

12TH EDITION OF GLOBAL CONFERENCE ON

CATALYSIS, CHEMICAL ENGINEERING AND TECHNOLOGY



VIRTUAL EVENT

SEPT **05-07**

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BOOK OF ABSTRACTS

12TH EDITION OF GLOBAL CONFERENCE ON
CATALYSIS, CHEMICAL
ENGINEERING AND
TECHNOLOGY

05-07 SEPT

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ABOUT MAGNUS GROUP

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

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



ABOUT CAT2022

Magnus Group welcomes you to our Online Event entitled “12th Edition of Global Conference on Catalysis, Chemical Engineering & Technology” CAT-2022 scheduled on September 05-07, 2022. with the theme “Expedite the Future Endeavours in Catalysis and Chemical Engineering”

CAT-2022 is an international platform that amalgamates world renowned experts of both academics and industries within the discipline of Catalysis and chemical engineering all over of the world. This event brings together all the chemical researcher and chemical engineers to exchange and innovates new theories and practices of Catalysis and Chemical Engineering.



KEYNOTE FORUM

DAY 01

12TH EDITION OF GLOBAL CONFERENCE ON

**CATALYSIS, CHEMICAL
ENGINEERING AND
TECHNOLOGY**

05-07 SEPT



**M. Osgouei¹, S. Zacarias², I.A.C. Pereira², S. Shleev³,
J.C. Conesa^{*1}, M. Faraldos¹, M. Pita¹, A.L. De Lacey¹**

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Enzyme-sulphide coupling for light-induced water splitting and CO₂ reduction

Many sulphide semiconductors are photocatalytically active in significant ranges of the visible spectrum; our group has shown this, specifically, for In₂S₃ and SnS₂ (R. Lucena *et al.*, Catal. Commun. 2012, 20, 1; *ibid.* Appl. Catal. A: General, 2012, 415-416, 111). Furthermore, by including V in these sulphides we have shown how their photocatalytic activities can be further extended to even the NIR range (P. Wahnón *et al.*, Phys. Chem. Chem. Phys. 2011, 13, 20401; R. Lucena *et al.*, J. Mater. Chem. A 2014, 2, 8236). Here we will show how coupling these sulphides with enzymes of hydrogenase or laccase types allow photoevolving H₂ or O₂. First, we could show that combining In₂S₃ with a hydrogenase it was possible to generate photocatalytically H₂ in presence of a sacrificial agent (C. Tapia *et al.*, ACS Catalysis 2016, 6, 5691). Then, we showed that combining In₂S₃ with a laccase it was possible to generate O₂ photoelectrochemically (C. Tapia *et al.*, ACS Catalysis 2017, 17, 4881), this being the first time that such enzyme-sulphide combination allowed photoevolution of O₂. A similar photoelectrochemical generation of O₂ could be shown by combining SnS₂ with a laccase enzyme (C. Jarne *et al.*, ChemElectroChem 2019, 9, 2755). Some of us carried out recently work which coupled an electrode with a formate dehydrogenase enzyme, including W as active species, so that it was possible to reduce electrocatalytically CO₂ to formate (J. Álvarez-Malmagro *et al.*, ACS Appl. Mater. Interfaces 2021, 13, 11891). Ongoing work will be shown here in which combining this latter enzyme with In₂S₃ nanoparticles allows to perform the same task photocatalytically.

Audience Take Away:

- How to use In₂S₃ and SnS₂ for HCOOH degradation and how to extend their range by doping with V.
- How to couple these materials with enzymes to achieve photo-splitting of water.
- How to drive as well, in preliminary work, the coupling of In₂S₃ with a formate dehydrogenase enzyme to achieve CO₂ reduction.

Biography

J.C. Conesa entered the permanent staff of ICP in 1979. He was ICP Vicedirector, then ICP Director, being now ICP Ad Honorem Professor. He was first in Spain using SR techniques to study heterogeneous catalysis, and first in CSIC to use quantum calculations to understand them. He is expert in XPS and FTIR (including *operando*), EPR and UV-Vis-NIR. He analyzed CeO₂-supported metals and oxides, firstly for car depollution and later for H₂ production technologies. He keeps continued interest in photocatalysis and photoactive solids. He belongs to the Steering Committee of AMPEA, a Joint Programme of the European EERA devoted to sustainable energy. His more than 200 articles and book chapters have received more than 9900 citations, leading to a Hirsch index h=57.

**Stanislaw Dzwigaj**

Sorbonne Universite, Laboratoire de Reactivite de Surface

Design of metal single-site zeolites and their application in industrial and environmental 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 new single-site zeolites 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 zeolites in different catalytic processes such as oxidative dehydrogenation of propane into propene, Fischer Tropsch synthesis, selective catalytic reduction of NO_x to N₂, production of 1,3-butadiene or hydrogen from renewable sources, including ethanol obtained from biomass will be discussed. This two-step postsynthesis method applied in this work allowed obtaining metal single-site zeolite catalysts active in above-mentioned processes. Their catalytic activity strongly depended on the speciation and amount of metal incorporated into zeolite structure as well as their acidity.

Audience Take Away:

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

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. His published work includes more than 170 papers published in reputable international journals.



Osman Adiguzel

Department of Physics, Firat University, Elazig, Turkey

Displacive characterization of thermal and mechanical transformations in shape memory alloys

Some materials take place in class of advanced smart materials with adaptive properties and stimulus response to the external changes. Shape memory alloys take place in this group, exhibiting a peculiar property called shape memory effect, which is characterized by the recoverability of two certain shapes of material at different temperatures. These alloys have dual characteristics called thermoelasticity and superelasticity, from viewpoint of memory behavior. Thermoelasticity is initiated by cooling and deformation processes and performed thermally on heating and cooling. Superelasticity is performed by stressing and releasing material at a constant temperature in parent phase region, and shape recovery is performed simultaneously upon releasing the applied stress. Superelasticity is performed in non-linear way; stressing and releasing paths are different in the stress-strain diagram, and hysteresis loop refers to energy dissipation. Thermal memory is governed by two successive structural transformations, thermal and stress induced martensitic transformations, in crystallographic basis. Thermal induced martensite occurs on cooling with the cooperative movement of atoms in two opposite directions, $\langle 110 \rangle$ -type directions on the $\{110\}$ -type plane of austenite matrix by means of lattice invariant shear, along with lattice twinning. These structures turn into detwinned martensitic structures by stressing by means of stress induced transformation. Motion of atoms is confined to the interatomic distances, and martensitic transformations exhibit displacive character, and neighborhood of atoms does not change. Superelasticity is also result of stress induced martensitic transformation and ordered parent phase structures turn into the detwinned martensitic structures. Lattice invariant shear is not uniform in copper-based shape memory alloys, and cause to the formation of long-period layered martensitic structures with lattice twinning on cooling. Copper based alloys exhibit this property in metastable beta-phase region, which has bcc based structures at high temperature parent phase field. Lattice invariant shear is not uniform in these alloys and cause to the formation of complex layered structures, like 3R, 9R or 18R structures depending on the stacking sequences, on the stacking sequences on the close-packed planes of the ordered lattice. In the present contribution, electron diffraction and x-ray diffraction studies performed on two copper based CuZnAl and CuAlMn alloys. Electron diffraction patterns and x-ray diffraction profiles exhibit super lattice reflections inherited from the parent phase structure, due to displacive character of the transformation. Specimens of these alloys aged at room temperature in martensitic condition, and a series of x-ray diffractions were taken during aging at room temperature. Reached results show that diffraction angles and peak intensities change with aging time at room temperature. Some of the successive peak pairs providing a special relation between Miller indices come close each other, and this result leads to the rearrangement of atoms in diffusive manner.

Audience Take Away:

- Shape effect is a multidisciplinary subject from chemistry, physics to materials sciences and metallurgy. These alloys are used shape memory devices in many fields from biomedical to the industry. I will introduce the basic terms and definitions at the beginning of my talk and introduce the experimental results.

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 already been working as professor. He published over 80 papers in international and national journals; He joined over 100 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 seven years (2014 - 2020) over 70 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. 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.

POSTERS

DAY 01

12TH EDITION OF GLOBAL CONFERENCE ON
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**G. Yergaziyeva^{1,2*}, N. Makayeva², J. Shaimerden²,
M. Anissova¹, M. Mambetova¹**

¹Institute of Combustion Problems, Almaty, Kazakhstan

²Faculty of chemistry and chemical technology, al-Farabi Kazakh National University, Almaty, Kazakhstan

Fe-containing composite for decomposition of methane into CO_x -free hydrogen and nano-carbon

Thermal catalytic decomposition (TCD) of methane is an efficient hydrogen production technology with the lowest carbon oxide emissions. TCD methane is an endothermic one-step reaction, which is essential for the following reasons: firstly, the large number of natural reserves of methane, besides leading known reserves of natural gas are increased so using methane economically reliable; secondly, decomposition of methane takes place without the participation of oxygen that does not result in the formation of CO or CO_2 , which is an advantage as compared with steam reforming of methane. In the present work, an iron-containing catalyst was synthesized electrochemically by cycling the potential on the nickel foam surface. The resulting catalysts were studied in the reaction of methane decomposition to hydrogen and carbon in the temperature range of 650-850°C. The cycle of iron deposition on nickel was studied, as well as the stability of the obtained composites in the decomposition of methane. A set of methods (SEM, TPR- H_2 , BET, etc.) investigated the physicochemical characteristics. It was determined that the highest catalytic activity is observed for the composite, where the cycle of iron deposition on nickel foam is 150 minutes to 98.6%, and was stable for 540 minutes. In the temperature range of 650-850°C, only hydrogen is formed in the gas reaction products, the presence of carbon oxides, ethylene and ethane was not observed. With an increase in the conversion of methane on Ni-Fe150, the yield of hydrogen in the reaction products increased, the initial yield of hydrogen was 71%, which increased from 60 minutes to 74% and from 180 minutes to 76%. According to the results of TGA/DTA and Raman spectroscopy, it was determined that graphite-like carbon is formed on all composites, the largest amount (32%) is formed on Ni-Fe150. According to the results of BET, TPR- H_2 , an increase in the activity of Ni-Fe composites in the decomposition of methane compared to Ni-foam is associated with an increase in the textural characteristics of the composite, as well as the formation of a Ni-Fe alloy. An increase in the activity of Ni-Fe150 in comparison with Ni-Fe75 and Ni-Fe250 - with an increase in the reducibility of iron cations in the composition of the nickel-iron alloy, which ensures an increase in the concentration of metal particles - active centers.

Acknowledgements

This research has been/was/is funded by the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan (Grant No. AP08855564).

Biography

Yergaziyeva Gaukhar is a candidate of chemical sciences, works in the field of catalysis and petrochemistry. The main scientific direction of research is the study of the mechanism of action and the development of new catalysts of directed action for the processing of hydrocarbon raw materials (methane, propane-butane, benzene, ethanol), obtaining valuable products (synthesis gas, hydrogen, maleic anhydride, etc.).

**C. Vasilescu¹, S. Marc^{1,2}, Francisc Peter¹, Cristina Paul^{1*}**

¹Politehnica University Timisoara, Faculty of Industrial Chemistry and Environmental Engineering, Department of Applied Chemistry and Engineering of Organic and Natural Compounds, Carol Telbisz, Timisoara, Romania

²University of Agricultural Sciences and Veterinary Medicine "King Michael I" of Banat Timișoara, Faculty of Veterinary Medicine, Calea, Timisoara, Romania

Optimized continuous-flow aroma ester synthesis by entrapped candida antarctica lipase B in novel sol-gels with epoxy functional groups

Immobilized lipases are excellent biocatalysts for the enzymatic synthesis of short- and medium-chain fatty esters used as food flavour compounds. However, because its catalytic activity greatly depends on the selected immobilization method, it is necessary to customize the immobilization procedure to the selected enzyme and the envisioned applications. Lipase from *Candida antarctica* B (GenoFocus, South Korea) was immobilized by entrapment in sol-gel hybrid matrices obtained with epoxy functionalized silane precursors following the hypothesis that the epoxide groups could lead to formation of supplementary covalent bonds between the enzyme and the sol-gel matrix, thus serving to further stabilize the enzyme. The characterization of the immobilized biocatalyst was accomplished through Scanning Electron Microscopy (SEM), Fluorescence Microscopy (FM), Fourier Transform Infrared Spectroscopy (FTIR), and Thermogravimetric Analysis (TG/DTA). The operational and thermal stability of the lipase were increased as a result of the immobilization, and the entrapped lipase retained 99% activity after 10 consecutive reaction cycles. The catalytic efficiency of the immobilized lipase was investigated in the synthesis of the flavour ester n-amyl hexanoate (apple, pineapple aroma) in organic solvent/solvent free media, by direct esterification of n-amyl alcohol and hexanoic acid. Continuous production of the flavour ester pentyl hexanoate in a packed-bed reactor was first developed using the immobilized lipase as a catalyst in a hexane solvent system. Subsequently, a solvent-free synthesis process was developed and optimized. This study demonstrates the applicability of sol-gel entrapped lipases in a packed-bed reactor for continuous aroma ester synthesis.

Acknowledgements

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Audience Take Away:

- Enzyme immobilization through the sol-gel entrapment method.
- Biocatalyst characterization and correlation of its properties with catalytic activity.
- Process optimization by design of experiments.
- Continuous flow ester synthesis in solvent-free media.

Biography

Dr. Eng. Cristina Paul studied Industrial Chemistry and Environmental Engineering at the University Politehnica Timisoara, Romania. In 2004 she joined the biocatalysis research group of Prof. Francisc Péter at University Politehnica Timisoara, Faculty of Industrial Chemistry and Environmental Engineering. Graduated from the Politehnica University Timisoara with an MS in Fine Organic Synthesis, Semisynthesis and Natural Products in 2005 and received her PhD in Chemistry in 2009 at the same institution. Her research interests include: biocatalysis, biotransformation, biomaterials, enzyme immobilization, sol-gel entrapment, green chemistry, enzymatic conversion of lignocellulosic biomass, nanomaterials, magnetic nanoparticles, process optimization, experimental design.



Vahide Nuran Mutlu^{1*}, Eser Dincer Hafizglu¹, Basar Caglar²

¹SOCAR Turkey Research & Development and Innovation Inc Aliaga, Izmir, Turkey

²Izmir Institute of Technology, Department of Energy Systems Engineering, İzmir, Turkey

Development of Cu-based bimetallic catalysts for the electrocatalytic hydrogenation of acetone to isopropanol for LOHC applications

Hydrogen has gained an increasing importance as secondary energy vector due to the urgent requirement of CO₂-neutral energy storage and transformation. However, the nature of hydrogen requires dedicated infrastructures, and this has prevented so far the introduction of elemental hydrogen into the energy sector to a large extent. The challenges associated with conventional hydrogen storage, such as compression and liquefaction technologies, include safety concerns, low storage density, transportation, boil-off losses, and relatively high costs. Liquid Organic Hydrogen Carrier (LOHC) have attracted large attention in recent years as an alternative to the conventional methods. LOHC uses pairs of a hydrogen-lean, and a hydrogen-rich compounds. Hydrogen is stored via the catalytic hydrogenation of the hydrogen-lean compound while it is released back by the catalytic dehydrogenation of the hydrogen-rich LOHC compounds. This method enables to store hydrogen in liquid form at ambient conditions over long periods, thereby allowing the utilization of the existing infrastructure used for conventional fuels. The LOHC fuel cells makes this method more attractive since once hydrogen is stored it can be converted to electricity by the direct use of LOHC-bound hydrogen. In the conventional LOHC system hydrogen storage occurs at high temperatures (100-250 °C) and pressures (10-50 bar) via the catalytic hydrogenation of the hydrogen-lean LOHC, however, hydrogen can be also stored by electrochemical hydrogenation (ECH) at low temperature and ambient pressure. ECH can be combined with water electrolyzer for the direct storage of renewable electricity. In this study, we proposed an acetone-water electrolyzer for the electricity storage, where water decomposes to oxygen, protons and electrons at the anode while acetone reacts protons and electrons to form isopropanol at the cathode. We focused on the cathode side and studied electrocatalytic hydrogenation (ECH) of acetone in the presence of carbon supported Cu-based bimetallic catalysts. We have investigated the effect of second metal (Co, Ni, Pt) and its composition on the activity, selectivity and stability in a divided cell via cyclic voltammetry, electrochemical impedance spectrometry (EIS) and chronoamperometry. The results will be presented and discussed and the potential of acetone-water electrolyzer will be evaluated as an energy storage alternative.

Audience Take Away:

- They will gain insight about a new emerging technology for energy storage, which eliminates the challenges in conventional energy storage methods.
- They will learn the working principle, components and characterization of acetone-water electrolyzer systems.
- They will gain knowledge on electrocatalysis, electrocatalytic reactions and the relation between catalysts properties and activity, selectivity and stability.
- They can use the related knowledge for the design of catalytic materials and electrochemical reactors and the development of methods for catalyst and product characterization.
- This study will help academics to expand their knowledge in energy storage, electrocatalytic reactions, electrocatalysis and electrolyzers and inspires them for the development of new ideas in this field.
- This study will inspire audience from industry to develop ideas for new energy storage technologies, new electrolyzer systems and new materials (catalysts, electrodes, transport layer, membrane, flow channels).

Biography

Dr. Vahide MUTLU is a Process Development Senior Specialist in SOCAR R&D. She got her PhD in Chemical Engineering, M.Sc in Material Science and Engineering, and B. Sc in Chemical Engineering at Izmir Institute of Technology, Türkiye where, she worked as a research assistant for 9 years. Her research interests are design & synthesis of solid catalysts, catalytic conversion of biomass to chemicals, catalytic processes and materials for renewable energy and chemical synthesis. She has expertise in catalyst preparation and characterization and reaction engineering.

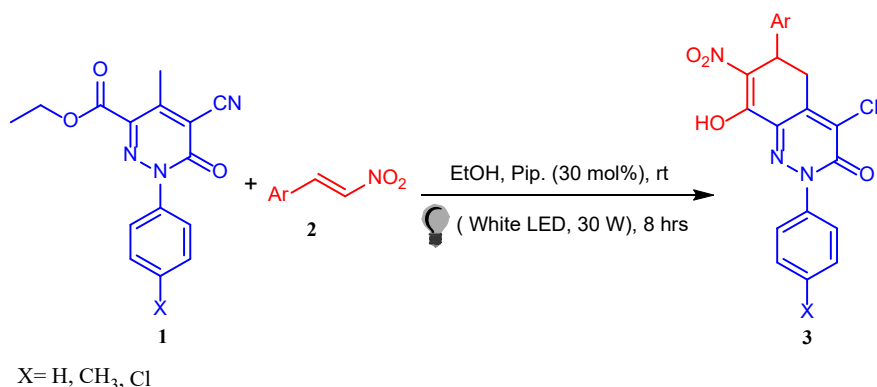


Tahany Mahmoud Mohamed*, Ramadan Ahmed Mekheimer, Afaf Mohamed Abdel Hameed, Mohamed Abd-Elmonem , Kamal Usef Sadek

Chemistry Department, Faculty of Science, Minia University, Egypt

Visible light in heterocyclic chemistry: An efficient and environmentally friendly protocol for the synthesis polyfunctionalized substituted cinnolines

Visible light has evolved into a widely used for many types of transformations in organic synthesis [1]. Cinnolines are interesting classes of heterocycles owing to their strong pharmaceutical and medicinal activities [2,3]. In the current study, we developed a simple and efficient synthesis of polyfunctionalized substituted cinnoline derivatives (3) that relied on reaction of ethyl 5-cyano-4-methyl-1-aryl-6-oxo-1,6-dihydropyridazine-3-carboxylates (1) with nitrostyrene (2) in visible light (White LED, 30 W) and catalysed by piperidine with ethanol as a solvent (Scheme 1). This method seems to be green, simple and with high atom economy.



Scheme 1. Synthesis of Polyfunctionalized Substituted Cinnoline derivatives.

Audience Take Away:

- This work provides a facile method for the synthesis of bioactive cinnolines.
- It will encourage synthetic chemists to use visible light as an alternative approach.
- It will contribute to the idea of making chemistry greener.

Biography

Mrs. Tahany Mahmoud Mohamed studied Chemistry at Sohag University, Egypt and graduated with BSC in 2000. She works as a senior chemist at Sohag Cancer institute. She joined the research group of Prof. Kamal Usef Sadek at Faculty of Science, Minia University and graduated as MS in 2012. With Prof. Sadek group, she is going to finish PhD degree by the end of this year.



**Lina María Grajales^{1*}, Gabriel Tavares Silva¹,
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Lipases from brazilian agroindustrial residues aiming to biodiesel production

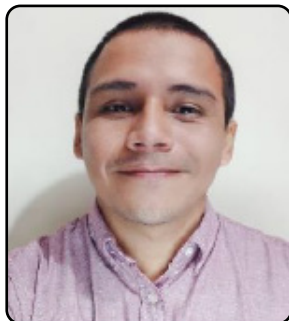
Enzymatic catalysts play an important role in the industrial sector, because they catalyze many reactions at room temperature and pressure, making the process more economical. Lipases are enzymes that have a great biotechnological potential. Their most common applications are regarding food, leather, cosmetics, detergent and paper. It is also used in, the pharmaceutical, medical and textile industries. But most importantly, it is crucial for a sustainable biodiesel production. However, lipase uses are still limited due to its high production costs. An economical way to produce lipases is through Solid-State Fermentation (SSF) processes by using agroindustrial residues as substrates. Hence, this work aimed to analyze the production of lipolytic enzymes from the fungus *Metarhizium anisopliae* by solid-state fermentation (FES). Babassu coconut bagasse, soy bran (from oil extraction and soy milk production), broken rice, wheat bran, and corn bran were used as substrates. Pretreatments on the substrates and the use of an inducing agent (olive oil) were carried out to verify their necessity on lipase production. Preliminary experiments showed that for babassu coconut bagasse there is no need for pretreatment. The results showed that there was no statistical difference in lipolytic activity between broken rice and soybean bran when the experiments were performed with or without pretreatment. Pretreatments for corn bran and soybean bran showed a statistical difference in the results. The highest enzymatic activities were obtained for the experiments carried out without pretreatment. Therefore, subsequent fermentations were carried out without pretreatments. Regarding the experiments without using inducers, soybean bran (residues generated after soy milk production) was the one that showed the highest enzymatic activity with 6.67 ± 1.90 U/mL. Wheat bran had the lowest enzymatic activity with 3.68 ± 0.72 U/mL. Concerning the experiments carried out with the inducer, the substrate that presented the highest enzymatic activity was the babassu coconut bagasse with 16.34 ± 0.38 U/mL. Soy bran had the lowest enzymatic activity with 5.33 ± 1.15 U/mL. In conclusion, for all the treatments evaluated, the highest enzymatic activity obtained was for the experiments carried out with babassu coconut bagasse as a substrate, using an inducing agent, and without using any type of pretreatment. The next step will consist of the biodiesel production from the lipases produced. These experiments could be carried out using free or immobilized lipases, in order to use homogeneous and heterogeneous catalysts and compare some variables such as production costs, reusability or operational stability.

Audience Take Away:

- It is possible to get new sustainable resources from agroindustrial residues in order to obtain lipases.
- An environmentally friendly way to produce lipases through Solid-State Fermentation (SSF) processes from agroindustrial residues. It could also be a cheaper process.
- Babassu coconut bagasse, soy bean (from oil extraction and soy milk production), broken rice, wheat bran, and corn bran are potential substrates in order to obtain lipases from the fungus *Metarhizium anisopliae*.
- Experiments using free or immobilized lipases must be carried out in order to produce biodiesel and to compare some variables such as production costs, reusability or operational stability.

Biography

Chemical Engineer graduated from the National University of Colombia, UNAL. She holds a master's and doctoral degree in Engineering and Food Science from São Paulo State University, UNESP. She has a Postdoctoral internship in Chemical Engineering at UNAL. She is a Professor at the Federal University of Tocantins, UFT, in the undergraduate course of Food Engineering and in the Graduate Program of Digital Agroenergy. She is a coordinator of the Support Group for Foreigner Students. She coordinates the Research Group "Bioreactor Engineering". Her expertise area is in developing rotary-drum and fixed-bed bioreactors for Solid-State Fermentation aiming at biofuels production.



Carlos Suarez*, Rogerio De Almeida

¹Chemical Engineering Faculty, National University of San Marcos/
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Production of high-quality CuNi thin films using magnetron sputtering

Cu-Ni alloys are widely used in mining and metallurgical work, in the chemical industry due to their high resistance to corrosion, mechanical and catalytic properties. Furthermore, Cu-Ni alloys have received much attention for their thermophysical and magnetic properties and are also used for decorative purposes. They are applied to valves, hardware, condensers and heat exchangers, due to their excellent thermal and electrical properties and are particularly resistant to bio-contamination. CuNi alloys are normally manufactured by electrolytic processes. In recent years, interest in making films using less polluting process than electrolytic baths have increased considerably. However, the commercial electrodeposition of these alloys in cyanide baths as an example produces high quality deposits, but environmental problems arise in the use and disposal of this component. The use of plasma technologies for the deposition of thin films has been studied and, despite being a more complex and costly technology, it has the advantage of generating practically no waste. There are many techniques to generate plasma. In this work plasma equipment generated by magnetron sputtering will be used. From the bibliographic review, it could be observed that there is not much research on the properties of thin films of binary CuNi alloys produced by plasma technologies. The aim is to investigate thin films composed of metal alloys produced by plasma and to be able to obtain the parameters of the process so that a stable, homogenous and reproducible thin film will be obtained. We start with the production of an alloy Cu-Ni (70-30) produced by vacuum arc remelting process, so we obtained the targets that are going to be used in the magnetron sputtering, then using a high vacuum magnetron sputtering process with a flux of argon we obtained a Cu-Ni thin film deposited in a glass substrate, finally this thin film is characterized by SEM.

Audience Take Away:

- They can extrapolate the information learn in this presentation so they can apply and replicated in similar alloys for the production of thin films, using magnetron sputtering is going to be a more environmentally friendly process compared to normally use electrolytic baths.
- The audience that are not in touch with this technology can learn a new process for thin film production.
- This is a more environmentally friendly process so the audience can obtain thin films that before were produced by electrolytic baths.
- This is a novel process that, so far, has not been used in this alloy so there is a high potential for new materials production with this technique.

Biography

MSc. Carlos Suárez currently working for his doctor degree in Chemical Engineering in San Marcos University, studied chemistry at The San Marcos University, Perú and graduated in 2013 and in 2015 he started his MSc degree in pontifical catholic university of Perú, having a internship in Dresden Germany for his Ms. Thesis, obtaining the master's degree in Engineering and Material science in 2017. He has constantly been working in Material Science Publishing in 2019 in the polymer Bulletin his first international article. He is currently working in thin film materials.

SPEAKERS

DAY 01

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05-07 SEPT



Sadia Ameen

Energy Materials & Surface Science Laboratory, Solar Energy Research Center, School of Chemical Engineering, Jeonbuk National University, Jeonju, Republic of Korea

Multi-dimension metal oxides and organic electronic catalysts for environmental remediation

Metal oxides and organic semiconducting (electronic materials) remain of vital interest in the field of electrochemistry for their flexibility in chemical and electrochemical behavior. Electrochemical sensors are becoming popular, owing to their good detection performances, ease of operation, less expensive, fast, and selective analytic technique. The sensing performance is highly influenced by the electrode materials for enhancing the catalytic effects and elimination of interferers thus, it is of great importance to design new electrode materials. For developing electrode materials, we can hardly ignore metal oxides nanomaterials and conjugated organic semiconductors due to their high electrical conductivity, highly efficient, tailorable charge transport characteristics, and rapid signal transduction. Due to associate π -conjugation in the backbone of conjugated organic semiconductors, they exhibit a direct interaction with the analyte in a redox process and thus, help in increasing the selectivity and sensitivity. So far, metal oxides of different morphologies and dimensions are promising as sensing electrode materials for the detection of various harmful chemicals. S. Ameen et al. fabricated hexagonal ZnO nanopyramids (NPys) modified disposable screen printed electrode (SPE) chemical sensor which showed a good sensing behavior with a sensitivity of $\sim 293.5 \mu\text{A}/\mu\text{M}/\text{cm}^2$ and limit of detection (LOD) of $\sim 17.3 \mu\text{M}$ toward the detection of dichloromethane. In other work, S. Ameen and co-workers reported Indandione oligomer@graphene oxide functionalized nanocomposites for enhanced and selective detection of trace Cr^{2+} and Cu^{2+} ions. In this work, we present the multi-dimensional metal oxide nanomaterials and conjugated organic semiconductors as electrode materials towards the detection of hazardous chemicals. The advantages of utilizing multi-dimensional metal oxide nanomaterials and conjugated organic semiconductors as electrode materials are these high yield materials are prepared by a facile and accessible low cost processes, these materials display a large surface area and thus, show enhanced electrochemical properties towards chemical sensing applications, and most importantly promising sensing parameter i.e, a high sensitivity with wide linear response range are obtained by using these electrode materials.

Biography

Professor Sadia Ameen is working as Associate Professor at Department of Bio-Convergence Science, Jeongeup Campus, Jeonbuk National University, Republic of Korea. Her current research focuses on Perovskite solar cells, Field emission transistors (FETs), Organic solar cells, Sensors (Chemical and Biosensors), Catalysts, and Optoelectronic devices. She is preoccupied with supervising and advising students in the domains of energy conversion, clean energy materials and catalysis, undertaking research that results in regular publication in internationally rated journals, developing core curriculum and teaching course material effectively. Professor Sadia Ameen's recent accomplishments are witnessed in published research papers, invited talks in conferences and seminars, contributions to book chapters, edited books, and authored national and international patents. She is proud recipient of honors and accolades in science to include a few: 1. Certificate of Excellence (2022), 2. Asia's Top-50 Scientist Award (2021), 3. Excellence in Research Award (2021), 4. Outstanding Scientist Award (2021), 5. Named among TOP 2% scientists in the world (2020, 2021), 6. Best Researcher Award (2016), 7. Awarded by National Research Foundation of Korea (NRF) Postdoctoral Fellowship for Foreign Researchers (2011), Jeonbuk National University, South Korea, 8. Awarded by Jeonbuk National University Post Doctoral Fellowship (2008-2010), South Korea, 9. Selected for Marquis Who's Who, 28th Edition, (2011), 10. Best Paper Presentation Award, KICChE (Korean Institute of Chemical Engineers), South Korea (2010), 11. Gold Medal Winner in Academics, and Merit Scholarship and Certificate Holder (2003).

**Vahide Nuran Mutlu^{1,2*}, Selahattin Yilmaz²**

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Enhanced catalytic performance of sulphated TiO₂-SiO₂ by La promoter for butyl glucoside synthesis

Alkyl glucosides are non-ionic chemicals with excellent properties such as low toxicity and good biodegradability. They have attracted the interest of researchers due to their diverse applications as food emulsifiers, personal care products, cleaning agents, textile lubricants, drug carriers and antimicrobial agents. Alkyl glucosides are termed as green surfactants since they are synthesized using renewable carbohydrates and alcohols. Conventionally, homogenous acids such as mineral acids (HCl, HF, and H₂SO₄) and p-toluenesulfonic acid are used for the alkyl glucoside production. However, they suffer from problems related with waste recovery, environmental hazards, corrosion and difficulties in catalyst recovery and product purification. Heterogeneous catalysts improved the Fischer glycosidation, but there is a constant need to develop active, selective and reusable heterogeneous catalysts. Sulphated metal oxides might be considered as alternative solid acid catalysts due to their high acidity, high activity, easy separation and recyclability, but they have stability problems due to the surface sulphate leaching. Mixed oxides were studied to overcome this limitation, and they showed better activity and thermal stability than their constituent single oxide. Titania-silica mixed oxides have been extensively reported in the literature. Different methods have been developed for their synthesis such as co-precipitation, impregnation, flame hydrolysis, chemical vapour deposition, etc. Besides them, the sol-gel method has high potential for controlled surface properties by tuning the preparation conditions. In this study, a series of La promoted sulphated TiO₂-SiO₂ catalysts were prepared by sol-gel with different La amounts and sulphate loading, as novel catalysts for this reaction. The effect of different La and sulphate amounts on the properties, activity and stability of the catalysts were investigated. Reaction temperature and catalyst amount were also studied as reaction parameters. The catalyst characterization was performed using N₂ adsorption, XRD, XRF, NH₃-TPD and pyridine adsorbed FTIR. The results showed that, the acidity and the amount of Brønsted acid sites (B/L ratio) was enhanced with La and sulphate loading while the surface area and pore size decreased. The catalysts were tested in butyl glucoside synthesis. Catalytic activity changed depending on the acidity and the amount of Brønsted acid sites. The highest butyl glucoside yield (71.4 %) was obtained over S1/La₄-TiO₂-SiO₂ catalyst which had the highest acidity and B/L ratio. Lower glucose conversion and butyl glucoside yield was obtained at lower reaction temperature. The initial butyl glucoside formation rate also decreased with reaction temperature. The increase in the catalyst amount caused a slight increase in both glucose conversion and butyl glucoside yield. No significant change was observed in the initial butyl glucoside formation rate. When the catalysts with different La amount were compared, it was found that the stability was improved with La addition. This proved that the La promoter enhanced the interaction between sulphate groups and TiO₂-SiO₂. The stability of the catalysts was proved by the results of the reusability tests.

Acknowledgements

This study was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) with project number of 117M160. Their support is gratefully acknowledged. The authors are also thankful to IZTECH environmental Research Center for the product analysis'.

Audience Take Away:

- The study exhibit the synthesis method and performance test results of La promoted sulphated titania-silica mixed oxide catalysts with high surface area, mesoporous structure and high stability for the alkyl glucoside production.
- The details of the sol-gel synthesis procedure might be useful to develop mesoporous mixed metal oxides with high surface area and acidity. This type of catalysts are applicable for various acid catalyzed reactions.

- La promotion is proved to be an effective approach to prevent the sulphate leaching and to enhance the stability of the catalyst.
- The results of the study showed that the La promoted sulphated titania-silica mixed oxide catalysts are promising alternatives for the production of alkyl glucosides. Alkyl glucosides can be produced via more environmentally friendly process with the use of the heterogeneous catalysts prepared.

Biography

Dr. Vahide MUTLU is a Process Development Senior Specialist in SOCAR R&D. She got her PhD in Chemical Engineering, M.Sc in Material Science and Engineering, and B. Sc in Chemical Engineering at Izmir Institute of Technology, Türkiye where, she worked as a research assistant for 9 years. Her research interests are design & synthesis of solid catalysts, catalytic conversion of biomass to chemicals, catalytic processes and materials for renewable energy and chemical synthesis. She has expertise in catalyst preparation and characterization and reaction engineering.



Chau-Ming So^{*1}, On-Ying Yuen², Shan-Shan Ng³, Zicong Chen⁴

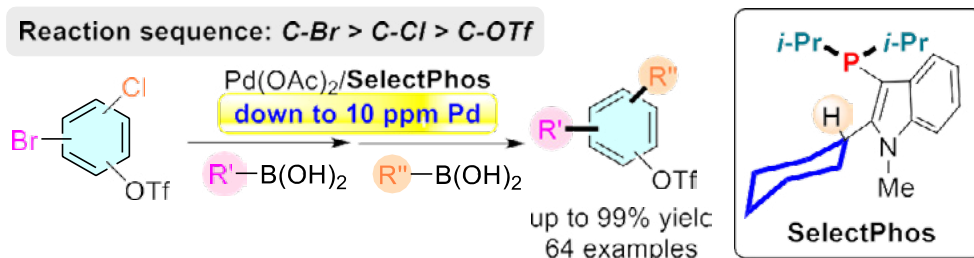
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Design of alkyl-heteroaryl-based phosphine ligands and their application in chemoselective coupling reactions of polyhalogenated aryl triflates

Aryl bromides, chlorides, and triflates are the most widely used electrophiles in pharmaceutical, industrial, and routine synthesis. However, having the approximate reactivity order of $C-I > C-Br \approx C-OTf >> C-Cl$, we are still always struggling with multiple factors and drawbacks during the use of multiple(pseudo)halides. For each substrate, we need to carefully consider and perform tedious trial and error of the use of ligand, base, solvent, temperature, and steric and electronic biases of the substrate itself. As ligands are indispensable factors in cross-coupling reactions, developing the appropriate ligands that can easily alternate the reactivity sequence is an extremely attractive strategy to align with the ideal synthetic pathways. In this study, we have newly designed and developed a series of phosphine ligands with a C_2 -alkyl group on the indole ring and realized the chemoselective cross-coupling processes of polyhalogenated aryl triflates (e.g., Suzuki-Miyaura coupling reaction). The Pd/SelectPhos system showed excellent chemoselectivity toward the $Ar-Cl$ bond in the presence of the $Ar-OTf$ bond with broad substrate scopes and excellent product yields. The chemoselective reactions are easily be scaled up to the gram scale. Especially in the Suzuki-Miyaura reactions, the use of parts per million levels of Pd catalyst (as low as 10 ppm Pd) is achieved. A further mechanistic investigation with the X-ray crystallographic data and the computational studies suggested that the methine hydrogen and the steric hindrance offered by the C_2 -alkyl group play a key role in reactivity and chemoselectivity.



Audience Take Away:

- We anticipate that this finding would be of interest to the general organic chemistry audience, especially to those in the fields of ligand design and catalysis. The benefits of this protocol are shown as follows.
- The reaction sequence can be directly manipulated.
- It can be time- and effort-saving for the correct prediction of the actual chemoselectivity of Pd-catalyzed cross-coupling reactions using multiple(pseudo)halides.
- The choice of synthetic routes in actual applications would be significantly broadened.
- The chemodivergent approach is useful in the synthesis of pharmaceutically active molecules and functional materials.

Biography

Dr. Chau-Ming So is currently an Assistant Professor in the Department of Applied Biology and Chemical Technology at The Hong Kong Polytechnic University. He received his B.Sc. (1st class honor) from PolyU in 2006. He pursued his postgraduate study at the same institution and obtained his Ph.D. degree in 2010. In 2012-2013, he moved to Institute of Materials Research and Engineering (IMRE) as the postdoctoral fellow in Prof. Tamio Hayashi's research group. So's research interests focus on the development of ligands and their application in transition metal-catalyzed chemo-/regio-/enantioselective reactions. He has published 62 papers in well-recognized SCI journals and licensed several patents.



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Fabrication of calcium bismuth oxide catalysts

This paper aims to study new bulk materials with exceptional photocatalytic activity, a key property for next-generation environmentally friendly technologies. The approach relies on the idea to use these materials to support the degradation of toxic pollutants and strong dyes. Catalysis is an important technology in an environmentally friendly, energy-efficient industry because it allows chemical reactions to occur at lower temperatures due to high activity, prevents the formation of harmful waste due to high selectivity, and is sustainable due to the high stability of the catalyst material. Bulk with a crystalline structure based on calcium bismuth oxide was obtained by precipitation method followed by calcination. The as obtained materials were characterized by X-ray powder diffraction (XRD) which provides a rapid phase identification of a crystalline material and information on unit cell dimensions competed by with Raman Spectroscopy a non-destructive chemical analysis technique which insures expressed details about phase connected with chemical crystalline structure and polymorphy. The FTIR spectra were carried out with a Thermo Scientific Nicolet 6700 FT-IR spectrometer, using KBr pellet technique in order to determine the molecular fingerprint. The thermal behaviour of the sample was evaluated based on thermal analysis (TG-DTA) carried out with a Mettler-Toledo TGA/SDTA851 (heating rate 5 °C/min, air flow 60 mL/min). An evaluation of catalytic activity of catalysts toward a degradation of Rhodamine B (RhB) was studied. The experiments were performed using suspensions of 30 mg catalyst particles continuously mixed with a magnetic stirrer at 500 rpm in the absence of irradiation in 30 mL RhB aqueous solution with an initial concentration of 1.5 mg L⁻¹. The removal of Rhodamine B by calcium bismuth oxide under dark conditions was almost 40% in 4 hours with a calculated rate constant for removal of organic pollutant of 0.002 min⁻¹.

Audience Take Away:

- The scientific audience could use this presentation in order to obtain new or better and deeper insight on the bismuth based materials in form of ABiO₃ with controllable characteristics and their potential applications.
- The audience will be able to use what they have learned in the evaluation of calcination temperatures on the effect it has on the structural properties of catalysts.
- The audience will be able to choose the most suitable temperature for the calcination of their catalysts using the TG analysis.
- Fast development of a new catalyst with a high rate of Rhodamine B removal under dark conditions.

Biography

Florina Rus studied Materials Engineering at the Politehnica University of Timisoara, Romania and graduated as PhD in 2014. During this time she did a short research stage of approximately 8 months in Leibniz Institute for Solid State and Materials Research in Dresden where she gained experience on growing films using pulsed laser deposition technique. She then joined the research Institute for Research and Development in Electrochemistry and Condensed Matter, Timisoara, Romania. She has published more than 25 research articles in Scopus database.



Abdulaziz Alturki

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Optimization of a heat exchanger network for a multi-product refinery

Petroleum refineries consume slightly over 5.83 quadrillions Btu of energy per year, about 7.7% of total energy consumption in the United States in 2019 and about 22% of total industrial energy consumption. Although only a small portion of refinery fuel is crude oil; energy consumption is frequently proportional to the amount of crude oil required; refinery fuel consumption accounts for approximately 12% of crude oil input to refineries. This study evaluates a crude oil refinery's energy and environmental sustainability metrics of multiple distillation columns. The refinery's feedstock was determined to be 120 000 barrels per day of crude oil. The primary aim is to determine the feasibility of reducing the refinery's thermal energy consumption and CO₂ emissions to achieve a more sustainable operation. The considerable energy requirement of crude oil distillation columns is met by expensive utilities such as steam and fuel for fired heaters and heaters, which poses energy savings opportunities via the heat exchanger network (HEN) that minimizes utility costs maximizing heat recovery. We performed pinch analysis using the energy analyzer to address energy intensity metrics to design and optimize the heat exchanger network system for process heat integration. We have applied the pinch technology concept to improve heat recovery and hot and cold utilities for the primary process units without restrictions or constraints. The results indicate that using an energy analyzer and carbon tracking, it is possible to identify the energy and environmental sustainability metrics associated with an existing design and significant improvements for lowering thermal energy costs and carbon dioxide emissions in a crude oil refinery operation. Given these high energy values for the utilities equivalent to 1512 GJ/h, an integrated case was developed to reduce the energy consumption from external sources by utilizing some of the process heat. The reduction in this modification's hot and cold utility requirements was 333 GJ/h, equivalent to 22%. Such reductions in energy requirements can provide savings equivalent to 46.89 MM\$/year.

Audience Take Away:

- Learn the importance of applying energy optimization techniques to existing facilities which could help reduce energy and CO₂ emissions.
- This presentation will help the audience in their job by the techniques needed to optimize the energy of existing facilities. It provides a practical solution to the current problem of refineries consuming high energy, which could negatively affect the environment.

Biography

Abdulaziz Al-Turki is an assistant professor at King Abdulaziz University (KAU). Prior to KAU, Abdulaziz was a Ph.D. student in the Department of Chemical and Biomolecular Engineering at UCLA, and before then, he was a process/supply planning engineer with Saudi Aramco. Abdulaziz's research expertise is in catalytic reaction synthesis, adsorptive separation processes, and process integration and intensification of chemical engineering processes. Abdulaziz received his B.S. in chemical engineering from the University of Leeds, U.K., in 2012 and his Ph.D. in chemical and biomolecular engineering from UCLA in 2020.



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Catalytic cracking of ricinoleic acid methyl esters to produces castor oil derivatives

The continuously increasing population and industrialization have triggered a demand for fossil fuels. Thus, rising demand resulted in an exponential increase in the amount of anthropogenic carbon dioxide emissions and other gases produced during the consumption of non-renewable resources, which cause serious problems for health risks. This results in an increase in the amount of greenhouse gases that contribute to global warming and spurs the search for a green path based on alternative energy sources that will alleviate the difficulties associated with CO_2 emissions and so contribute global warming mitigation. A green energy source, castor oil is a sustainable feedstock for chemical process industries as it contains 56 wt.% of the seed. The presence of ricinoleic acid in castor oil is about approximately has made it more important than other edible and non-edible oils. This ricinoleic acid has a carboxylic acid, a double bond, and a secondary alcohol or hydroxyl group, which allows for the conversion or modification of castor oil into a variety of valuable derivatives products depending on the application. Due to the high viscosity of castor oil, catalytic cracking is very difficult, and the resulting products are uneconomical, affecting products recovery. As a result, the transesterification of castor oil provides a means of circumventing these problems. When subjected to the optimum temperature, castor oil methyl esters break from the hydroxyl position, forming heptaldehyde and methyl undecenoate. Specifically, heptaldehyde and methyl undecenoate are critical raw materials for the synthesis and production of value-added chemicals used in a variety of industrial applications, including foods, lubricants, plastics, rubber, electronics and telecommunications, cosmetics, perfumeries, and pharmaceuticals. The conversion of castor oil methyl ester was carried out in a micro fixed-bed reactor over Ni/HZSM-5. By Impregnating commercial HZSM-5 with nickel ion, the acid sites of Lewis were increased, and the concentration ratio of Bronsted acid and Lewis acids in the catalyst was improved. The greatest yields of heptaldehyde and methyl undecenoate were achieved using the Ni/HZSM-5 catalyst, at 27.5 and 43.8 wt.%, respectively. Additionally, Ni/HZSM-5 significantly decreased the catalyst coke concentration while enhancing the selectivity of the desired product yield. Ni/HZSM-5 zeolite displayed strong catalytic activity and a favourable nature for the efficient synthesis of high-valued chemicals from castor oil derivatives.

Audience Take Away:

- The castor plant is adapted to a wide range of climates. The castor plant is monoecious and self-fertile, bearing numerous seed pods that develop on a raceme. While castor grows on agriculturally marginal lands and will produce some seed and oil without agricultural inputs, it benefits considerably from the inclusion of fertilizer. Since the main use of the castor plant is castor oil production, traits that enhance the oil content are of greatest interest.
- Oleo-chemicals from Castor experience a meaningful pattern within the chemical industry. India, being a world leader in Castor seeds and Castor oil production and processing has edge over other countries like Japan, France and Germany who are importing castor oil and manufacturing these perfumery chemicals for further processing into perfumes and Synthetic flavors.
- Growth in the world's most developed markets will continue to be moderate, restrained by market maturity, consolidation in flavors and fragrances using industries and strong downward pressure on prices. Flavor and fragrance is looking for products from natural sources and prefer to use raw materials which are harmless and bio-degradable.
- Working towards a substantial degree of price stability, eliminating frequent short term price volatility, in the first stage.
- Leverage the country's strengths to grab the opportunity of becoming a world class manufacturer of Value-Added Derivatives, serving consumers all over the world with end products.
- Establish direct contact with the end consumers, understand their specific applications and be of service through "solution selling" improving performance of consumers' finished products.

Biography

Mr. Sagarkumar Yogesh Dhanuskar earned a bachelor's degree and master's degree in Chemical Engineering from RTMNU University, Nagpur in 2014 and 2016. The B.tech project was titled "Distillery wastewater treatment using a membrane bioreactor," while the M.tech thesis was titled "Studies on cottonseed oil transesterification." During internship at CSIR_NCL in Pune, he also worked on "Poly(l-lactide) ionomers." A fourteen-month project at IIT Guwahati focused on "Supercritical fluid extraction of natural antioxidants for food preservation from spices and non-conventional fruits endemic in the northeastern region". I am now pursuing a doctorate at Indian Institute of Technology Delhi. I am now working on "Development of second and third generation castor oil derivatives." With Prof. Kamal Kishore Pant and Prof. Satya Narayan Naik.



Prof. Dr. Anjali Patel

Polyoxometalate and Catalysis Laboratory, Department of Chemistry, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India

Catalysis engineering based on polyoxometalates

Polyoxometalates chemistry is a key emerging area that promises the development of a new generation materials which finds numerous applications in the areas of material science, medicine and catalysis. A discrete class of metal-oxygen clusters, Polyoxometalates (POMs) have gained tremendous attention for their opportune shapes, sizes, composition and structural diversities. Their best advantage is their ability to modify at molecular level, giving rise to second, third and fourth generation materials. In this context, the Transition Metal Substituted Polyoxometalates (TMSPOMs) have attracted significant attention in catalysis due to tuning of redox properties and ability to show variable oxidation states. The unique catalytic activity makes them promising environmentally benign heterogeneous catalysts. In the present talk, engineering of catalysts based on Lacunary Phosphotungstates (PW_{11} & PW_{10}) and Transition metal, Copper (Cu) will be discussed for example mono copper substituted phosphotungstate ($PW_{11}Cu$), di copper substituted phosphotungstate ($PW_{10}Cu_2$), ligand (L = imidazole & s-phenylethylamine) functionalized copper substituted phosphotungstate ($PW_{11}Cu_L$) and supported $PW_{11}Cu$ will be discussed. Their catalytic activity for one of the industrially important organic transformations, oxidation/epoxidation of styrene will be conversed. Further kinetics and mechanistic aspects will also be discussed.

Audience Take Away:

- The diversity in the designing of catalyst based on polyoxometalates are open towards developing highly product selective catalyst for industrial important reactions, such as hydrogenation and oxidation.
- By taking the advantages of their properties, there is a large scope to explore new applications for example, Biomass conversion, which is an upcoming field in current scenario.
- It is useful for the audience to develop hybrid compounds based on POMs for example, supported TMSPOMs and functionalized TMSPOMs, by different chiral moieties, which will be helpful especially for asymmetric oxidation and water oxidation.

Biography

Dr. Anjali Patel, Professor (Inorganic Chemistry) and former Offg. Head, Department of Chemistry, The Maharaja Sayajirao University of Baroda, joint director of BSc. HPP, M.K. Amin Arts and Science College, Padra, Vadodara, Gujarat. Her research interest focuses on Polyoxometalates and Catalysis. She has 134 papers in international journals, 5 reviews (Highest IF-40.50), 3 patents, 6 book chapters and 2 books to her credit. She has visited various countries for delivering lectures at international conferences. she has been awarded the prestigious Fellow of the Royal Society of Chemistry (FRSC) and member of different committees/societies at national level.



Prakash Kumar Sarangi

College of Agriculture, Central Agricultural University, Imphal, India

Ferulic acid esterase as biocatalyst in lignin biorefinery having industrial applications

Ferulic acid (FA) chemically known as 4-hydroxy-3-methoxycinnamic acid is a ubiquitous phenolic compound in plant tissues. It is the most abundant hydroxycinnamic acid widely found in vegetables, fruits and some beverages. This compound has been reported to possess many physiological functions such as antimicrobial, anti-inflammatory, anti-thrombosis anti-cancer activities etc. It is one of the metabolites of lignin biosynthesis and is found both in free and conjugated form in plants. These are found covalently linked to polysaccharides by ester bonds and to components of lignin by ester or ether bonds. Ferulic acid esterase (FAEs EC 3.1.1.73) being a subclass of the carboxylic acid esterases plays a central role in degradation of intricate structure of the plant cell wall by cleavage of ester bonds between hydroxycinnamic acids esterified to arabinoxylans (AXs) and certain pectins present in plant cell walls. Various studies were conducted regarding the action of FAE by using different microorganisms for production of ferulic acid. Varieties of crop residues those are rich in lignocellulosic biomass could act as a renewable resource for the extraction of FA having wide range of applications in food and pharmaceutical industries.

Audience Take Away:

- Audiences will get information about bioconversion of waste biomass towards production of wide array of biochemicals having long applications in industrial sectors. The mode of enzymatic actions and routes into various metabolites will be learnt from this speech. Additionally, role of microbial originated FAE and their actions will be cleared from the concept.

Biography

Dr. Prakash Kumar Sarangi is a Scientist with specialization in Microbiology at the Central Agricultural University in Imphal, India. Dr. Sarangi's research is focused on bioprocess engineering, biochemicals, waste biomass utilization and sustainable development. His expertise is in bioconversion of biomass into biofuels, biochemicals and nutraceuticals, as well as environmental waste remediation. He has taken leading roles as the investigators in different R&D projects on biomass conversion and microbial biodegradation into value-added products. He has more than 12 years of teaching and research experience in Biochemical Engineering, Microbial Biotechnology, Downstream Processing and Food Microbiology. He is serving as the Editorial Board member for many international journals.

KEYNOTE FORUM

DAY 02

12TH EDITION OF GLOBAL CONFERENCE ON

**CATALYSIS, CHEMICAL
ENGINEERING AND
TECHNOLOGY**

05-07 SEPT



Dr. Anne M. Gaffney

University of South Carolina, Columbia, South Carolina, USA

New perspectives and insights into silver catalyzed direct propylene epoxidation

A series of Ag-based catalysts were studied for direct PO epoxidation with O_2 as the oxidant. Ag supported on $CaCO_3$ and $\alpha-Al_2O_3$ were prepared as base materials to study. Promoters (K^+ , Cs^+ , Mo) and feed additives (EtCl, NO, CO_2) were added to the catalyst and feed stream, respectively, in order to evaluate their effects on PO selectivity and yield. Ball-milling of the catalyst during preparation was a significant factor in ensuring proper blending of promoter species in the Ag particle. Surface characterization (chemisorption, XPS, SEM-EDX), bulk composition characterization (XRD, ICP-OES), and reaction kinetic evaluation were conducted to understand the nature of PO selectivity.

Biography

Dr. Anne M. Gaffney is the Chief Science Officer of Idaho National Laboratory and Distinguished National Lab Fellow (2014 – present). She has thirty-four years of experience working in industry inventing and commercializing new technologies for major chemical manufacturing companies including Koch Industries, Lummus Technology, Dow, Dupont and ARCO Chemical Company. She has authored 155 publications and 257 patents. Dr. Gaffney is also a distinguished Joint Appointment Fellow at the University of South Carolina (2018 – present) where she is the Technical Director of the National Science Foundation Center for Rational Catalyst Synthesis. Some of her recent awards include: the 2019 American Chemical Society, Energy & Fuels, Distinguished Researcher Award in Petroleum Chemistry; the 2015 Eugene J. Houdry Award of the North American Catalysis Society; the Chemical Heritage Foundation, Women in Science Inductee, 2014; and the American Chemical Society, Industrial Chemistry Award, 2013. Dr. Gaffney received her BA in chemistry and mathematics from Mount Holyoke College and her Ph.D. in physical organic chemistry from University of Delaware.



Ahmet Haxhiaj PhD*¹, Bajram Haxhiaj²

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Environment management and advancing technological processes for technical lead production

In this talk we aim to present the analyses of the composition of agglomerate that is used in Shaft-water-jacket furnace in Trepça. It is also analyzed the theoretical and real consumption of the coke for technical lead produced. The aim of the research is to optimize the parameters of the technological process in order to increase quantity of the technical lead produced by minimizing the quantity of lead in agglomerate and gases in the furnace. The data presented are supported in the work of Shaft furnace and are a result of the theoretical and experimental study of the quantity of scoria and the percentage of the lead in the scoria. The presentation especially emphasizes the increase of the technical lead and minimizing the quantity of the lead in the scoria. The research also emphasizes the reduction in energy consumption and the improvements in the environment protection. The Institute Vniicvetrnet has concluded that the future of the lead metallurgy and lead production with economic and environmental sustainability stands on the processes with direct reactive melting in the Kivcet Process. The research has analyzed Kivcet processes for the possibility of utilizing it in the lead production in Trepça company.

Audience Take Away:

- The article helps the audience in the production technical lead.
- The article offers process solutions with economic benefits.
- The article offers new parameters for the advancement of the production.

Biography

Professor Ahmet Haxhiaj was entitled PhD by University of Prishtina, Faculty of Mining and Metallurgy, with topic “Intensify and Optimize the Reductive Process of Melting the Lead Agglomerate in Port-Piri Furnace” in 2003. In 1989 he finished post-graduate studies at University of Zagreb, Faculty of Metallurgy, Sisak. He studied Metallurgy Science and presented a master thesis in “Materials and Heat Balance in Port-Piri Furnace”. In 1978 graduated in the topic “Indium Composition in Products and Inter-products of Lead and Zinc, and Separation Process of Extracting Indium in Trepça. He currently lectures in the Department of Metallurgy and Materials, Faculty of Geoscience, University of Mitrovica and Faculty of Applied Arts at University of Peja. He published more than 42 papers and is a member of the Alb-shkenca board. Since 2016 is the Editing Chief on IJMPM “International Journal Minerals Processing Extractive Metallurgy. In 1983-1993 he worked in the Zastava laboratory in Peja në thermal processing and was the manager of four projects in this field. In 1978-1983 he worked in the Lead Metallurgy in Zveqan, Trepça.

**E. Meloni*, V. Palma, M. Martino**

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The electrification of chemical engineering as a way for the process intensification

In the Paris Agreement of 2015, UN member states agreed to limit global warming to 2°C versus pre-industrial levels. This would imply reducing greenhouse gas (GHG) emissions by 80 to 95 % of the 1990 level by 2050. In 2019, the United Nations announced that over 60 countries — including the United Kingdom and the European Union (with the exception of Poland) — had committed to. Regarding this ambitious global challenge, hydrogen is enjoying a renewed and rapidly growing attention in Europe and around the world: in particular, the EU strongly believes that hydrogen represents a key priority to achieve the European Green Deal and Europe's clean energy transition in different sectors. In particular, the electrification of heat provides attractive decarbonisation pathways for industry and will significantly change industrial electricity use in a carbon-constrained world. Similar to electrification in residential and commercial buildings, industrial electrification primarily involves substituting heat generated from combustion for heat generated from an electrical source. Unlike the buildings sectors, however, industry has a much wider range of required temperatures and possible technologies. The recent exponential growth of renewable electricity resources, wind and solar power, provides a major opportunity for the electrification of the industry processes by harnessing low-cost carbon-free energy.

Audience Take Away:

- The presentation could allow the audience to view Chemical Engineering in a new point of view, by identifying the limiting step of a process and consequently generating alternatives in order to implement an innovative process.
- The presentation could help in a sustainable process design, and in a scale-down of an existing industrial process, with the aim for example of a distributed H₂ production.

Biography

Eng. Eugenio Meloni studied Chemical Engineering at the University of Salerno (Italy) and graduated in 2001. He then joined the research group of Professor Vincenzo Palma at the Department of Industrial Engineering of the same University, as research fellow in the field of Catalysis and Industrial Chemistry. His researches involve the formulation, preparation, characterization and testing of structured catalysts for (i) soot abatement emitted by diesel engines or bio-mass combustion plants, and (ii) the intensification of different catalytic processes, also by means of alternative energy sources. At January 2022 He published 65 research articles on international peer reviewed journals, with h-index 17.

SPEAKERS

DAY 02

12TH EDITION OF GLOBAL CONFERENCE ON
**CATALYSIS, CHEMICAL
ENGINEERING AND
TECHNOLOGY**

05-07 SEPT



Adi A. Basri^{1*}, Mohamed Zubair², Ernnie I. Basri¹, Masaaki Tamagawa⁵, Kamarul A. Ahmad¹

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⁴Department of Cardiology, National Heart Institute, Kuala Lumpur, Malaysia

⁵Department of Biological Function and Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

Fluid structure interaction on paravalvular leakage of the undersizing TAVI valve; patient specific case

This study investigated the impact of Paravalvular Leakage (PVL) due to the undersizing Transcatheter Aortic Valve Implantation (TAVI) valve using the Fluid Structure Interaction (FSI) approach. A 3D patient-specific aorta model with an annulus diameter of 27.3 mm was constructed using MIMICS software. The TAVI valve identical to Edward SAPIEN XT 26 and 23 size was implanted into the patient's aortic annulus. The impact of severe aortic stenosis by means of smaller opening of 20% different Geometrical Orifice Area (GOA) was represented in terms of undersizing of TAVI valves in order to investigate the fluid and structure mechanical properties using FSI simulation. TAVI 26 (20% GOA) produced highest and critical value compared to undersize of TAVI 23 (20% GOA) in terms of maximum velocity, highest magnitude of pressure drop, maximum WSS distribution and maximum total mesh displacement. In contrast, the mass flow rate showed that TAVI 23 (20% GOA) produced smaller percentage of uneven mass flow rate distributions at the aorta outlets compared to TAVI 26 (20% GOA). Moreover, the mass flow rate magnitude of PVL complication for TAVI 23 (20% GOA) also showed higher magnitude than TAVI 26 (20% GOA) due to higher area of PVL region.

Audience Take Away:

- The FSI simulation technique on understanding the blood flow behavior of patient specific case.
- The knowledge hemodynamics on undersizing TAVI valve using FSI simulation.
- To have a clear overview on the impact of undersizing TAVI valve with the help of simulation prior to perform actual operation.
- To facilitate the procedure especially for cardiology to envision more realistically the region of interest for both clinician and patient.

Biography

Dr. Adi Azriff Bin Basri is currently a Senior Lecturer in the Department of Aerospace Engineering, Universiti Putra Malaysia (UPM). He received his Doctoral of Philosophy (PhD) from UPM in the area of blood flow behaviour of cardiovascular disease (CVD) with the computational application of Fluid-Structure Interaction (FSI). During his PhD, he also collaborated with National Heart Institute (IJN), Malaysia and Kyushu Institute of Technology (Kyutech), Japan for numerical and experimental studies. In the past, he had received more than 10 awards of gold and silvers from university and national levels related to the project on multi-purpose safety syringe, PUTRA UAV biodegradable natural fiber composite and innovatory pineapple leaves fiber extraction blade for extraction machine. His project of multi-purpose safety syringe acknowledged by other countries such as Indonesia, Australia, South Africa, India, Japan, United Arab Emirates and United States of America since 2011 and until now. Currently, he just received another patent document related to the project on multistage safety cannula/catheter protector. He is also had secured around MYR 244,000 under various research grant as leader and also member. He had graduated 1 master by course student and currently supervising 2 master by research students. He is also co-supervising 10 Phd students and 6 master by research students. He also actively participated in international conferences as invited speaker, presenter and technical committees. Plus, he had experienced in organizing international conferences in Malaysia and Japan. His current research interest is leading him to the wide research applications such medical device development, FSI associated to bio-medical engineering including paravalvular leakage (PVL), transcatheter aortic valve implantation (TAVI), stenosed renal artery, and CVD effects at high altitude flight condition. He is also active in aerodynamics research by implementing the CFD and FSI approach in aerospace field such as in aerodynamics loading lifting line theory, propeller blade, aerodynamics morphing wing and tesla microturbine performance. Moreover, he is also active in experimental and simulation study of structural analysis and material composite. Till date, he has several publications in reputed international and national journals/conferences. He is also a member of Board of Engineers Malaysia (BEM) in 2010.

**H. ILA**

New Chemistry Unit, Jawahar Lal Nehru Centre for Advanced Scientific Research, Bangalore

Design and development of new efficient routes for the synthesis of biologically important heterocycles via catalytic C-C and C-heteroatom bond formation

Small molecule heterocycles play important role in both drug discovery and material science research providing one of the richest source of diversity, besides serving as rigid scaffolds for further display of a range of functionalities. The present lecture will focuss on our recent research directed towards design and development of new, efficient and concise routes for biologically important heterocycles such as indoles, benzothiazoles benzothiophenes, benzofurans, substituted thiophenes, pyrazoles, imidazoles, oxazoles, bisoxazoles etc., involving transition metal catalyzed cross coupling and atom economy reactions such as C-H activation, domino reactions and multicomponent one-pot reactions, from easily accessibly organosulfur building blocks. Some of our recent results involving bio-inspired synthesis of few of non-natural indole alkaloids using β -carboline derived enamnone precursors will also be presented.

Audience Take Away:

- The lecture covers simple one step methods for the synthesis of a broad range of biologically important heterocycles, such as indoles, benzothiophenes, benzofurans, pyrazoles, benzothiazoles thiophenes, oxazoles and imidazoles etc from easily accessible starting materials under mild conditions via transition metal catalysed or transition metal free C-Heteroatom bond formation. These methods can be extended for the synthesis of some important biologically important. heterocyclic targets, under simpler conditions. Definitely, the other faculty can expand their research by using these methods, besides including as part of teaching in heterocycle synthesis.

Biography

Prof. Hiriyakkanavar Ila received her MSc from DAV College, Kanpur in 1964 and was the first woman to receive the PhD in 1968 from IIT Kanpur. She did postdoctoral work at Purdue University, Lafayette in 1969 and was Alexander von Humboldt Fellow at Ludwig Maximilian University, Munich (1984-85). She was a scientist at Medicinal Chemistry Division, CDRI, Lucknow (1970-76) and then moved to North Eastern Hill University, Shillong (1977) as a founding faculty member and continued for nearly 18 years. She moved to IIT Kanpur as Professor (1995) and continued till 2006. She was a Marie-Curie Visiting Fellow at University of Cambridge (1995) and a Visiting Professor at Locker Hydrocarbon Research Institute, USC, Los Angeles (2002), at Institut de Investigaciones, Sevilla, Spain, and at Kuwait University (2007). She has published more than 285 research articles in SCI(E) journals.



Ram Sambhar Shukla

Inorganic Materials and Catalysis Division, Council of Scientific and Industrial Research (CSIR) - Central Salt and Marine Chemicals Research Institute (CSMCRI) Bhavnagar, Gujarat, India

Heterogeneous catalysis for conversion of carbon dioxide to formic acid

Heterogeneous catalysis proffers the potential advantage of easy separation and recycling of the catalyst and easy purification of the products where as it's counter part homogeneous catalysis although affords the advantages of high conversion and selectivity but lacks efficient recyclability of the costly metal catalysts. Carbon dioxide, a potent greenhouse gas produced mainly through the combustion of fossil fuels and deforestation, is drastically contributing to global warming, climate change and pollution. One of the attractive ways is to convert it into useful chemicals due to its availability as plenty, cheap and non-toxic C-1 resource specifically for formic acid as it is a renewable energy storage for H_2 gas. Formic acid is an essential intermediate and chemical feedstock because of it's important applications in textile, dyeing, paper, medicinal agents, tanning agent, preservative agent and in livestock feed. The currently established and practised commercial process for the synthesis of formic acid is in two steps, comprising toxic carbon monoxide at high pressure and high temperature. To avoid the use of toxic carbon monoxide, the promising and potential replacement for the production of formic acid is the direct hydrogenation of very abundant, inexpensive and nontoxic CO_2 using various transition metal based homogeneous and heterogeneous catalyst. Hydrogenation of CO_2 to formic acid is mostly reported under homogeneous conditions by metal based catalysts additionally using liquid base, in which the transfer of the proton to the base favors the reaction. It was conceptualized to use metal and hydrotalcite as solid soft base and support as well, to heterogenise the homogeneous catalyst systems. Rhodium, ruthenium and copper based heterogeneous catalysts using hydrotalcite as support as well as base are synthesized, characterized and had been investigated in detail for the effective conversion of CO_2 to formic acid at moderate, temperature and total pressure of CO_2 and hydrogen. Activity, selectivity and recyclability of these catalysts were appreciable for the production of formic acid under the employed reaction conditions in the autoclave. My speech will discuss the above advances made in the recent research and developments for the atom economic conversion of CO_2 to formic acid.

Biography

He had worked as Research Scientist in my whole career in the institute, CSIR-Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar, Gujarat, India, since 13th June 1983 to perform investigations on the Research and Development of the catalysis for various organic transformations. During Ph.D. He had performed investigations on ruthenium catalyzed oxidation of organic compounds which had formed the basis of my importance to perform the research in the demanding area, which He had focused and performed on metal complexes based homogeneous and heterogeneous catalyst systems for environmentally and industrially important organic transformations using gaseous molecules, molecular oxygen, carbon monoxide, carbon dioxide and methane for their value addition and widening the scope of their utilization in organic transformations. He had been actively engaged in the research and development activities since 13th June 1983 in the research projects of national/international/network/collaborative status and still actively contributing to research and development. He had been faculty (Professor Dr. Ram Sambhar Shukla) of Academy of Scientific and Innovative Research (AcSIR). had been teaching the Ph.D. course to the Research Scholars of, AcSIR of CSIR-CSMCRI, and Chemistry Department of Bhavnagar University, Bhavnagar. He had been taught to M.Sc. Chemistry students of Bhavnagar University, Bhavnagar.

**Dr. Harjinder Kaur**

Department of Chemistry, Gujarat University, Ahmedabad, India

Role of resin supported metal nanoparticles as catalyst in organic synthesis

In the near future catalysts will be playing pivotal role in reaching the targets of sustainability in industrial organic synthesis. Recent research has established the superiority of nanoparticles (NPs) as catalysts by facilitating numerous chemical transformations with high turnover numbers, high product selectivity, in green solvents using mild reaction conditions. High surface energy of NPs makes them thermodynamically unstable and prone to migration and coagulation during chemical reaction. It is imperative to stabilize these nanoparticles for successful application in fine chemical and pharmaceutical industry. Immobilization of nanoparticles on a solid support can enhance stability leading to high efficiency and recyclability. Traditional inorganic supports have been very useful for supporting catalyst in vapour and gas phase reactions but for liquid phase organic synthesis organic supports may turn out to be a better option. In the present talk I elaborate the use of polystyrene resins (PSR) as a promising support for the metal nanoparticles. They are commercially available, chemically inert, and stable up to 400 °C, can be easily synthesized and modified to suit the reaction requirements, easily separated and reused. Supported nanoparticles of Au, Pd, Rh, Cu and Fe on the PSR have been used in C-C coupling, oxidation, click reaction, hydrogenation, carbonylation, heterocyclic synthesis etc. and the data is widely published in literature. However, some special instances where nanocatalysts are successfully used for sequential coupling reactions under microwave irradiations and selective oxidation reactions will be discussed. Further, the low metal loading required for the synthesis of efficient polystyrene catalyst reduces the likelihood of metal contamination in the ensued products.

Audience Take Away:

- Audience can learn about the concept of nanoparticles synthesis and stability.
- They will be able to learn about the various organic transformation catalyzed by supported nanoparticles and the reaction conditions.
- How the supported nanoparticles are making organic synthesis green and sustainable which can be used in industry.

Biography

Dr. Harjinder Kaur did her graduation and post graduation from Kurukshetra University, Haryana, India and soon after started her teaching career as lecturer in a undergraduate college. In 1994 she was awarded prestigious UGC-CSIR JRF and obtained Ph. D, degree from Gujarat University. This was followed by CSIR postdoctoral fellowship a brief stint as assistant professor at Nirma institute of technology. She has worked in diverse research fields and her interest involves synthesis of supported nanoparticles, Nanocatalysts including photocatalysts, green and microwave organic synthesis, supramolecules, biopolymers etc. She has guided 5 Ph. D. students and published 35 papers in high impact journals.



Sudip Kumar Das*, Koushik Ghosh

Chemical Engineering Department, University of Calcutta

Bioremediation of methylene blue from the aqueous environment using bamboo leaves and its acid-treated forms as bio sorbent

Bamboo leaves (BL) and their two acids-treated forms H_2SO_4 (SBL) and H_3PO_4 (PBL), have been applied as bio-sorbents for the removal of methylene blue (MB) from its aqueous solution. The effects of different operating parameters like pH, bio-sorbent quantity, the contact time, initial concentration of MB and temperature are investigated. Several kinetic models have been applied to fit the kinetic data, which can be clarified well by the pseudo-2nd-order model. The isotherm data fit well with the Langmuir model with maximum bio-sorption capacity, for PBL is 181.172 mg/g at 298 K. The sorption energy was calculated from the Dubinin-Radushkevich (DR) isotherm and confirmed the physisorption. The ^{13}C NMR and FTIR outcomes displayed that several functional groups of cellulose, hemicellulose and lignin are associated with eradicating MB. The adsorption mechanism is also established. Also, the percentage elimination of MB has been fruitfully predicted by multiple polynomial regression (MLR) and genetic algorithms (GA). The method of the safe disposal of the used adsorbents was also reported.

Audience Take Away:

- In rural areas of the 3rd World countries, many small and medium-sized industries generate wastewater containing heavy metals and dyes. These industries are not in a position to treat their wastewater before discharge due to financial constraint. This wastewater enters the local water bodies or the agricultural fields and ultimately enters the food chain.
- This adsorptive technique benefits these industries as the adsorbents are locally available practically free of cost.

Biography

Prof. Sudip Kumar Das passed B. Sc. (Chemistry Hons.) & B. Tech. (Chemical Engineering) from the University of Calcutta, M.Tech. and Ph.D. (Chemical Engineering) from Indian Institute of Technology, Kharagpur. At present he is professor in the Chemical Engineering Department, University of Calcutta. He worked in different fields of engineering, like multiphase flow, fluidization & inverse fluidization, wastewater treatment technology, Adsorptive removal of heavy metals and dyes, Artificial Intelligence, Process Safety and Resilience engineering of process design. He published 215 papers in SCI journals and presented more than 250 papers in National/International Seminars. The hi index is 37, i10 index is 97 and citation 7196.



Meera Yadav

Department of Chemistry, North Eastern Regional Institute of Science and Technology, Nirjuli, Arunachal Pradesh, India

Key role of catalase enzyme in catalysis

The first antioxidant enzyme to be identified and studied was catalase (EC 1.11.1.6). Catalase is a crucial enzyme in preventing reactive oxygen species from causing oxidative damage to the cell (ROS). It can catalyse the oxidation of many metabolites and poisons, including as formaldehyde, formic acid, phenols, acetaldehyde, and alcohols, by hydrogen peroxide. Catalase in our bodies converts dangerous superoxide radicals into hydrogen peroxide, which then decomposes into water and oxygen. Microbiologists frequently utilise the catalase test to identify and distinguish between various bacterial species. The food sector uses catalase frequently. By removing hydrogen peroxide from milk, catalase helps with the creation of cheese. Catalase is utilised in food packaging because it stops food from oxidising. In contact lenses, catalase is utilised as a disinfectant. Catalase is used in the elimination of hydrogen peroxide residues from cotton fabrics which improve the dyeing behavior and the colour yield. Kinetics of enzyme catalyzed reaction with respect to aims of enzyme kinetic studies, steady state and transient state kinetics, enzyme activity measurements, factors affecting enzyme activity, experimentally determined rate parameters for Michaelis-Menten type kinetics, selective and potent inhibition kinetics, quantitative enzyme characterization: effect of pH, temperature, ionic strength, concentration and enzyme specificity will be discussed. Provide an understanding of role of an enzyme in metabolic pathways.

Biography

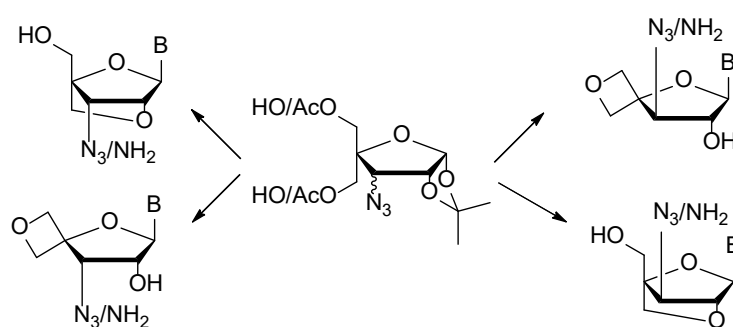
Dr. Meera Yadav completed her Master's and Ph.D in Chemistry from DDU Gorakhpur University, Gorakhpur, Uttar Pradesh, India. She was awarded CSIR-SRF (2000-2003), twice as DST- Woman scientist A (2005-2008) & (2013-2016) and UGC- Dr. D. S Kothari Postdoctoral Fellow (2009-2012) at Department of Chemistry, Gorakhpur University, Gorakhpur. Her research area includes, purification, characterization and applications of Metalloenzymes- Lignin peroxidase, Mn-peroxidase, Laccase and Chloroperoxidase, isolation of fungal strains producing ligninolytic enzymes, their structural-functional studies using X-ray crystallography, spectroscopic and fast reaction kinetic techniques. Use of enzymes in synthetic inorganic and organic chemistry. She has served two years as guest lecturer in Madan Mohan Malviya Technical University (MMTU), Gorakhpur. Currently she is working as an Assistant professor in the Department of Chemistry, North Eastern Regional Institute of Science and Technology (NERIST), Nirjuli, Itanagar, Arunachal Pradesh, India. She has attended and participated in more than 30 national and international seminars and conferences. She has guided one Ph.D and five students are being involved in various research activities in her laboratory. Eight students have submitted their M.Sc dissertation under her guidance till now. She has published more than 40 research papers in reputed national and international peer reviewed journals and reputed standard books. She has also reviewed many research papers. She is life member of American Chemical Society, Indian Council of Chemists and Indian Society of Chemists and Biologists.

**Dr. Rajesh Kumar**

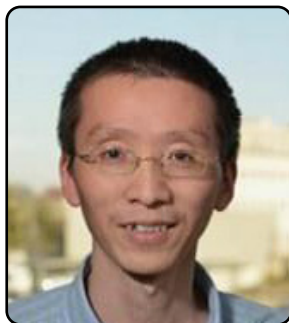
Department of Chemistry, R.D.S. College (B.R.A. Bihar University), India

Bio-catalytic approach to synthesis of modified 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 moiety 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)



Haibo Ge

Department of Chemistry & Biochemistry, Texas Tech University, Lubbock, TX, USA

Distal functionalization via transition metal catalysis

Selective carbon-carbon and carbon-heteroatom bond formation reactions are among the most important processes in organic chemistry since it enables the construction of common organic molecules from simple precursors. Among various methodologies, the transition metal-catalyzed transient directing group-enabled C-H functionalization process represents one of the most efficient and straightforward approaches due to the avoidance of pre-functionalization of the reaction precursors. In comparison with the well-established sp^2 C-H functionalization process, much less progress has been made to the unactivated sp^3 carbons with the transient directing group strategy. In view of the prevalent presence of sp^3 C-H bonds in organic molecules, advances in this area will allow for broad applicability by providing a powerful and valuable synthetic approach to access common organic frameworks, such as (hetero)cycles, privileged structures in medicines. This area will be advanced further by the development of site- and enantio-selective functionalization of unactivated sp^3 C-H bonds. Furthermore, demonstration of these transformations through different reaction pathways will provide a new opportunity for the design of novel transition metal-catalyzed coupling reactions on sp^3 carbons. Herein, we are presenting our studies on transition metal-catalyzed transient directing group-enabled C-H functionalization reaction.

Audience Take Away:

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

Biography

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



Muhammad Asif Nawaz^{1*}, Sidra Pervez², Shah Ali Ul Qader³, Afsheen Aman⁴

¹Department of Biotechnology, Shaheed Benazir Bhutto University, Sheringal, Dir (Upper), KPK, Pakistan

²Department of Biochemistry, Shaheed Benazir Bhutto Women University Peshawar, Khyberpakhtunkhwa

³Department of Biochemistry, University of Karachi, Pakistan

⁴The Karachi Institute of Biotechnology and Genetic Engineering (KIBGE), University of Karachi, Karachi-, Pakistan

Immobilization of bacterial maltase using different polymers: An excellent design of using maltase in continuous industrial process

The current study deals with the comparative study related to immobilization of maltase using synthetic (polyacrylamide) and non-synthetic (calcium alginate, agar-agar and agarose) polymers via entrapment technique. Polyacrylamide beads were formed by cross-linking of monomers, agar-agar and agarose through solidification while alginate beads were prepared by simple gelation. Results showed that the efficiency of enzyme significantly improved after immobilization and among all tested supports agar-agar was found to be the most promising and biocompatible for maltase in terms of immobilization yield (82.77%). The catalytic behavior of maltase was slightly shifted in terms of reaction time (free enzyme, agarose and polyacrylamide: 05 minutes; agar-agar and alginate: 10 minutes), pH (free enzyme, alginate and polyacrylamide: 6.5; agar-agar, agarose: 7.0) and temperature (free enzyme: 45°C; alginate: 50°C; polyacrylamide: 55°C; agarose: 60°C; agar-agar: 65°C). Furthermore, evaluation of kinetic study revealed that after entrapment the affinity (K_m) and maximum velocity (V_{max}) of maltase was affected. Activation energy of entrapped maltase decreased which increases its stability at higher temperatures for longer time period. Stability profile of immobilized maltase also revealed that all the supports utilized have significantly enhanced the activity of maltase at higher temperatures then its free counterpart. However, recycling data showed that agar-agar entrapped maltase retained 20% of its initial activity even after 10 cycles followed by agarose (10%) while polyacrylamide and alginate showed no activity after 8 and 6 cycles respectively. Thus, it can be anticipated from current study that immobilization of maltase using various supports effectively improve the catalytic properties of enzyme for its efficient utilization in different bioprocesses.

Audience Take Away:

- The audience will be able to use immobilization technology in industrial process.
- He will discuss enzyme engineering with the latest challenges and will provide proficient skills and entrepreneurship opportunities in the field of Enzyme Biotechnology.
- He talk will discuss to establish more linkage programs and collaboration for improving competitive skills and learning horizon of researchers.

Biography

Dr. Muhammad Asif Nawaz has completed his Ph.D. in Biotechnology and working as Assistant professor at Department of Biotechnology, SBBU Sheringal Dir . His research work has been published in peer reviewed research journals in national/international scientific journals with an overall impact factor more than 100 and of citation of more than 1500. He has been the principal/co-principal investigator of several research projects funded by national funding agencies.

**L.A. Cano*, L.M. Sanchez, R. Ollier y V.A. Alvarez**

Grupo de Materiales Compuestos Termoplasticos (CoMP) - Instituto de Investigaciones en Ciencia y Tecnologia de Materiales (INTEMA), Universidad Nacional de Mar del Plata – CONICET, Mar del Plata, Argentina

Development of new nanocomposites for the remediation of contaminated water

The development of new hybrid adsorbents based on polymers has opened new opportunities in terms of their application in the removal of contaminants, especially those present in aqueous systems. Among them, hydrogels constitute one of the most outstanding families in biological, medical and technological areas and today they play a fundamental role in sectors with high socio-economic impact. These basically consist of a soft and usually low-cost hydrophilic polymer, which forms a three-dimensional network and has the capacity to adsorb a large number of fluids without dissolve. On our platform we offer the development of nanomaterials with polymers and the design of new multifunctional filter systems, with adsorbent materials with a rigid structure, easy to use, resistant, reusable, with novel physical-chemical properties and with the possibility of being transferred to society or the world. productive medium. Magnetic nanoparticles (MNPs) of iron oxides coated with polyacrylic acid (PAA), polyvinyl alcohol (PVA) ferrogels incorporating the MNPs, hydrogels in film format and PVA beads alone and combined with PAA, chitosan and sodium alginate, reinforced with natural and modified bentonite (national clay), hydrotalcite and carbon particles. As a result, a range of nanomaterials with different specific properties and functionalities has been obtained. In all cases, priority has been given to the implementation of low-cost and environmentally friendly raw materials, of simple and easy-to-apply techniques for obtaining them. The different developed materials that make up the platform have proven to be effective adsorbents of dyes of different chemical nature, metals such as Cadmium and Arsenic, anions such as nitrates and phosphates, and emerging contaminants such as antibiotics.

Audience Take Away:

- Water pollution is a global problem far from being solved in a simple and low-cost way and the technologies available today are not within the reach of the majority of the affected population. The new adsorbent materials that we develop provide a simple and low-cost solution to these problems and are therefore of great interest to water treatment companies, governments and the general public.
- We intend that the knowledge or technology generated demonstrate the feasibility and economic and social profitability so that it obtains the interest of the productive sector for its implementation, in the manufacture of water filters, for example, and in the service sector; in the treatment of water in drinking water supply companies.
- The challenge of the working group is to generate high-impact scientific knowledge that contributes to value chains through the development of innovative products and the generation of high-tech enterprises that create jobs, allowing production to be differentiated based on the generation of competitive, dynamic, genuine and systemic advantages.

Biography

Dr. Cano graduated with a degree in Chemistry from the National University of La Plata (2006) and is a PhD of Exact Sciences, Chemical Area (2011, UNLP). Currently is an Associate Researcher of CONICET with a place of work in the Institute of Research in Science and Materials Technology (INTEMA). He is the author of one book, 17 scientific publications, 4 book chapters and more than 30 presentations to national and international conferences. In addition, he was the director of 4 final degree projects and currently director of a doctoral student and investigator responsible for an investigation project with public funds.

KEYNOTE FORUM

DAY 03

12TH EDITION OF GLOBAL CONFERENCE ON

**CATALYSIS, CHEMICAL
ENGINEERING AND
TECHNOLOGY**

05-07 SEPT



Kotohiro Nomura

Department of Chemistry, Tokyo Metropolitan University, Japan

Synthesis of bio-based polymers from plant oils for better chemical recycling

Design and development of sustainable polymers with various architectures from bio-renewable feedstocks by development of new strategies and methods by precise catalysis (polymerization) techniques have been attractive and important subjects. Development of functional polymers derived from hydrocarbon-rich molecular biomass (vegetable oils and fatty acids such as linseed, sunflower, soybean, castor, palm, and olive oils), most abundant and low-cost molecular biomass, has thus been recognized as an attractive subject.

In particular, development of advanced polyesters, displaying tunable mechanical properties and biodegradability, from so-called bio-based monomers by precise polymerization techniques attracts considerable attention. In this lecture, synthesis of long chain aliphatic polyesters, promising semicrystalline materials expected as alternative to linear polyethylene (widely used in our daily life), especially by acyclic diene metathesis (ADMET) polymerization, including our recent results, will be introduced. These materials can be depolymerized by chemical modification. The approach, conversion of polymer to monomers or fine chemicals called “chemical recycling”, has also been considered as important subject (key technology) to establish green, sustainable circular economy. We also introduce another approach for synthesis of new bio-based polyolefins by using half-titanocene catalysts.

Audience Take Away:

- Approaches for synthesis of bio-based aliphatic polyesters from nonedible plant oil.
- Catalysis technology for synthesis of polymers and chemical recycling.
- Understanding importance of catalyst design and new methodology.

Biography

Kotohiro Nomura finished his master studies in University of Tokyo, and then joined as a research scientist in Sumitomo Chemical Co., Ltd in 1988. He received his Ph.D. in 1993 from Osaka University and joined Massachusetts Institute of Technology as a postdoctoral fellow. He once returned Sumitomo and became an associate professor in Nara Institute of Science and Technology in 1998. Since 2010, he has been a full professor in Tokyo Metropolitan University. He has co-authored more than 300 publications, and his recent research focuses on design of molecular catalysts for efficient carbon-carbon bond formation and chemo-specific organic transformations.



Nikolaos C. Kokkinos

Department of Chemistry, School of Science, International Hellenic University, Kavala, Greece

The contribution of immersive technologies in novel industrial catalytic processes

Laboratories and institutes usually consume resources for further studying novel catalytic reactions and not so much for scaling them up into industrial catalytic processes and training professionals to use them. On the other hand, chemical industry keens on turnkey solutions. The main scope of this study is to examine the twofold contribution of immersive technologies in scaling-up novel catalytic processes in the chemical industry, as well as the professional training and certification of staff for using them. Hence, a novel application of heterogenized homogeneous catalysis applied on the neuralgic sector of energy was thoroughly examined taking into advantage its pioneering benefit that is the efficient and convenient recovering of the catalyst. Firstly, a laboratory research of the catalytic process took place. Then, the chemical catalytic process was modelled, simulated, verified, validated and tested with proper feedback from the laboratory experiments. In the next step, immersive technologies were used in order to create a virtual reality environment of the real field as well as a virtual control room environment for supervisory, control and data acquisition of the chemical process. Subsequently, an in-situ training and assessment process of the chemical industry staff occurred on virtual reality high tech facilities interacting with emergency what-if scenarios, which were not hypothetical or fiction products, but rather the result of long-term interviews with industry executives, field operators and control room operators in order to reproduce accurately, efficiently and effectively near-misses, dangerous incidents and accidents. Consequently, a ready-to-use environment for the chemical industry was designed and developed.

Audience Take Away:

- Heterogenizing homogeneous catalysts and taking advantage of their pioneering benefits.
- Modeling and simulating of novel chemical process with complicated substances for an effective scale-up study, training and assessment procedure.
- Verifying, validating and testing of the chemical process model.
- Applying immersive technologies in industrial catalysis.

Biography

Dr Nikolaos C. Kokkinos is Associate Professor at the Department of Chemistry of the International Hellenic University (IHU), Greece. He is the Program Director of MSc in Oil and Gas Technology at IHU. He is in charge of the Process Simulation in Petroleum and Natural Gas Engineering Laboratory at IHU; and he holds a researcher position in the Division of Petroleum Forensic Fingerprinting (PFF) of Hephaestus Advanced Laboratory at IHU. Dr Kokkinos has more than 80 peer-reviewed publications in international scientific journals and conference proceedings. His research interests among others include applied catalysis and process modelling and simulation of complex substances.

SPEAKERS

DAY 03

12TH EDITION OF GLOBAL CONFERENCE ON
**CATALYSIS, CHEMICAL
ENGINEERING AND
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05-07 SEPT



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Role of sulphuric acid modification to coconut shell activated carbon in catalytic cracking of waste cooking oil

Biofuel production from catalytic cracking of waste cooking oil is an attractive topic because it incorporates waste management and introduction of a new clean source of energy. Catalytic cracking is a promising technology for biofuel production because it is a simpler and easy-to-manage process compared with fermentation, capable to produce a wide range of products, and cost-effective. The catalyst type and/or surface modifications have a substantial impact on the reaction and consequently the distribution of product components. Activated carbon (AC) considers a viable catalyst in the catalytic cracking of vegetable oils due to its high thermal stability, abundance, ease of surface modification, and high surface area. Acid modification with sulphuric acid could be regarded as a low-cost and simple pre-treatment step for activated carbon to enhance the chemical and physical properties of the coconut-shell activated carbon catalyst. This work shows the improvement in hydrocarbon yield and its distribution over different percentage of acid loading (5%, 10%, 20%, and 30%) on the activated carbon surface. Besides, the characterization of the modified catalysts (BET-BJH, SEM, XRD, FTIR, TPD-NH₃, and TGA) are also discussed. The performance of the prepared catalysts is evaluated in terms of hydrocarbon fractions in the product stream, total liquid, coke, and gas yield.

Audience Take Away:

- How the surface acidity of catalyst influences the performance of the WCO cracking reaction.
- How a simple/low-cost modification action like acid modification can enhance the catalyst cracking performance.
- The compositions of the organic liquid products produce from the catalytic cracking of waste cooking oil.
- Characterization results of prepared catalysts.

Biography

Mrs. Samah Zaki is currently a PhD candidate at School of Chemical Engineering, Universiti Sains Malaysia, Malaysia supervised by Associate Professor Ching Thian Tye. She completed her bachelor's degree from the University of Babylon in Electrochemical Engineering, Babil, Iraq in 2010 with honor. She got her master's degree in chemical engineering department from Curtin University of Technology, Perth, Australia in 2016 through full scholarship from the Higher Committee for Education Development in Iraq. Then She worked as a lecturer and researcher at Kerbala University, petroleum engineering department, Iraq since 2016 to the present. She has published more than 20 research articles in ISI/SCOPUS journals. She is going to finish her PhD degree by middle of the next year.

**Qing Tang*, Fuhua Li**

School of Chemistry and Chemical Engineering, Chongqing Key Laboratory of Theoretical and Computational Chemistry, Chongqing University, Chongqing, China

Revealing the active site of single palladium atom catalyst towards electrochemical CO₂RR to CO

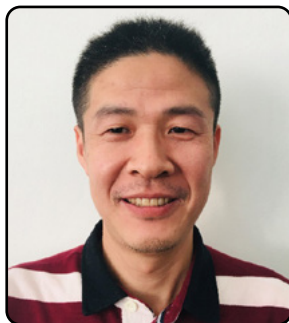
The single palladium atom anchored on graphene exhibits high selectivity and activity for electrocatalytic CO₂ reduction (CO₂RR) to CO, which is extremely meaningful for great atomic utilization of noble metals. However, the origin of the high catalytic activity, especially the real coordination model of active center Pd site, remains puzzle. Different with the conclusion of conventional density functional theory (DFT) calculations that the Pd-N₄ is responsible for the excellent CO₂RR performance, here we employ the grand-canonical density functional theory (GC-DFT) approach to confirm the Pd-N₁ site is more likely the active center for efficient CO₂RR to CO. The results show that the charge-carrying capability that usually be ignored can be actually accepted as an effective descriptor to characterize the performance of electrocatalytic CO₂RR. Particularly, the site with higher charge-carrying capacity allows to carry more excess negative charges to balance the Fermi level to match the applied potential. Then the excess negative charge prioritizes to occupy the 3d_{z²} orbital of Pd atom promoting the electron injection into the intermediates, which can more effectively reduce the reaction grand free energy of elementary step and stabilize the intermediates to further facilitate the electrochemical process. This work not only solves the puzzle of confirmation of coordinating model of Pd-site but also reveals the important role of charge-carrying capability in electrochemical process, which can provide reference for further exploration on the understanding of the mechanisms and the design of electrocatalysts.

Audience Take Away:

- The importance of potential in the theoretical studies of electrochemical process.
- The coordination environment is critical in affecting the activity of SACs.

Biography

Qing Tang is Professor of Chemistry at Chongqing University. She received her B.S. in Chemistry from Shenzhen University, and her Ph.D. in Chemistry from Nankai University in 2014. After three years of postdoctoral research at the University of California Riverside, she joined the faculty at the school of chemistry and chemical engineering at Chongqing University in 2018. Her current research interests focus on the application of multi-scale computational methods to understand, design and discover new materials for electrocatalytic applications, such as hydrogen evolution, oxygen reduction and CO₂ conversion. She has published more than 80 research articles in peer-reviewed journals.



Yanqing Shen

School of Physics, Harbin Institute of Technology, Harbin, China

Theoretical study of 2D photocatalysts for producing hydrogen

The International Energy Agency reports that the combustion of fossil fuels results in serious energy crisis and environmental pollution. Fortunately Hydrogen can tackle these challenges. However, nowadays producing hydrogen mainly originates from fossil fuels. To date, a very promising route to produce hydrogen is photocatalytic water splitting by utilizing solar energy.

Whereas, most of 3D photocatalysts can not utilize visible light. Experiments have proved that 2D materials can enhance the photocatalytic performances. However, experiments are expensive and time consuming. Encouragingly, theory such as first-principles calculations can fast screen 2D materials with accuracy comparable to experiments. Now many predicted 2D photocatalysts have been synthesized. However, they are still far behind requirements for practical applications. Strong light absorption and great carrier mobilities are both urgently needed for efficient photocatalysts. Hence, tremendous progress has been made on developing high-performance 2D photocatalysts for producing hydrogen. The major goal of our research is to design and predict novel 2D photocatalysts by using first-principles calculations. We have successfully predicted a series of novel monolayers and heterostructures for producing hydrogen. Here, I will briefly introduce the design methods and recent advances of 2D photocatalysts from a theoretical perspective, and show our latest advances in studying high-performance 2D photocatalysts.

Audience Take Away:

- The methods described here can be used for others to design novel 2D materials.
- Our research work will stimulate further experimental efforts in developing high-performance 2D photocatalysts for producing hydrogen.
- We can provide theoretical support for the experimental studies.

Biography

Prof. Yanqing Shen is Associate Professor of Harbin Institute of Technology. He received BS degree from Jilin University in 2004, and received PhD degree from Harbin Institute of Technology in 2009. He was a Visiting Scientist in Stony Brook University (with Artem R. Oganov) in 2014. He serves as a reviewer for many scientific journals, and has been recognized as an Outstanding Reviewer for Physical Chemistry Chemical Physics in 2020. He has published more than 60 peer-reviewed papers and book chapters. He serves as a Guest Editor for JoVE (SCI journal). He has been honored with Vebleo Fellow in 2022.



Ulkuye Dudu Gul

Department of Bioengineering, Faculty of Engineering, University of Bilecik
Seyh Edebali, Bilecik, Turkey,

Fungal biocatalysts in environmental applications; enzymatic treatment of textile wastewater by fungi

Today, textile wastewater is among the top water pollution factors, and dyes in high concentrations in the wastewater content have mutagenic, carcinogenic, and toxic effects on aquatic organisms. For this reason, it is necessary to remove dyes in wastewater after production in textile factories. Although a wide variety of methods are used in wastewater treatment, biological treatment has attracted attention as an environmentally friendly and inexpensive method in recent years. Biodegradation is one of the mechanisms used in biological treatment methods, and it is based on the principle that active microorganisms degraded pollutants using enzymes. Fungal ligninolytic enzymes are effectively used in biotechnological applications. For instance, laccases and certain fungal class II peroxidases from white-rot basidiomycetes are considered in the degradation of persistent organic pollutants such as textile dyes. The aim of this study is to examine the information in the literature on the use of fungal enzymes in the bioremediation of textile wastewater. In particular, necessary information has been given for the design of systems involving enzymatic degradation of dyes by fungi. While the articles currently published in the literature are reviewed it has been determined that due to the fact that fungi are resistant to unfavorable conditions such as wastewater and produce a variety of enzymes for degradation, they can be used effectively in wastewater treatment enzymatically. As a result, biological wastewater treatment technologies involving fungal enzymes are economical and efficient processes.

Audience Take Away:

- General information about fungal enzymes used in environmental applications will be given in the speech.
- The knowledge about the usage of fungi/fungal enzymes in the degradation of textile dyes will be stated in the speech.
- The advantages of biocatalysts in the environmental application will be explained in the speech.
- The parameters affected enzymatically bioremediation processes will be introduced.

Biography

Prof. Dr. Ülküye Dudu Gül graduated from the biology department of Ankara University, where she was also awarded her Ph.D. During her master's degree studies, she completed an internship program at Iowa State University in the United States as a Fulbright Scholar. She is currently a professor at Bilecik Seyh Edebali University. Her research interests include environmental biotechnology, wastewater treatment technology, and enzymes in industrial microbiology. She carries out studies on using microorganisms in biotechnological processes as well as on the application of microorganisms in bioprocess engineering. She has published more than 50 research articles in journals including SCI(E).



S. Girish Kumar

Department of Chemistry, School of Engineering and Technology, CMR University, Bagaluru campus, Bengaluru-Karnataka, India

Understanding the doping mechanisms in C-N-S tridoped TiO_2

The multi non-metal doping of C-N-S into TiO_2 has attracted significant interests because of low energy substitution of carbon, nitrogen and sulfur from the cheaply available precursors (thiourea, L-cystine and L-cysteine), stabilization of the anatase crystal structure, red shift in the band gap response towards the solar spectrum, cooperative interactions with these codopants, and the absence of any impure phase formation and with high doping density during the substitution process. Despite of these unique features, reports on C-N-S- TiO_2 are not extensive and the discussions presented are far from the relevant aspects of the doping mechanism. With the intention of shedding light on the pros and cons of C-N-S- TiO_2 , this presentation is framed to understand the beneficial effects multiple doping in photocatalysis, doping mode of each dopant in the codoped system with respect to the reaction conditions and contradictions about the doping states of each dopant in the codoped system with reference to the previous literature. The concepts like modifications of defect structures, dopant distribution, doping mode and mutual interferences among them will be dealt. The codoping process involving carbon, nitrogen and sulfur is quite complicated as several doping modes are witnessed for each dopant, which are coupled to other factors like dopant diffusivity and solubility, extent of doping, dopant segregation at the surface, nature of the dopant precursor, unpredictable interactions of the dopant states, and interactive reactions between the dopant and titania precursor together with the annealing conditions.

Audience Take Away:

- The non-metal doping considering the sensitivity in the preparation method will be outlined, the audience can choose the reaction conditions to obtain effective tridoped system. Also, the preparation conditions can be extended to other metal oxides as well. The difficulties associated to understand the doping mechanism will be simplified which can be useful for the design of doped oxides.

Biography

Girish is active in the interdisciplinary area of scientific research associated with materials chemistry and physics. He has published 44 research articles which have received more than 6300 citations. He is serving as Associate Editor for 'Chemical Papers-SPRINGER' and 'Applied Surface Science Advances- ELSEVIER' along with potential member in the Reviewer Panel Committee, RSC Advances. He has reviewed more than 1700 manuscripts from 175 journals. He has been recognized as 'Top 2% world scientist' by the survey conducted by 'Stanford University, USA (2019 and 2021)' and 'Top 1% reviewer' by the Publons.



Srabanti Basu*, Abhishek Mukherjee

Department of Biotechnology, Heritage Institute of Technology, Kolkata, WB, India

Lactase and amylase from the seeds of *Artocarpus heterophyllus* (Jack fruit)

Biocatalysts are natural substances that include enzymes and whole cells to carry out different biochemical reactions. Enzymes have become important tools for production of food and pharmaceutical products as they offer less energy requiring and less polluting methods compared to conventional processes. Amylase and lactase are two enzymes widely used in food industry for bread, wine, cheese, and other products. The present study reports the recovery of appreciable amount of lactase and amylase from the seeds of jack fruit (*Artocarpus heterophyllus*). The seed extract hydrolyzed almost 90% of 2 % (w/v) at pH 5.5 in 3h at 50°C. It hydrolyzed 75% of milk sugar present in 100 mL of pasteurized cow milk at 40°C in the same time interval. The extract possessed amylase activity too and hydrolyzed raw and gelatinized cereal and tuber starches obtained from corn, rice, gram, wheat and potato. The amylase could hydrolyze both amylopectin and starch with the same ease. Both lactase and amylase were optimally active at a pH and temperature range of 5.0-7.5 and 45-60°C respectively. Both were stable in the pH range of 4-8 upto 60°C. Both the enzymes were resistant to the action of several proteases. Hg^{2+} and Ag^+ completely inhibited the activities of both the enzymes. Lactase was purified by ethanol precipitation, followed by Ammonium sulphate precipitation, ion exchange chromatography (DEAE Sephadex), size exclusion chromatography (Sephacryl S-300) and SDS PAGE. Activity staining by x-gal on Native gel was also performed. Lyophilized seed powder and extract remained stable till one year of the study period when stored at 40°C.

Audience Take Away:

- The work describes extraction, characterization and purification of two industrially important enzymes from a commonly available tropical plant. Other plants can be explored for the same or other industrially important enzymes.
- The research can be expanded to large scale production of the enzymes.
- Jack fruit seeds are edible. Therefore the extract can be applied safely in food and pharmaceutical industries.
- Lactase described here is resistant to proteases. It can be directly supplemented in milk formulations for lactose intolerant people.

Biography

Dr. Srabanti Basu is a professor in the department of biotechnology, Heritage Institute of Technology, Kolkata. She did her M.Sc. and Ph.D. in Biochemistry from the University of Calcutta. She started her career as a journalist in The Telegraph, a leading daily of Kolkata for the science page. After two years, she joined her present institute as an assistant professor (then lecturer). She received Fulbright Nehru fellowship and several other international and national awards for her contribution to biotechnology research. Environmental biotechnology is her special area of interest. She has 26 publications in peer-reviewed journals.



Dr. Bashir Ahmad Dar

Department of Chemistry Govt. Degree College Sopore J & K, Dept. of Higher Education Govt. of Jammu and Kashmir

Montmorillonite supported catalysts for organic chemical reactions

Organic chemical reactions via green chemical routes are of prime importance for safer environment. Heterogeneous catalysts are the major tools for achieving the goals of sustainable development. In accomplishing many of these goals, an important family of catalysts that has received considerable attention of the synthetic chemists in recent times is derived from the soil, the most noteworthy ones being clays and zeolites. Montmorillonite clays are solid acidic catalysts which can function as both Bronsted and Lewis acids in their natural and ion-exchanged form. Using clay catalysts, environmentally benign green chemistry can be done both at industrial level and laboratory scale. Cu-Clay has developed into trendy heterogeneous catalyst in our group owing to its characteristic properties such as enhanced reactivity, selectivity and a straight forward work-up procedure.

Audience Take Away:

- Audience will learn importance, preparation and applications of heterogeneous clay catalysts.
- Catalysts are the key components in organic chemical transformation and most of the chemical industries depend on catalysts in one or other way. Learning the preparation and applications of catalysts makes a person eligible for different roles industry as well as academia. Lot of research in this field has been done and practically applied to industries and incorporated in academia but a lot more is still to be done.

Biography

Dr Bashir is presently working as Assistant Professor at Govt. Degree College boys Sopore Kashmir (Department of Higher Education Govt. of Jammu and Kashmir). Prior to this he had been working as lecturer at University of Kashmir, North campus Baramulla Kashmir. Furthermore Dr. Bashir also served as Assistant Professor at Maulana Azad College Aurangabad Maharashtra India, Senior Project Fellow IIIM Jammu, Senior Research Fellow IIIM Jammu, Junior Research Fellow IIIM Jammu, Junior Research Fellow (IICT Hyderabad), Lecturer (Maulana Azad College, Aurangabad Maharashtra India) and Visiting Lecturer (Post Graduate Department of Chemistry, Vasantroa Nayak College, of Science Aurangabad Maharashtra India). Having 13 years of experience in teaching and research, Dr Bashir has published more than 80 research papers in journals of international repute. He has also published various books on heterogeneous catalysis and is acting as editor and peer reviewer of many chemistry journals. He has delivered many talks as an invited speaker in national as well as international conferences and has participated in the scientific committee of several conferences and associations.

**Samuzal Bhuyan*, Biswajit G. Roy**

Department of Chemistry, Sikkim University, Gangtok, Sikkim, India

Visible light mediated photoredox catalysis for C-O bond manipulation

Application of visible light catalysis has revolutionized the field of organic synthesis by providing much efficient and greener alternatives to many important organic transformations. Visible light mediated reactions require a photocatalyst that absorbs the visible light and engage it in the single electron transfer (SET) or energy transfer process with the substrates. In this presentation we will be demonstrating our recent work on C-O bond breaking and C-O bond making by using visible light photocatalysis and their application in the field of natural product synthesis, carbohydrates and amino acids.

Audience Take Away:

- Application of visible light mediated photocatalysis and scaling-up for industrial use.
- To utilize visible light photocatalysis for greener and efficient synthesis of biomolecules.
- Importance of visible light photocatalysis and its application in bond manipulations.
- Yes, this provide a practical solution to a problem that could simplify or make a designer's job more efficient.
- Yes, it improves the accuracy of a design, or provide new information to assist in a design problem.

Biography

Samuzal Bhuyan studied Chemistry in Sikkim University and received MSc in Chemistry in the year of 2014. Same year he joined MPhil course in Organic Synthesis, at Sikkim University and received MPhil degree in 2016. He has submitted his PhD thesis to Sikkim University during 2022 in Diversity Oriented Synthesis under broad subject area of Synthetic Organic Chemistry. He basically works on stereoselective synthesis and Diversity oriented synthesis from carbohydrate. He also works on photoredox catalysis and published 12 papers in research articles in SCI(E) journals in his early research carrier.



Omvir Singh^{1,2*}, Ankit Agrawal^{1,2}, Bipul Sarkar²

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^{1,2}Catalytic Depolymerization Area, Upstream & Wax Rheology Division, CSIR-
Indian Institute of Petroleum, Haridwar Road, Dehradun

Integration of zeolite@metal-organic framework: A composite catalyst for Isopropyl alcohol conversion to aromatics

In this study, a Zn-based metal-organic framework-zeolite composite ZSM-5@IRMOF-1 was synthesised for an alternative production of BTX from isopropyl alcohol (IPA). Incorporation ensured the capacity of tuning the Lewis acidity at a framework level and designing accessible pore structures, which make composites highly attractive to be used as catalysts. The combination of monodispersed HZSM-5 zeolites on and within acidic IRMOF-1 provided the highly selective production of lower aromatics from IPA. The interaction of IPA with catalysts was investigated at different temperatures in a fixed-bed continuous flow reactor. The obtained product was analysed using a standard test method ASTM D6730 through GC-DHA. The results indicated that the reaction between IPA and MOF-supported zeolite occurred without substantial participation of MOFs. The maximum aromatic (BTX) selectivity of up to 40.8% was achieved among all hydrocarbons at 86.1% carbon conversion. In addition, the gas yield was <20% for this catalyst system. The appropriate density of Brønsted and Lewis acidic sites and hierarchical pore structures provided the composite catalyst with an outstanding aromatic selectivity and yield and high stability.

Audience Take Away:

- Synthesized a composite material using (novel surfactant for zeolite, Silica, Metal, Metal oxides, MOF) synthesis using hydrothermal, nucleation-growth, assisted techniques.
- The characterizations of composite using SEM, TEM, XPS, XRD, GCMS, N₂ sorption, TGA, UV-DRS, FT-IR, and solid state NMR.
- Catalysis (Liquid phase, Gas-phase), batch and flow reactions, online monitoring by GC-MS.

Biography

Omvir Singh is presently working as Senior Research Fellow at CSIR-Indian Institute of Petroleum, Dehradun. His core areas of interest are Heterogeneous Catalysis and Organic reactions transformation. He has published various research papers in international journals.

Research Interests:

1. Pore size engineering of porous nanocatalyst.
2. Study the interaction of CO₂ with amine and organic reactants using ZIF as a single atom catalyst.
3. Direct conversion of aromatics hydrocarbon (BTX) from non-edible seed oil or used cooking oil.
4. production of value-added chemicals from renewable sources biomass, bio-oil.

Research Expertise:

1. Nanomaterials (novel surfactant for zeolite, Silica, Metal, Metal oxides, MOF) synthesis using sol-gel, hydrothermal, nucleation-growth, self-assembly, and microwave assisted techniques.
2. Material characterizations using SEM, TEM, XPS, XRD, GCMS, N₂ sorption, TGA, UV-DRS, FT-IR, and solid state NMR.
3. Catalysis (Liquid phase, Gas-phase), batch and flow reactions, online monitoring by GC-MS.
4. High-pressure reactor for catalysis and synthesis purposes.
5. Synthesis of single atom heterogeneous nano-catalyst for various applications.

**Vikas K Sangal*¹, Anoop Verma²**¹Department Chemical Engineering, MNIT Jaipur, Rajasthan, India²School of Energy & Environment, TIET Patiala, Punjab, India**Treatment of pharmaceutical effluent in pilot-scale once through reactor systems by dual process (photocatalysis and photo-fenton) using in-situ novel catalyst**

Treatment of pharmaceutical effluent in Pilot-scale once through solar reactor systems was done. Reactor in series and compound parabolic concentration reactor system was used. The catalyst beads for fixed bed reactor was prepared by coating of TiO_2 nanocatalyst on novel composite beads made up of waste foundry sand (FS) and fuller's earth (FE), both being good source of iron. These composite beads works as a surface for the coating of TiO_2 along with enabling the iron leaching, thus leading to the in-situ dual effect of photocatalysis and photo-Fenton. Optimization of various parameters like a number of beads, treatment time, the dosage of H_2O_2 using batch and the continuous re-circulation mode reactor has been studied in the sunlight. The dual effect was effective in eliminating the complex compounds present in the effluent as confirmed through GC-MS analysis along with the significant reduction in (COD) Cost analysis of the overall treatment was also evaluated of the prototype for the complete revelation of the dual process for commercial-scale applications. The composite beads was effectively recycled for more than 150 cycles without loss in activity of catalyst. The intactness of dual activity during recycles was confirmed through various characterization techniques like XRD, SEM-EDS, FTIR and UV-DRS. Retention of dual catalytic activity without much deterioration even after so much recycles confirms its applications at industrial scale. The novel technique of in-situ dual process particularly in fixed-mode envisaged by using renewable energy and durable catalyst can represent a practical solution to various industries for the treatment of wastewater comprising of bio-recalcitrant pollutants.

Audience Take Away:

- Recycling/reuse of Industrial waste like Fly-ash, Foundry Sand for their applications in waste water treatment through innovative ways.
- Audience will learn about insitu dual process for the wastewater treatment.
- This research unlocks the new horizon towards the degradation of wastewater employing large scale dual effect.

Biography

Dr. Vikas Kumar Sangal, presently working as Associate Professor, in department of Chemical Engineering at MNIT Jaipur, India. He has more than 20 years of Professional and research Experience. The major areas of his research are Industrial Pollution Abatement, Modelling and Simulation, Photocatalytic oxidation, Water and Wastewater Treatment. He published 65 articles in SCI Journals and many conference publications. He also published 06 Book/Chapter. He has supervised 08 Ph.D. Scholars, 23 master students and currently guiding 05 PhD research scholars. Dr. Sangal is fellow of the Institution of Engineers India, Life Member of Indian Institute of Chemical Engineers, NAARRI and InDA.



Muhammad Yaseen, Abbas Khan*, Nasrullah Shah, Shaista Bibi

Department of chemistry Abdul Wali Khan University, Mardan, Pakistan

Fabrication and characterization of $\text{Fe}_3\text{O}_4\text{-SiO}_2$ composite and evaluation of its activity toward removal of methylene blue and methyle orange from water

Due to biocompatibility, stability, high surface area to volume ratio and superparamagnetic characteristics the magnetic nanoparticles (Fe_3O_4 and $\alpha\text{-Fe}_2\text{O}_3$) have gained pionsess. Moreover they are nonporous with greater proficiency and are oxidized easily in atmospheric air that affects their magnetic characteristics and dispensability. In order to stabilize magnetic nanoparticles they are functionalized with carbon, noble metals, metal oxides, and chitosan etc. while using different methods. To minimize toxicity, increase stability, biodegradability, and biocompatibility and avoid the aggregation of these particles, silica an inert coating material is employed. The $\text{Fe}_3\text{O}_4\text{-SiO}_2$ nanocomposite was successfully synthesized via Co-precipitation and stober methods by mixing Ferric chloride hexahydrate ($\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$), Ferrous chloride Tetrahydrate ($\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$) as Fe_3O_4 precursors in 2:1 ratio, NH_3 solution as a precipitating agent, water as a solvent and TEOS as SiO_2 silica precursor. The ratio between Fe_3O_4 and TEOS was 1:5 and a ratio of 1:1:20:6 of Fe_3O_4 , TEOS, Abs. Ethanol and D.I.W was used in $\text{Fe}_3\text{O}_4\text{-SiO}_2$ nanocomposite synthesis. The $\text{Fe}_3\text{O}_4\text{-SiO}_2$ nanocomposites were characterized by using SEM EDX, TEM, XRD, FTIR, etc. The synthesized nanocomposite $\text{Fe}_3\text{O}_4\text{-SiO}_2$ was employed for potential environmental applications in the terms of its catalytic/photocatalytic activities toward the degradation of Methylene blue (MB) and methyl orange (MO) dyes, in the presence and absence of light, while observing the dye degradation process by UV- Visible spectroscopy. The catalytic efficiency of the same composite was studied and discussed in terms of changes in the chemical structures of dyes and other experimental conditions, such as the presence and absence of light. Moreover, the composite showed 93% and 51% efficiency towards the removal Methylene blue (MB) and methyl orange (MO) dyes respectively. The synthesized nanocomposite was applied for the catalytic and photocatalytic applications using the Methylene blue (MB) and methyl orange (MO) dyes and compared their efficiency and confirmed that the Methylene blue was degraded faster and showed more catalytic and photocatalytic activity compared to methyl orange using $\text{Fe}_3\text{O}_4\text{-SiO}_2$ nanocomposite which is a new work. Moreover the antioxidant, activity was also evaluated and they synthesized nanocomposite exhibited better activity.

Audience Take Away:

- As the conference is focusing on catalysis, chemical engineering and technology, therefore, intend to present that how cheaper and easily fabricated catalyst can be prepared, characterized, and applied for their role in catalysis.
- The audience who are working in the field of chemistry, material chemistry, environmental chemistry, chemical engineering and technology may know more about this nanocomposite material and will help them to refresh their knowledge from the academic and applied point of view.
- Yes of course, this will help them to expand their teaching/research. In other words they can use this composite by doping with various nanomaterials (semiconductors metals, polymers etc.) and can be applied for potential catalytic and environmental applications
- Yes surely why not, due to this the researcher will be able to design more and more projects in the field and will easily remove the hurdles of a problem. Especially the people who are working in the chemical/environmental engineering and technology.
- Yes it will bring about amendment in designing and will also leads to modifications in the previous design after clearly understanding the fundamental of the nanocomposite based catalysts. The role of light in the terms of quality and quantity used in photocatalysis can also be explored.

Biography

Muhammad Yaseen currently a Senior Research Ph.D student of chemistry in Abdul Wali Khan University Mardan, Pakistan. received my M.Phil degree in 2016 From Hazara University Mansehra Pakistan , done research on the synthesis and applications of nanomaterials and published research article in 2017 in Journal of Analytical and Bioanalytical techniques. Currently, senior Ph.D research student at AWKUM under the supervision of Dr.Abbas Khan. He working on Synthesis and characterization of nanostructures materials and their environmental applications for the degradation of pollutants. Currently I have published 5 research articles as an Author and 3 articles as a co-authors in different journals.

**C. Rocha*, M. A. Soria , Luís M. Madeira**

Alice, Department of Chemical Engineering, Faculty of Engineering,
University of Porto, Rua Dr. Roberto Frias S/n, Porto, Portugal

Catalytic screening for steam reforming of olive mill wastewater

Olive mill wastewater (OMW) is a pollutant effluent of the olive oil production. To reduce the environmental impact of this agro-industrial sector, with simultaneous valorization of such waste, the steam reforming of OMW (OMWSR) was studied in this work. Besides the reduction of pollution resulting from OMW, the process allows producing “green” H_2 . In this study, several commercial catalysts (Ni-, Cu-Zn- and noble metal-based) were tested to compare their performances. A catalytic screening study with all the commercial catalysts was performed, and stability tests were conducted with the material that demonstrated higher activity (Rh-based catalyst). The physicochemical characterization of the fresh and spent materials was realized through several techniques (temperature-programmed reduction, temperature-programmed oxidation, transmission electron microscopy, temperature-programmed desorption of CO_2 , temperature-programmed desorption of NH_3 , chemisorption of H_2 , scanning electron microscopy with energy dispersive spectroscopy and physical adsorption of N_2 at $-196^\circ C$). Although there are some materials with good catalytic performance, the Rh-based sample stood out during the tests, exhibiting high catalytic activity and high stability: at $400^\circ C$ the H_2 yield (over $9\text{ molH}_2\cdot\text{molOMW}^{-1}$) and total organic carbon (TOC) conversion ($>98\%$) were high along all the 24 h of the stability test. Besides that, several Ni-containing catalysts were prepared and tested to compare their performances for the OMWSR; still, stability tests were also carried out. The materials were also extensively characterized. Amongst the materials tested, the Ni-Ru/ SiO_2 sample stood out, exhibiting high catalytic performance: at $400^\circ C$, the H_2 yield ($>8\text{ molH}_2\cdot\text{molOMW}^{-1}$) and conversion of total organic carbon ($\approx 75\%$) were high during all the 24 h of the long-term test, with only a small deactivation being noticed.

Audience Take Away:

- Properties of the catalysts that effect the catalytic activities of the materials in a steam reforming process.
- Solution for valorization of the Olive Oil Mill Wastewater.

Biography

Cláudio Rocha (MSc in Chemical Engineering at FEUP) is a Postdoctoral Research at ALiCE, FEUP. His research is focused on the valorization of the Olive Oil Mill Wastewater (OMW) through the Steam Reforming Reaction in hybrid multifunctional reactors. He has published in only 6 years of his R&D career 11 papers in international journals with peer review, plus 1 manuscript already submitted, achieving 82 citations, and holding an h-index of 6 (source: Scopus, August 2022). He co-authored 6 abstracts published in international peer-reviewed conference proceedings, 3 of which selected as oral communications.



Sudhagar Pitchaimuthu

Research Centre for Carbon Solutions, Institute of Mechanical and Processing Engineering, School of Engineering and Physical Science, Heriot-Watt University Edinburgh, United Kingdom

Accelerating photo(electro)chemical technology beyond the water splitting process - cross fertilisation of wastewater treatment and green hydrogen generation

Green hydrogen – a carbon-free renewable fuel that has the capability to decarbonize a variety of sectors. The generation of green hydrogen is currently restricted to water electrolyzers. The use of freshwater resources and critical raw materials, however, limits its use. Alternative water splitting methods for green hydrogen generation via photocatalysis and photoelectrocatalysis (PEC) has been explored in the past few decades. However, their commercial potential still remains unexploited due to the high hydrogen generation costs. Novel PEC-based simultaneous generation of green hydrogen and wastewater treatment/high value product production is therefore seen as an alternative to conventional water splitting. Interestingly, the organic/inorganic pollutants in wastewater and biomass favourably act as electron donors and facilitate the dual-functional process of recovering green hydrogen while oxidizing the organic matter. Generation of green hydrogen through the dual-functional PEC process opens up opportunities for a “circular economy”. It further enables the end-of-life commodities to be reused, recycled and resourced for a better life-cycle design while being economically viable for commercialization. This invited talk brings together and critically analyses the recent trends towards simultaneous wastewater treatment/biomass reforming while generating hydrogen gas by employing the PEC technology. We have briefly discussed the technical challenges associated with the tandem PEC process, new avenues, techno-economic feasibility and future direction towards achieving net neutrality.

Biography

Dr Sudhagar Pitchaimuthu is an Associate Professor at the School of Engineering and Physical Sciences and the Associate Director for Energy Materials within the Research Centre for Carbon Solutions at Heriot-Watt University, UK. He graduated from Physics discipline, Bharathiar University, India in 2009. He was served as Research Assistant Professor during 2009-2013 under Prof. Yong Soo Kang's group at the Centre for Next Generation Dye-sensitized Solar Cells in Hanyang University, South Korea. He was the recipient of the prestigious JSPS award (2013) and worked as JSPS Research Fellow under Prof. Akira Fujishima (Inventor of Photoelectrocatalytic water splitting for hydrogen generation) at the International Photocatalytic Research Centre, Tokyo University of Science. He was the recipient of Sêr Cymru II-Rising Star Fellowship awarded by the European Regional Development Fund through the Welsh Government (2017). His research expertise is in 'material synthesis and coatings' for scalable energy conversion systems. Particular focus is on effective solar energy harnessing via applications such as solar to green hydrogen generation, environmental clean-up (photocatalytic water treatment, air purification and artificial CO₂ recycling). Sudhagar is one of the leading scientists in his niche and has published 111 research articles in peer-reviewed international journals (Citations-4672). His h index is 39, and he has contributed to 8 book chapters. He has disseminated his work in >50 national and international conferences.



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Enzymes on engineered supports: A strategy to obtain pharmaceutical compounds

The use of enzymes has contributed to obtention of enantiomerically pure compounds. However, for greater industrial viability, the enzyme immobilization technique is required. The design and production of each support for each enzyme can be obtained by support engineering and immobilization techniques. Depending on the support used in the enzyme immobilization process, the biocatalyst may exhibit particular activities. In this context, one material for supports that should be highlighted comprises core-shell polymer supports synthesized through combined suspension/emulsion polymerization. This technique can be very advantageous because it allows the production of porous particles on a micrometric scale and the functionalization of the shell of the particles. In this way, new polymeric core-shell particles produced through combined suspension and emulsion polymerization process were produced for the synthesis of high-performance enzymatic biocatalysts. Particularly, distinct comonomers, containing different functional compounds (such as glycidyl methacrylate, methyl methacrylate, styrene, and divinylbenzene), were added to the polymerization step in order to produce particles with distinct textural properties, including high specific area, porosity, and distinct hydrophobicity degree. Then, such core-shell particles were employed as supports for the immobilization of lipases. The performances of the obtained biocatalysts were investigated in hydrolysis reactions. Some strategies to improve the enzyme properties during the performance of tailor-made enzyme immobilization protocols was made. It was observed that immobilized enzymes may also exhibit better functional properties than the corresponding soluble enzymes by simple immobilization protocols. Besides, the biochemical characterization of new biocatalysts showed new performance if compared with its soluble enzyme version. The potential for industrial applications to obtain pharmacological derivatives was explored.

Audience Take Away:

- This work will help more understanding about immobilization of proteins for synthesis of active compounds.
- The audience will contribute to expand biochemical concepts in catalysis area.
- The information can simplify researcher's job more efficient.

Biography

Evelin Andrade Manoel is a Biologist and holds a PhD in the area of Biochemical Engineering. She was awarded by the Coordination for the Improvement of Higher Education Personnel (CAPES), being considered the best thesis in the country in the area of Engineering (2015) and works as a permanent professor at the Faculty of Pharmacy at UFRJ. She has experience in the areas of Biochemical and Biochemical Engineering with an emphasis on Biotechnology applied to Pharmaceuticals and Cosmetics. Recently she had a patent filing for the production of a new drug (Process number: BR1020210224649).



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Bio-oil upgrading to alternative diesel fuel with novel catalysts

Bio-oil produced from biomass is regarded as a promising alternative fuel source for transportation in the future. However, some properties of bio-oil, such as high water and oxygen content, strong acidity, and low heating value, prevents it use as a fuel source in current engines. For this reason, bio-oil should be upgraded to gasoline or diesel. In this study, the zeolite cracking process is used for upgrading bio-oil. Numerous compounds exists in bio-oil structure and model compounds should be employed in investigations. Acids, aldehydes and ketones are the major groups increasing the oxygen content of bio-oil. These groups will be represented with a mixture consisting of formic acid, furfural and hydroxypropanol(HPO), this mixture will be used as feed in reaction experiments. In this study, zeolite cracking process was conducted over alumina based catalysts. The quality of fuel phase was obviously improved when active metal addition to alumina supported catalysts. Catalysts utilized in reactions are required to have high Bronsted acidity in the structure which will be achieved via zirconia and tantalum loading in structure. Zirconia content increased reactant conversion and oil phase selectivity. Moreover, oil phase produced in the presence of tantalum catalyst had higher oxygen content then zirconia catalysts. Furthermore, increasing the reaction temperature also enhanced the selectivity of the oil phase. The conversion of the reactants reached to 90% and the selectivity of the oil phase reached to 17.5 wt.% in the co-cracking process under 400 °C and 1 bar. The oil phase had hydrocarbon content of 100% and mainly contained hydrocarbons with carbon numbers ranging from 5 to 10, which are the main components in commercial gasoline.

Audience Take Away:

- The properties of alternative fuel of bio-oil that is preferred instead of fossil fuels.
- Learning about new concept catalysis for bio-fuel production.
- Methodology and optimum reaction conditions for efficient production of Bio-oil.

Biography

Dr. Birce KARAMAN studied Chemical Engineering Department at the Gazi University, Turkey. She received her PhD degree in 2020 at the same institution. She has published 5 research articles in SCI(E) journals.



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The challenges of green nanotechnology in an ever-changing world

One of the great problems in the science and engineering, it is a development of sustainable materials, which are produce by a chemically green rout. In this sense, production of new materials, such as nanomaterials, based on new chemically green route using low-cost reagents is a great science challenge. In addition, the world is passing for various changes, mainly, in the environmental and climate area. Then, choosing routes more ecofriendly and sustainable is an important demand in an ever- changing world. These nanomaterials have gained more and more space in the society and market. Nevertheless, the production of these materials is still used an unsustainable chemical route. For example, the industry of electronic devices has invested in the development new nanoelectronics devices, however, most of the methodology used is based on not eco-friendly route, using toxically reagents. In this context, searching of new green routes is a challenge in nanomaterials science. Thus, the research of BIOSEM group is based on produced new nanomaterials for multiple applications, using green routes and reagents a feedstock of semiarid region and agroindustry waste, which has many potentials to produce nanomaterials for various applications.

Audience Take Away:

- The audience will able to understand the new challenges in the nanomaterial's science in an ever-changing world.
- Many types of industry, such as electronic industry, biomaterial industry, pharmaceutical industry, have invested in the development new nanoelectronics devices, so, understand and looking for new green chemically routes in a world that has searching more sustainability, and less environmental impacts is a real and important differential for the works of industry. This speaks is an invitation to reflect on necessary changes in an ever-changing world.

Biography

Material Engineering, Master and PhD at UFMG/Brazil in the subject area Material Chemistry, Polymer Chemistry to environmental and biological applications. Research of environmental problems in the rivers of State capital of Minas Gerais/Brazil. Professor at Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM) at Institute of Engineering, Science and Technology, in the Department of Materials Engineering. Reviewer of various important journals of Springer, Elsevier, and other, such as Carbohydrate Polymers, International Journal fo Biological Macromolecule, Journal of Environmental Chemical Engineering, Journal of Polymers and the Environment, Materials Chemistry and Physics, and other important journals. In addition, member of editorial board of Nanoarchitectonics, dvanced Chemicobiology Research (ACBR), Journal of Food Science and Engineering (Online), International Journal of Environmental Monitoring and Analysis, Journal of Materials New Horizons, Journal of Physics. Author of articles in journals such as International Journal of Biological Macromolecule, Journal of Environmental Chemical Engineering, ACS Applied Materials & Interfaces, and others.

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