered in the submitted report.

The paper developed a method for obtaining columnar microporous sorbents (PILC) based on calcium forms of montmorillonite and stevensite using more concentrated solutions and dispersions of reagents. Catalytic cracking of polyethylene on modified montmorillonite and saponite and their regenerated samples in a semi-batch reactor was studied. Columnar clays are capable of almost completely converting polyethylene into gaseous and liquid hydrocarbons, showing a low coking level. The selectivity and yield of liquid hydrocarbons were high, since the mild acidity of the columnar clays allowed to avoid excessive cracking to small molecules. The regenerated catalyst samples showed little loss in conversion rate and selectivity with fresh clay samples (sey Tab. 1). In addition, they gave hydrocarbons with almost the same distribution as

fresh samples, which confirms the possibility of complete regeneration of columnar clays. Both the high yield of liquid products and the ability to regenerate make PILCs potential catalysts for industrial use.

Table 1: Yield of catalytic cracking reaction products on different catalysts.

Catalyst	Yield to gases, (%)	Yield to liquid, (%)	Coke yield (%)
Thermolysis	11	67	22
Freshly prepared catalyst			
Montmorillonite	22	72	6
Saponite	26	69	5
PILC-M	20	76	4
PILC-S	23	74	3
Regenerated catalyst			
Montmorillonite	18	69	13
Saponite	21	68	11
PILC-M	17	75	8
PILC-S	18	72	10

In addition, they gave hydrocarbons with almost the same distribution as fresh samples, which confirms the possibility of complete regeneration of columnar clays. Both the high yield of liquid products and the ability to regenerate make PILCs potential catalysts for industrial use.

The influence of the heating rate on the quality and distribution of the liquid product using different heating temperatures is also investigated. This result shows the importance of the state of the polymer at each stage of the pyrolysis process.

Conclusions: Considering the importance of catalytic cracking of plastic waste into fuel, two aluminum pillared clays, PILC-M, a saponite derivative, and PILC-S, a montmorillonite derivative, were tested for their effectiveness in the catalytic cracking of polyethylene, as well as their efficiency.

At low temperatures, clay catalysts showed low activity. However, this pattern changes dramatically with temperature, as PILCs are able to completely decompose polyethylene after increasing the process temperature. In addition, they have achieved high levels of liquid hydrocarbon fuel formation. The yield of liquid products is more than 70%. Such a high yield of liquid from columnar clays is explained by their weak acidity, which does not withstand excessive cracking to small molecules, and is also reflected in the distribution of the liquid product. In addition, columnar clays give products that are mostly in the boiling range of motor fuels. In addition to the high liquid yield, the low coke yield found in the catalytic cracking of plastic waste on columnar clays makes these materials promising candidates for a future commercial process. In addition, the regenerated columnar clays after burning the formed coke showed almost the same behavior as their fresh counterparts in terms of conversion and yield, as well as product distribution. The ability to regenerate PILC increases their potential for successful introduction into the commercial process of cracking plastic waste.

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Challenges and trends of green chemistry in the era of artificial intelligence

As global environmental concerns intensify, green chemistry has gained significant attention. Green chemistry, known as sustainable chemistry, is an innovative approach to chemical research and manufacturing that seeks to reduce harmful substances, designing safer chemicals, developing alternative technologies, efficient utilization of resources, minimizing waste, and improving energy efficiency. Green chemistry involves multiple subject areas, including chemistry, biology, materials science, engineering, etc. Green chemistry is key to solving big environmental problems. In the pharmaceutical industry, the synthesis of drugs through green chemical methods can avoid the use of organic solvents with carcinogenic properties, thus reducing the risks of drug production to the environment and human health.Green chemistry minimizes or even eliminates the formation of hazardous substances by selecting safer and more environmentally friendly raw materials and reaction paths.Green chemistry contributes to the sustainable development of the ecological environment and reduces environmental pollution caused by industrialization, such as ozone layer destruction, atmospheric pollution, Marine pollution, etc.This abstract explores the emerging trends, opportunities, and challenges at the intersection of green chemistry and AI, highlighting key advancements and directions.

In recent decades the integration of artificial intelligence (AI) into green chemistry represents a transformative shift in sustainable scientific research and chemical industrial applications.AI-driven technologies, including machine learning (ML), deep learning, and predictive modeling, are revolutionizing chemical research by accelerating discovery, optimizing processes, and minimizing environmental impact.There is enormous potential for synergies between green chemistry and AI. AI is helping researchers and industries design more sustainable and efficient chemical systems. Artificial Intelligence (AI) can analyze vast amounts of data to identify promising new materials for green chemistry applications. ML algorithms can predict the properties and performance of potential materials, reducing the time required for experimentation and development. Despite these advancements, several challenges persist,including Data quality and availability,Dependence on Fossil Fuels and Traditional Chemical Processes, technological limitations, Economic and Industrial Barriers,Green Catalysis and Alternative Reaction Pathways,Green Solvents, Regulatory and Policy Challenges,etc.

One of the most significant trends of Green chemistry is the application of AI in designing eco-friendly chemical processes.Data quality and availability remain critical barriers, as AI models require large, high-quality datasets to generate reliable predictions.Another key trend is that green chemistry also needs to strengthen ethical review and regulation to ensure that the application of technology is in line with

ethical norms and social responsibility. Through measures such as data privacy protection, algorithmic fairness, ethical responsibility transparency, social impact fairness, and interdisciplinary cooperation, it can be effectively addressed to ensure the sustainable development of AI technology in green chemistry. Green chemistry is evolving rapidly, driven by biotechnology, artificial intelligence, and materials science. Looking ahead, the convergence of AI and green chemistry holds immense potential but demands a balanced approach. Future research should focus on developing explainable AI models,Green Catalysis and Enzyme Engineering, Sustainable Polymers and Biodegradable Materials, Green Energy and Sustainable Chemical Processes, Application of AI ,Ethical review and regulation,and Interdisciplinary cooperation and knowledge sharing .

Biography

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

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From bench to atmosphere: New materials for Direct Air Capture (DAC) of CO_2 using electro-swing chemistry

The increased amount of Carbon Dioxide (CO_2) in the atmosphere is the main factor contributing to recent climate change. This accumulation of CO_2 is mainly due to the burning of fossil fuels that disrupts the natural carbon cycle. In addition to global warming, the abundance of atmospheric CO_2 also causes ocean acidification, agriculture disruption, and negative impacts on human health. Recent studies determined that simply reducing emissions is insufficient to restore the Earth's atmospheric system—negative emissions are now in dire need. Current carbon (i.e., CO_2) capture technologies use thermo/pressure swing which often suffers from low energy efficiency, high cost, and geographic constraints. Electro-swing chemistry-based carbon capture using quinone sorbents emerged as a promising potential solution to these problems. However, strong CO_2-binding sorbents, not susceptible to oxygen interference, remain elusive. In this study, I designed and synthesized three novel quinones for Direct Air Capture (DAC) of CO_2. Cyclic voltammetry studies of these quinones and follow-up data analysis found that 2,3-Dicyanobenzoquinone (DBQ) has a second reductive potential of -0.935 V, positive of that of oxygen, and binds to CO_2 strongly with the binding free energy ΔG_{bind} of -5.39 kcal/mol. These results suggest that DBQ is a desired sorbent that can capture >70% of CO_2 at low concentrations (i.e., 420 ppm in the current atmosphere) at room temperature using electro-swing chemistry without oxygen interference. This technology has the potential to be further developed for worldwide applications by solving global warming and its implications.

Biography

Ms. Zoe Wang is a 10th grader at the Fairview High School in Boulder Colorado and has been working on electrochemistry under the supervision of Hunter and Phil Pham in the laboratory of Dr. Oana Luca at the University of Colorado Boulder since 2022. Her research entails developing novel methods on plastic recycling and direct air capture of carbon dioxide.

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