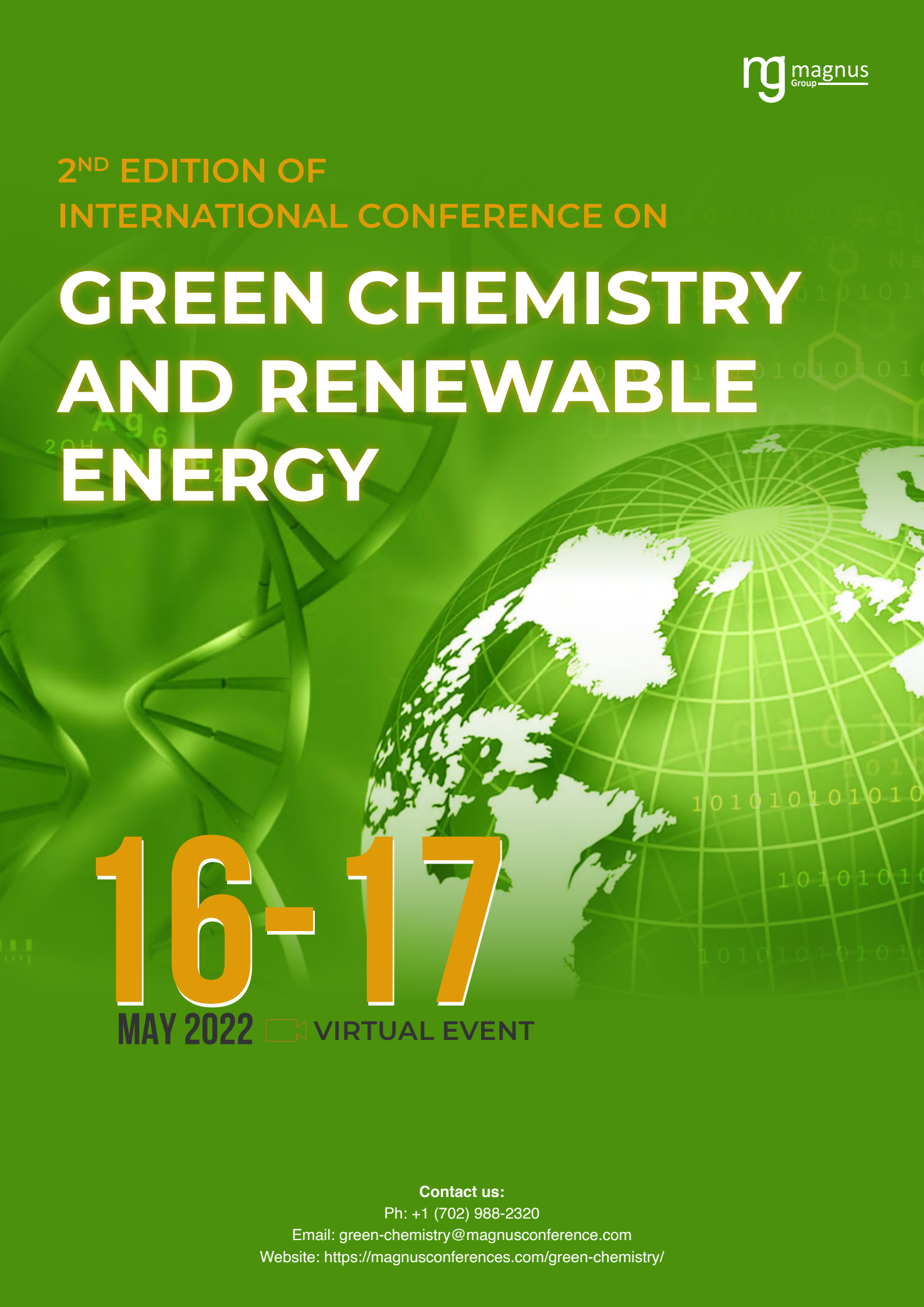
magnus Group

2ND EDITION OF
INTERNATIONAL CONFERENCE ON

GREEN CHEMISTRY AND RENEWABLE ENERGY



16-17 MAY 2022 VIRTUAL EVENT

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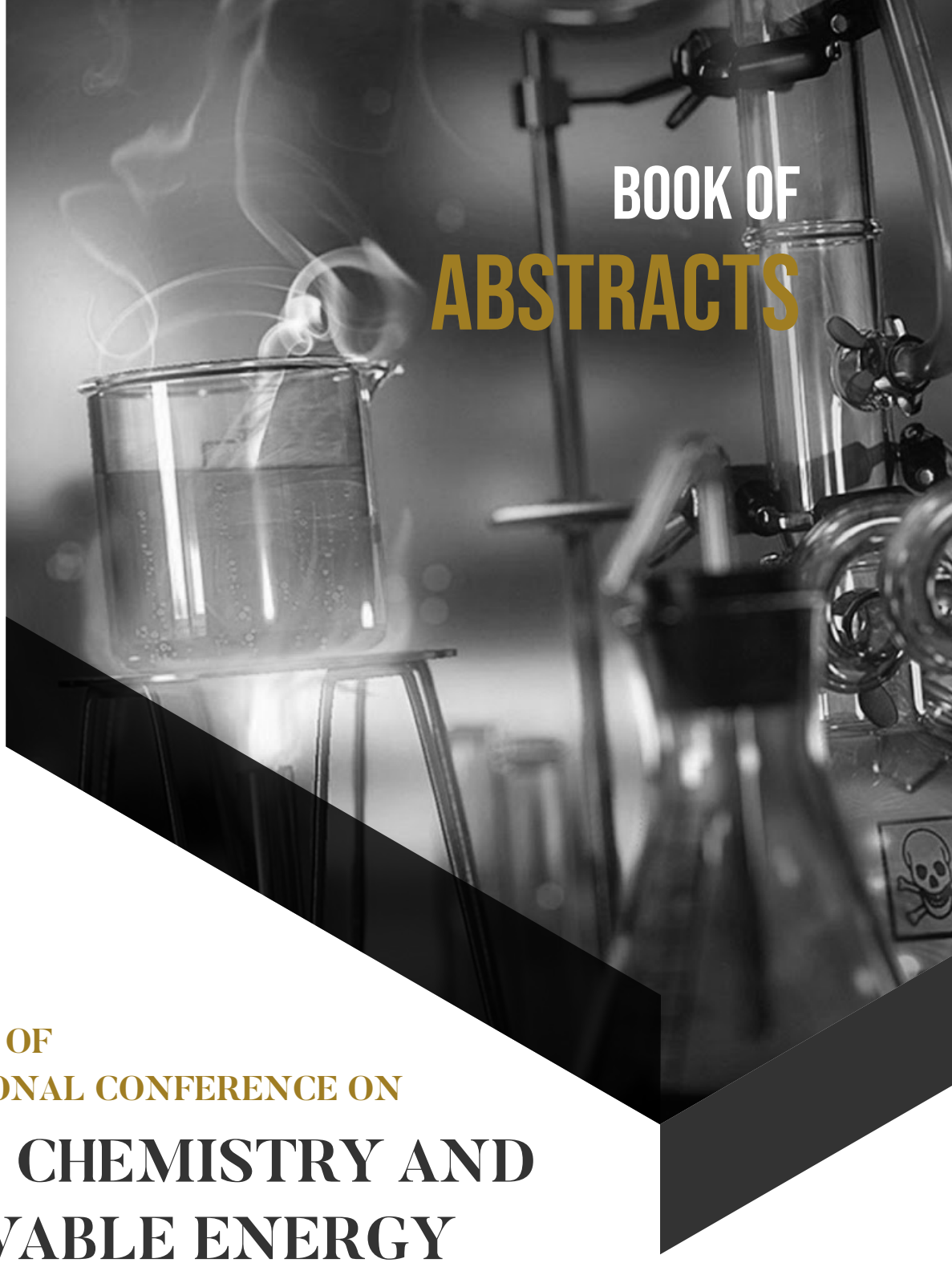

BOOK OF ABSTRACTS

2ND EDITION OF INTERNATIONAL CONFERENCE ON

GREEN CHEMISTRY AND RENEWABLE ENERGY

16-17 MAY

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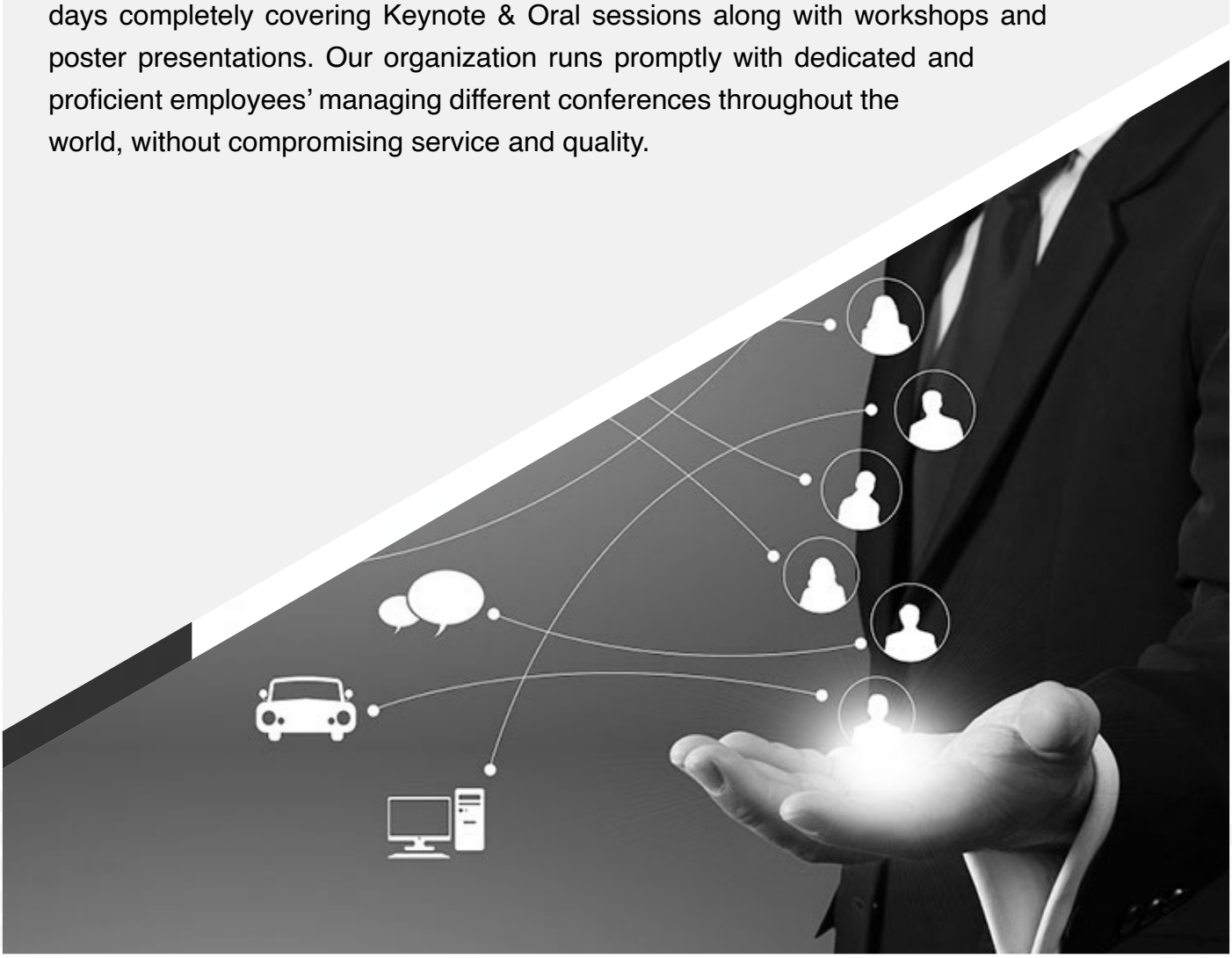
ABOUT MAGNUS GROUP

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 GREEN CHEMISTRY 2022

GREEN CHEMISTRY 2022 welcomes members from different parts of the world to join our Online Event - "2nd edition of International Conference on Green Chemistry and Renewable Energy" scheduled during May 16-17, 2022. It includes prompt Keynote presentations, Oral presentations, and Poster presentations, interactive and informal exchanges. This is going to be one of the most remarkable events of the year. Through the theme "Thriving Sustainability: Multifaceted Aspects of Green Chemistry" conference will explore the advances in the field. Green Chemistry 2022 goal is to bring together bright minds to give talks that are ideas-focused, and on a wide range of scientific sessions, to faster learning inspiration. It will provide an international platform to share expertise, foster collaborations, discover new information, and stay current with trends and networking.

KEYNOTE FORUM

DAY 01

2ND EDITION OF
INTERNATIONAL CONFERENCE ON

GREEN CHEMISTRY AND RENEWABLE ENERGY

16-17 MAY

Arno A. Evers

Arno A. Evers, Philippines

Will hydrogen be able, to solve the energy problems of the world?

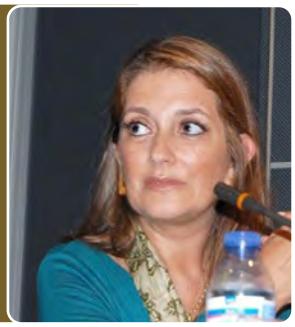
Recently, there has been more and more talk about hydrogen in the energy and transport industry. There are some powerful government programs for its introduction. But is this the solution to our energy problems? Hydrogen is not, what many people imagine, an environmentally friendly energy source. It is a technical gas, which was used since the 1930s for a number of industrial applications. Like in the food and glass industry, and mainly for making fertilizer. Hydrogen has to be made first on earth, it might be, one far day, used as an energy carrier. But that will be rather expensive. Considering the conversion and transport losses, this does not make much sense, when knowing the facts and figures of "our" today`s existing energy infrastructure. If we really want to save the world, we have to start different.

Audience Take Away:

- Earth`s Energy Balance
- Worldwide Energy Production by Source
- The German Power Grid
- Hydrogen and the Laws of Physics
- Four steps to a new Energy Supply
- Can 35 Cars power one Skyscraper?
- Use of a Personal Power Provider (3P+)

Biography

Arno A. Evers was born in 1946 in Hamburg. After several years in the oil survey industry, he worked for Messerschmitt Boelkow Blohm (MBB) in Hamburg before he became a press spokesman in 1985 for MBB at their Munich headquarters. Arno was responsible for Public Relations and Press-work at the first years of the introduction of the European Airbus into its commercialization. In 1995, Arno founded the Group Exhibit Hydrogen and Fuel Cells at the HANNOVER FAIR which developed over the years to become Europe s largest industry and research gathering, taking place annually at the Hannover Fair in Germany. Until 2006, he led and owned the entire organization. Thereafter he attended numerous H2/FC conferences, trade shows and events worldwide. Evers is now building a community in the Philippines to demonstrate the world, how cheap, easy, straightforward and environmentally friendly the energy supply of the global population in future can and will be.



Helena Belchior-Rocha

ISCTE-University Institute of Lisbon, Portugal

SymbioCity model for sustainable urban development

SymbioCity is a holistic and inclusive approach to sustainable urban development that transforms urban challenges into opportunities. Nowadays the way cities choose to respond to climate change and urban challenges is the path to the resident's wellbeing. The objectives of this program followed the standards of the 1990s: decontamination and use of already built-up land; sustainable building materials; emphasis on public transport; limiting noise to 45 dB (through the building system) and optimising energy, water and waste services. The concept of symbiosity is very simple and has to do with the idea of transforming neighbourhoods into communities (eco-neighbourhoods) where people can live, live, work and prosper without the need to move to another part of the city or beyond, thus reducing the ecological footprint inherent in that displacement. It is not about enclosing people in ghettos, just about making mobility an option and not a necessity. Sustainable cities will be made of sets of neighbourhoods with a strong identity and autonomous centres with a multiplicity of facilities, sports, cultural, leisure facilities and public services, so that people do not feel the need to move in their daily lives. Although these issues are seen as distinct problems in research fields and policy, they are connected, requiring a holistic approach to solutions.

The SymbioCity Approach supports cities in planning sustainably and identifying inclusive and innovative solutions to urban challenges through synergies between different urban systems. The approach is largely founded on practical experience and expertise from Swedish local governments. In December 2015 and with renewed support from Sida, SKL International started up the global SymbioCity Approach 2.0 programme. The main objective was to improve health, safety, comfort and quality of life for poor people living in urban areas, to address urban challenges related to sustainability and resilience. Within this context, the Global Platform for Sustainable Cities (GPSC) and the Global Program on Nature-Based Solutions for Climate Resilience aimed to bring together leading policymakers, practitioners, and experts to share knowledge, and help urban areas integrate climate and biodiversity concerns into urban development projects and investments.

Cities all over the world are increasingly pursuing green sustainability agenda, to grow their economies while working to reduce carbon footprints and avoid biodiversity loss. Moreover, cities are uniquely positioned to deliver green recovery after crises and provide the foundation of resilience. In fact, the COVID-19 pandemic has highlighted the need for open green spaces in cities and access to urban nature, providing insights into future planning and policies.

Audience Take Away:

- This approach emphasizes a multidisciplinary view, in order to make an analysis with various perspectives so that synergies between the different aspects and areas can be identified in an integrated planning framework.
- This approach helps to understand how to be able to manage urban development in a way that is inclusive, holistic and a matter for all citizens; understand integrated and holistic planning so as to be able to identify synergies between urban systems; understand how to manage change through multi-level collaboration and be able to use the SymbioCity approach to improve the process and the results of urban change projects.

Biography

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

Nabisab Mujawar Mubarak

Brunei University of Technology, Brunei Darussalam

Recent development of deep eutectic solvent for chitosan-based cellulose nanowhiskers

The synthesis of chitosan/CNW bio composite films was done with the help of DES as solvent media. The impact of applying DES in the bio composite films synthesis is analyzed in the aspect of chemical structure, mechanical properties, and thermal properties. The idea of green solvent reflects the aim of reducing the environmental effect of the application of solvents in chemical production. The synthesis of CNW/chitosan nanocomposite films via DES present's changes in the chemical structures. A pure chitosan film has broadband at 3180 to 3400 cm^{-1} which indicates the presence of amide and hydroxyl groups. With the incorporation of CNW, the peak shifts to the greater wavelength and turns sharper and stronger. The addition of DES infuses more elements of amide into the nanocomposite films. For the mechanical properties, the incorporation of CNW filler into the chitosan matrix presents an enhancement in terms of Young's Modulus, tensile strength, and elongation at break. The Young's Modulus and tensile strength are increased while the elongation break is decreased as the incorporation of CNW concentration increases. However, the application of DES results in a lower Young's Modulus and tensile strength as the film is hygroscopic. In a conclusion, DES is considered the new solvent media in the synthesis application in green chemistry. It has the potential to replace IL due to its biodegradability and non-toxic properties while preserving the character of low vapor pressure. Besides that, chitosan is the potential material to be applied in various industries such as the biomedical and pharmaceutical industries. The more CNW concentration incorporated into the chitosan films, the more the enhancement of mechanical properties.

Audience Take Away:

- Deep eutectic solvent as a green solvent for various application
- DES-based composite material for sustainable development
- Chitosan-based DES for bio-composite material
- Combination of DES and chitosan for development of nanowhiskers

Biography

Dr Mubarak Nabisab Mujawar is an Associate Professor in the Department of Petroleum and Chemical Engineering, UTB. In research, He has published more than 210 journal papers, 30 conference proceedings, and authored 30 book chapters, 9 Malaysian patents and the H-index is 42. He has published 5 books and co-editor 5 ongoing Elsevier edited books. He also has the distinction of being listed in the top two percent of the World's most influential scientists in the area of chemical and energy. The List of the Top 2% Scientists in the World compiled and published by Stanford University. he is a Fellow Member of The Institution of Engineers Australia, a Chartered Professional Engineer (CPEng) of The Institution of Engineers Australia, a Chartered Chemical Engineer of the Institute of Chemical Engineering (IChemE) and Fellow of the Higher Education Academy (FHEA), UK.

Suresh C. Ameta

PAHER University, India

Photocatalysis: A green chemical pathway

World is facing three major problems such as scarcity of portable water, global warming and acute shortage of energy. Water and air are being polluted at an ever increasing pace, increasing industrialization and transportation supported by exponential increasing population. Although different methods are there to solve these problems but every technique has some or the other disadvantages. There is an urgent demand to develop some eco-friendly route to solve these problems and here, photocatalysis enters the scene. Photocatalysis provides electron as a reductant and hole as an oxidant, simultaneously upon excitation. These excitons (e^-–h^+) can be used for reducing and oxidizing environmental contaminants. If a proper modification of the photocatalyst is done to check the recombination of e^- and h^+, then photocatalysis can degrade water and air pollutants efficiently giving better quality of water and air. The major culprit of global warming is considered to be carbon dioxide. It can be reduced by photocatalytic route to some value added fuels, which can be further used to generate other forms of energy such as electricity and heat. Hydrogen has been predicted as the fuel of future, which can solve the problem of energy scarcity taking care of environmental pollution also. These three important aspects will be discussed.

Audience Take Away:

- Audience will know the advantages of photocatalysis and its application in combating against polluted water, photoreduction of carbon dioxide and hydrogen generation using a green chemical route, which is a need of the day.

Biography

Prof. Suresh C. Ameta is serving as Professor of Eminence, Faculty of Science, PAHER University, Udaipur, India. He has guided 102 students for Ph. D. Prof. Ameta has occupied the prestigious position of President, Indian Chemical Society, Kolkata (2000-2001) and is now lifelong Advisor. He was awarded a number of prizes during his career including three Life Time Achievement Awards. Indian Chemical Society has published a Special issue of the Journal of Indian Chemical Society on his Sixtieth Birthday and also instituted a National Prize in his honor as Prof. Suresh C. Ameta Award.

POSTERS
DAY 01

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16-17 MAY

Rania Farouq
Pharos University in Alexandria, Egypt

Development of functional nanocatalyst /polymer composite

The application of nanotechnology has become inevitable in almost all sectors. Nanoparticle (NP) is the matter between molecule and bulk material. It has attracted much attention in catalysis, optoelectronics and biology due to its unique physical and chemical properties. Incorporation of these NPs into the polymer matrix is one of the best methods to display their special functions, which not only stabilize the NPs but also realize the functional assembly of NPs and polymers. The polymer nanocomposites are widely used in various fields and slowly they have become an integral part of our life.

Recycled commercial polystyrene can be successfully sulphonated under mild conditions to increase the surface functionalities facilitating thus the composite formation by interaction between the surface functional groups and the nanoparticles.

The porous R-Fe_2O_3 nanorods were successfully obtained by calcining the R-FeOOH precursors at 300°C for 2 h. the structural and magnetic properties of R- Fe_2O_3 nanoparticles stabilized in a sulfonated polystyrene resin matrix have been studied by DLS, FTIR.

Audience Take Away:

- Fabricating monodisperse sulphonated polystyrene (SPS) microspheres with abundant sulphonic acid groups.
- Use the advantage of the sulphonic acid groups on the surface of polymer for increasing adsorption ability of SPS.
- Coupling Fe_2O_3 nano particles with sulphonated polystyrene (SPS) could be used in varieties of application as a catalyst.

Biography

Rania Farouq received her PhD in chemical engineering with a CGPA (A-) from the Faculty of Engineering, Alexandria University in Egypt in 2013. She got her master of science in chemical engineering with a CGPA (B+) from the Faculty of Engineering, Alexandria University in Egypt. In 2009. And she received her diploma in chemical engineering with general grade good in 2006. She obtained her bachelor of science in chemical engineering in 2003. She is an associate professor in the Petrochemical Engineering Department; Pharos University in Alexandria, Egypt She has published more than 15 research articles in SCI (E) journals.

Grzegorz Klosowski*, Dawid Mikulski
Kazimierz Wielki University, Poland

Susceptibility of cellulose from various types of biomass after microwave-assisted hydrotropic pretreatment to enzymatic hydrolysis

Plant biomass is a cheap and renewable source of carbon which might be used as a substrate in biosynthesis processes. The effective use of lignocellulosic biomass depends on the efficient delignification of the biomass, which largely increases the susceptibility of cellulose to enzymatic hydrolysis. The study was aimed at evaluating the influence the effectiveness of microwave-assisted hydrotropic pretreatment of pine chips, beech chips and wheat straw, taking into account changeable process conditions with sodium cumene sulfonate (NaCS) on the susceptibility of cellulose to enzymatic hydrolysis. The concentration of glucose obtained as a result of enzymatic hydrolysis of cellulose is strongly correlated with biomass extractives. A higher concentration of glucose as a result of enzymatic hydrolysis was achieved from the raw material marked by a high level of loss of biomass components and a high content of cellulose in the biomass, which is related to the already discussed effect of the absence of cellulose extraction during microwave-assisted hydrotropic pretreatment. Obtaining the highest concentration of glucose as a result of hydrolysis of a given type of biomass subjected to microwave-assisted hydrotropic pretreatment has always been conditioned by the use of 40% w/v NaCS at 117 PSI for 60 minutes. As a result of enzymatic hydrolysis of non-wood (wheat straw) and hardwood (beech chips) biomass, a high concentration of glucose was achieved at, respectively, 463.27±11.25 mg/g of biomass and 327.70±22.15 mg/g of biomass. The highest resistance to enzymatic hydrolysis involving cellulases was determined for pine chip (softwood) biomass, which yielded a maximum glucose concentration at 50.77±0.75 mg/g of biomass. The processed wheat straw and beech chip biomass obtained as a result of microwave-assisted hydrotropic pretreatment was marked by the highest cellulose content and a high susceptibility to enzymatic hydrolysis (effect of a high level of delignification), which speaks for the use of these raw materials as a source of carbon in microbiological biosynthesis processes. From among the analysed sources of biomass, the lowest susceptibility to enzymatic hydrolysis of cellulose was recorded for pine chips, which is related to the lower level of delignification obtained. The obtained biomass after microwave-assisted hydrotropic pretreatment is a potential source of carbon that can be used in microbiological biosynthesis processes. Funding: The work was supported by the National Science Centre, Poland, grant No. 2020/37/B/NZ9/00372.

Biography

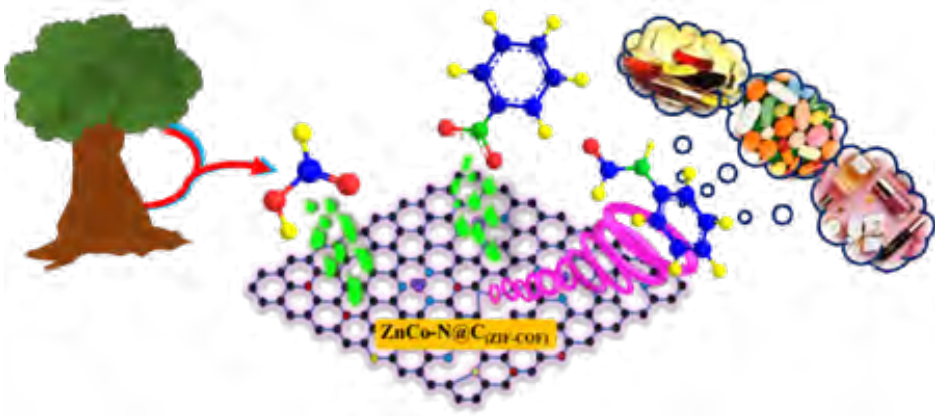
1991-2005 Assistant and adjunct researcher, Institute of Agricultural and Food Biotechnology in Warsaw, Distillery Division in Bydgoszcz; 2003 Ph.D., specialization in organic chemical technology, Szczecin University of Technology, Faculty of Technology and Chemical Engineering; 2005-2022 Faculty of Biological Sciences, Kazimierz Wielki University in Bydgoszcz, 2009-2012 vice chairman of the Institute of Experimental Biology; 2012-2019 Dean of the Faculty of Natural Sciences. Current positions: Associate Professor (since 2012) - head of the Department of Biotechnology (since 2011). Author of 37 research articles in SCI(E) journals and many other industry and knowledge dissemination publications.

Ashish Kumar Kar* and Rajendra Srivastava

Indian Institute of Technology Ropar, India

A sustainable approach for reductive formylation of Nitroarenes And N-Heterocyclic Arenes using formic acid over a CoZn embedded N-doped porous carbon catalyst derived from the Zif-Cof Integration

A highly efficient CoZn embedded N-doped porous carbon (ZnCo-N@C(ZIF-COF)) is prepared by the carbonization of CoZn bimetallic Zeolitic imidazolate framework (ZIF) integrated with Covalent organic framework (COF). The synthesized catalyst was investigated in the sustainable reductive formylation of nitro arenes and N-heterocyclic arenes using formic acid which is a bio renewable resources obtained from the biomass. Several control experiments and the detailed catalyst characterizations were conducted to understand the structure activity relationship. The recycling experiment, hot-filtration test, and poisoning experiment demonstrate the ZnCo-N@C(ZIF-COF) is a stable and recyclable heterogeneous catalyst.

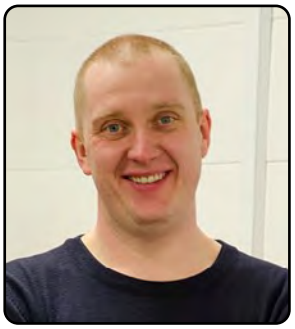


Audience Take Away:

- This presentation will motivate the researchers and industrialists to work on the synthesis of MOF derived material and metal embedded N-doped carbon-based material.
- The presentation also highlights the development of low cost, easy to fabricate, and highly active multifunctional catalytic materials for the formylation reaction of aromatic amines and N-heterocyclic arenes.
- The careful design of a catalyst with defined active sites and their structure active relationship will also be discussed.

Biography

Ashish Kumar Kar completed his Master of Science (MSc) in Organic Chemistry at Maharaja Sriram Chandra Bhanja Deo University, Odisha, India in 2015. He joined the Department of Chemistry, IIT Ropar as a junior research fellow (JRF) and began his PhD in Aug 2017. He is currently working on the development of carbon-based materials including MOF, COF, metal/metal oxide-embedded N-doped carbon, etc., for sustainable catalytic and photocatalytic processes. His research contribution also covers catalytic and photocatalytic biomass transformations.



Dawid Mikulski*, Grzegorz Klosowski
Kazimierz Wielki University, Poland

Influence of microwave-assisted hydrotropic pretreatment on the level of delignification of various types of biomass

Structural polysaccharides (cellulose and hemicellulose), which are the main components of lignocellulosic biomass, can be an inexpensive and easily available source of carbon used in biosynthesis processes; however, they must be susceptible to enzymatic degradation. An increase in the susceptibility of cellulose and hemicellulose to enzymatic hydrolysis is achieved during pretreatment aimed at reducing crystalline areas in cellulose, increasing the porosity of cellulose and hemicellulose and, primarily, removing lignins. The study was aimed at evaluating the effectiveness of the delignification of pine chips, beech chips and wheat straw, taking into account changeable process conditions of microwave-assisted pretreatment with sodium cumene sulfonate (NaCS) as the hydrotrope. Tests were conducted with the microwave generator at a constant power of 600 W, but with a variable concentration of NaCS (10, 20, 40%, w/v), time (10, 30, 60 min) and pressure (39, 78, 117 PSI). The highest level of biomass loss as a result of pretreatment was determined for wheat straw, and the lowest for pine chips. The maximum level of extraction of components achieved as a result of microwave-assisted hydrotropic pretreatment was ca. 55% for wheat straw, ca. 45% for beech chips, and 35% for pine chips. At constant NaCS concentration, regardless of the type of lignocellulosic biomass, increased loss of biomass was recorded as a result of pretreatment at increasing pressure and exposure. The highest loss of mass after microwave-assisted hydrotropic pretreatment was obtained at 117 PSI for 60 minutes, regardless of the biomass type. Microwave-assisted hydrotropic pretreatment also caused extraction of hemicellulose from biomass, lowering the content of this polysaccharide in the analysed samples. The effectiveness of the extraction of hemicellulose from biomass is correlated with biomass extractives. The pretreatment method used enables an almost complete extraction of hemicellulose from wheat straw from the level of 29-30% DW and from pine chips (original content 12-13% DW). The extraction of lignins from biomass was less intense in comparison to hemicellulose. In the case of the use of 10% w/v NaCS, increased content of lignins in the biomass was recorded, while when 20% w/v NaCS was used, the content of lignins was constant regardless of the conditions of microwave-assisted pretreatment and biomass type. The observed increase in lignin content in biomass results from the use of constant weights for determination of lignocellulose components. The lowering of lignin content in biomass was determined at as much as 40% w/v NaCS, although the level of extraction depended on the type of biomass. Conclusions facilitating the highest delignification of raw materials used include NaCS concentration at 40% w/v, pressure of 117 PSI and duration of 60 minutes. The obtained biomass after microwave-assisted hydrotropic pretreatment is a potential source of carbon that can be used in microbiological biosynthesis processes. Funding: The work was supported by the National Science Centre, Poland, grant No. 2020/37/B/NZ9/00372.

Biography

Dr. Mikulski studied Biology at the Kazimierz Wielki University, Poland and received hid PhD degree in 2015 at the same institution. He implements numerous research projects related to fermentation processes, microbiological biosynthesis and biotransformation. The main research direction is the integration of first and second generation bioethanol production process. Dr Mikulski is also interested in the processes of microbiological biosynthesis of products constituting food additives and the production of biosurfactants from the agro-food industry waste.

Alena Kharissova*, Shadai Lugo Loredo, Francisco Enrique Longoria Rodriguez, Alejandro Arizpe

Autonomous University of Nuevo Leon (UANL), Mexico

Synthesis of TiO_2 sensitized with SnS quantum dots for application in photovoltaic devices and solar paints

One way to revolutionize solar energy production at scale is by reducing the manufacturing cost, complexity of manufacturing and the possibility to apply it on any shape and surface. For this purpose, quantum dot-sensitized solar cells (QDSSC) are good candidates to push solar cell technology in this direction using pseudo-SILAR process. In this work, pseudo-SILAR is used as a unique route to develop quantum dot (QD) sensitized via QDs deposition on titanium dioxide (TiO_2). We have successfully developed at room temperature SnS QDs without the use of heat on TiO_2 using a simple wet chemical modification of p-SILAR using 7 cycles of ultrasonication from aqueous solutions of $SnCl_2$ and Na_2S in different concentrations. Consequent deposition of SnS QDs was affirmed via transmission electron microscope (TEM), photoluminescence (pl) spectroscopy, energy dispersive X-ray (EDX), UV–vis spectroscopy and X-ray diffraction (XRD). Eventually, solar paint-based photovoltaics and photocatalysis were carried out to show the photocurrent density (JSC) of solar cells to determine the efficiency as a solar paste. In this regard, the ultimate goal of the investigation is making the filler to be added to household exterior paint that can be applied to any transparent conductive surface to turn it into the photoanode of QDSSCs. Whereas further improvements are necessary to develop strategies for scaling, this initial effort to prepare solar paint offers the advantages of simple design, abundant materials and economically viable next generation solar cells with abundant, low-cost, non-toxic, greener raw materials and highly energy efficient production process.

Audience Take Away:

- Novel sustainable energy efficient process to synthesize SnS quantum dots on TiO_2 without the use of heat.
- It can potentially provide a solution to new solar cell materials with abundant, low carbon and nontoxic materials.
- This is intended to be used to produce fillers by pseudo silar method for in solar paint applications.

Biography

MC student at the Sustainable Chemistry department at Autonomous University of Nuevo Leon (UANL), Mexico. Graduated as a Materials Science Engineer in 2018, then as an engineer at Schneider Electric, and later joined the research group at Mighty Buildings 3D printing company where 1 patent was created of a 3D printed scaled formula.

SPEAKERS
DAY 01

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16-17 MAY

Jinsong Wu
Guilin University of Electronic Technology, China

Big data driven internet of things: Toward environmental sustainability and intelligence

Although the term of green has been often used to refer to energy consumption reduction or energy efficiency by many people and literatures, green actually should refer to environmental sustainability in more general senses. Environmental sustainability issues have been important topics for recent years, which has impacted and will further impact individuals, enterprises, governments, and societies. Environmental sustainability is not simply regarding reducing the amount of waste or using less energy, but relevant to developing processes leading to completely sustainable human society in the future. The long term consequences of the relevant serious issues have not yet been fully forecasted, but it has been generally accepted in many communities that immediate responses are necessary. From 30 November to 12 December 2015, the 21th United Nations Climate Change Conferences of the Parties (COP 21) was held in Paris, France, as the a historical breakthrough and milestone towards securing the future Earth, a global agreement on the reduction of climate change, the text of which represented a consensus of the representatives of more than 193 countries attending it, which was a profound milestone for global environmental sustainability. Nowadays there is another significant tendency on how to process the enormous amount of data, big data. This talk would discuss the history, technical issues, challenges, and new trends of big data driven Internet of things for environmental sustainability and intelligence.

Audience Take Away:

- This talk will introduce the relations of big data, Internet of things, environmental sustainability, and environmental intelligence.
- This talk may help audiences understand the issues relevant to big data driven Internet of things for environmental sustainability and intelligence.

Biography

Jinsong Wu won 2020 IEEE Green Communications and Computing Technical Committee Distinguished Technical Achievement Recognition Award, for his outstanding technical leadership and achievement in green wireless communications and networking. He is as Vice-Chair Technical Activities (2017-present), IEEE Environmental Engineering Initiative. He was Founding Chair (2011-2017) of IEEE Technical Committee on Green Communications and Computing (TCGCC). He is also Founding Vice-Chair (2015-present) of IEEE Technical Committee on Big Data (TCBD). He received 2017, 2019, and 2021 IEEE System Journal Best Paper Awards. He was the leading Editor and co-author of book “Green Communications: Theoretical Fundamentals, Algorithms, and Applications” (CRC Press, 2012).

Hasan Saygili* and Gulbahar Akkaya Saygili

Batman University, Turkey

A new separable green-carbon material design with potential application in herbicide adsorption

The 2,4-dichlorophenoxyacetic acid (2,4-D) is one of the herbicides used on a large scale in agriculture worldwide due to its low cost, selectivity, and efficacy. Therefore, elimination of 2,4-D from the ecosystem is a very important issue to be solved. Many techniques have been applied to eliminate 2,4-D from aquatic environment such as advance oxidation, photodegradation, chemical oxidation with ozone, coagulation and adsorption. Of these techniques, adsorption is the most preferred and applied because of its ease of application, low-cost and environmentally friendly features. This study is focused on the synthesis and application of lentil waste-based carbon composite material (LCC) as adsorbent for the removal of the herbicide compound 2,4-dichlorphenoxyacetic acid from aqueous solution. The composite was prepared from activated carbon precursor, which was produced and optimized by the microwave-assisted K_2CO_3 chemical activation method using lentil processing residues. The physical and chemical structure of LCC were investigated through a series of characterization methods including FE-SEM, Raman, XRD, XPS, FT-IR, BET, and VSM. The effects of pH and temperature on the adsorption performances are investigated in detail, for which the significance of structure of LCC composite is elucidated. The effect of pH shows that the adsorbent has excellent adsorption performance for 2,4-D at pH=2. The equilibrium data were better fitted to the Langmuir model. The maximum adsorption capacity of the LCC towards 2,4-dichlorophenoxyacetic acid was 400 mg/g at 318 K. Thermodynamic studies showed the favorability and spontaneity of the adsorption process. Therefore, it can be concluded that magnetic carbon composite developed from lentil waste is a promising alternative as an adsorbent for the treatment of actual effluents containing 2,4-D herbicide.

Keywords: Lentil waste; 2,4-dichlorophenoxyacetic acid; magnetic carbon composite; Adsorption.

1. Introduction

Pesticides, including herbicides, are compounds used to increase agricultural productivity and ensure an adequate food supply. The high consumption of herbicides in modern agriculture, urban landscaping and inadequate storage or disposal causes the contamination of these compounds in soil, groundwater, rivers, lakes, rainwater and air. Sometimes herbicide/pesticide concentrations in agricultural effluents can reach up to 500 mg L^{-1}, potentially causing environmental problems. The effects of chronic, sublethal exposure to increasing combinations of herbicides and other xenobiotics are still largely understudied, despite the potential risk to human health and the environment.

Among the various herbicides currently available, 2,4-D is a polar molecule with high water solubility, considered as an active ingredient with low cost and selective action, applied for post-emergence control of grasses and weeds in crops (Franco et al., 2021;Islam et al., 2018). However, due to its low pKa value (i.e. 2.81), the herbicide is found predominantly in its anionic form in the pH range present in the natural environment and is unsuccessfully removed due to its high mobility. In addition, membership in phenoxy or acetic acid groups is considered potentially toxic to humans, has been linked to kidney, immune and respiratory problems, and is classified as carcinogenic and endocrine deregulating. Due to its highly mobile character, low biodegradability and high toxicity, 2,4-D represents a common problem with surface and groundwater contamination and encourages or develops research into alternative recovery and treatment methods (Magnoli et al., 2020).

Many traditional approaches have been adapted to treat wastewater contaminated with 2,4-D, such as biological degradation, pre-oxidation and adsorption. Among these methods, adsorption has often been used due to its unique advantages such as low cost, ease of operation, and fewer harmful by-products (Liu et al., 2016).

To our knowledge, only a few works regarding the removal of 2,4-D by carbon based composite materials have been performed. In this work, LCC was synthesized through a simple method, and characterized by various spectroscopic techniques. The impact of key parameters such as initial pH and temperature were evaluated. Meanwhile, the adsorption mechanism was also tentatively proposed.

2. Materials and experimental details

Lentil waste was procured as a raw material from lentil factory at Batman in Turkey. $FeCl_3.6H_2O$, $CuCl_2$, K_2CO_3, NaOH, NaCl, HCl and 2,4-D were bought from Sigma-Aldrich Company. The chemicals were at high purity (>99%) and analytical grade.

2.1. LCC fabrication

$CuFe_2O_4$ nanoparticles (NPs) were loaded into the fabricated LCC by implementing a co-precipitation method: $CuCl_2$ (0.02 mol) and $FeCl_3 \cdot 6H_2O$ (0.04 mol) were dissolved in ultrapure water (400 mL), followed by lens waste-based activated carbon (4.8 g) was added. With vigorous mixing, NaOH (5M) was added dropwise to raise the pH of this mixture to about 10-11. This vigorous mixing was continued for 1 hour. The mixture was then kept at 100 °C for 2 h. Then, the obtained LCC was magnetically separated from the medium, washed with ultrapure water, and then dried in an oven at 105°C.

Figure 1. Synthesis route of LCC sample.

2.2. Characterization of LCC

The morphology of prepared LCC was characterized by SEM. Raman spectrum was recorded using the Raman microspectrometer. XPS is applied for analyzing the surface chemical properties of the LCC. The crystallographic structure of composite was evaluated by XRD analysis. The surface functional groups on LCC were confirmed with the help of FT-IR. BET surface area analyzer was used for measurement of specific surface area and pore characteristics of LCC. Vibrating sample magnetometer was used to examine the magnetic characteristics of LCC.

Adsorption studies

For all adsorption experiments, 0.02 g LCC was accurate weighted and subjected into a 100 mL stoppered flask containing 50 mL 2,4-D with known concentration. Solution pH was adjusted varying from 2 to 10 and tested by a pH meter. The adsorption isotherm study was conducted with varying concentrations of 2,4-D (50-600 mg/L) at the temperatures of 298, 308 K, 318 K, respectively. The residual concentration of 2,4-D after adsorption was determined by using UV-visible spectrometer, at maximum absorbance wavelength of 282 nm. The amount of 2,4-D adsorbed per gram of LCC at equilibrium, qe (mg/g) was calculated using Eq. (1) (Fernandez et al., 2022).

$$q_e = \frac{(C_o - C_e)}{W} V \qquad (1)$$

Where C_0 and C_e (mg/L) were the initial and equilibrium concentration of 2,4-D, respectively. V (mL) was the volume of solution and W (g) was the mass of sorbent.

Results and discussion

3.1. Characteristics of magnetic carbon composite

Scanning electron microscopy (SEM) was used to examine the morphology of LCC (Figure 2a). The $CuFe_2O_4$ nanoparticles are placed into the carbon framework. The Raman spectra (Figure 2b) of LCC, show characteristic peak of CuFe2O4 NPs at 672 cm^{-1}, which helps confirm the formation of the composite structure. Figure 2c shows the X-ray diffraction patterns of the LCC composite. The composite show sharp diffraction peaks at 2θ= 30.6, 35.8, 38.9, 42.6, 50.9, 57.5, 62.5, 75.8°, indicating that the composite was crystalline.

Figure 2d shows XPS spectra of the LCC obtained for the deconvolution of the peaks. The presence of C, Fe, O and Cu elements has been verified by the survey spectra. The FTIR analysis of LCC is shown in Figure 3a. The sharp peaks appeared at 575.5 cm^{-1} and 432.6 cm^{-1} in the spectrum of the LCC. This can be due to the stretching vibration of Fe3+-O2- and Cu^{2+}-O^{2-}, indicating the existence of $CuFe_2O_4$ NPs on the surface of LCC. LCC is characterized by N_2 adsorption-desorption isotherm that shows the existence of micro and mesoporous in the framework (Figure 3b). Magnetism is a key property for practical separation and recovery of adsorbents from liquid phase. The magnetic hysteresis curve of LCC is shown in Figure 3c. In Figure 3c, the typical VSM curves of a superparamagnetic material with a hysteresis loop in S-shaped can be observed.

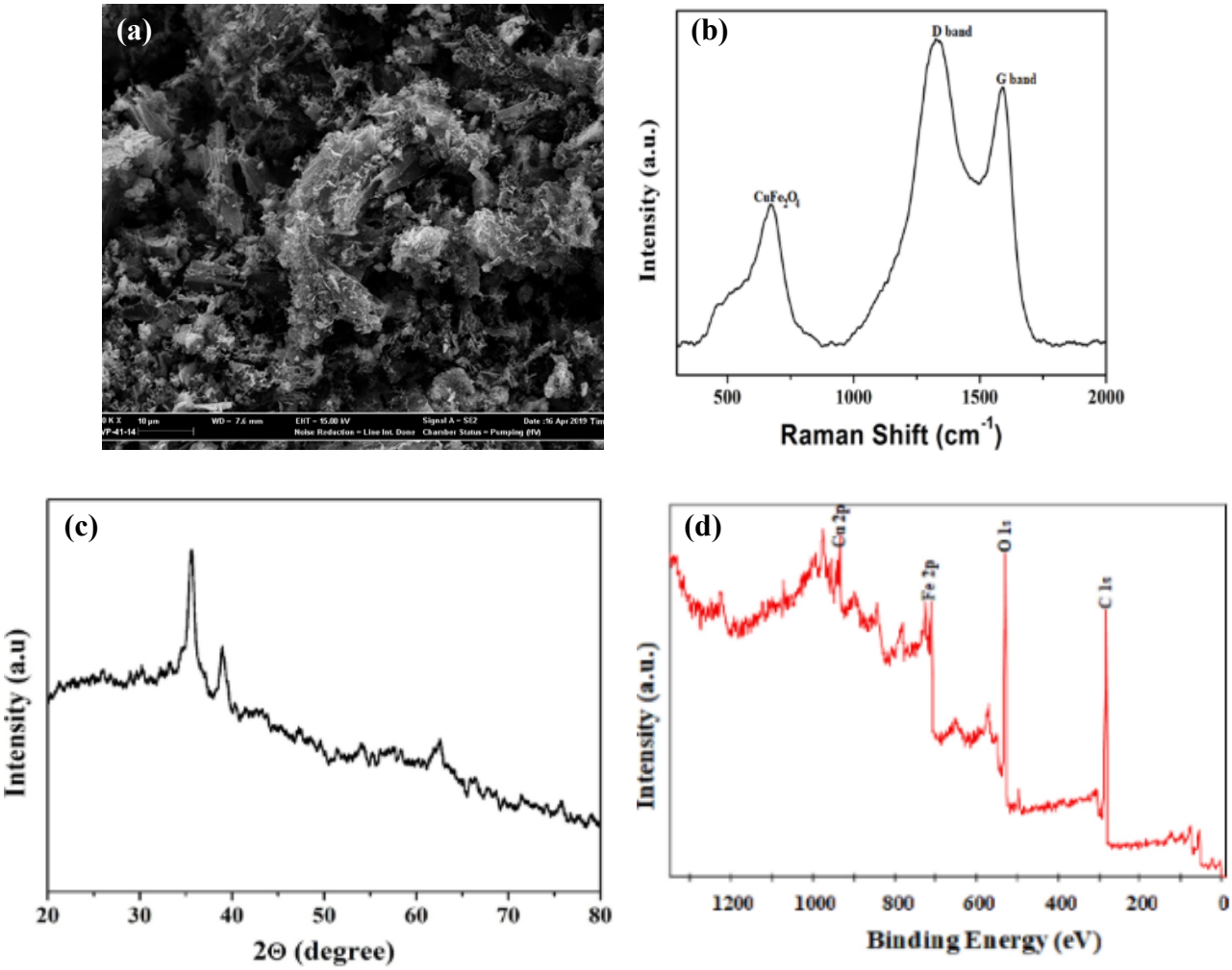

Figure 2. SEM image (a), Raman spectra (b), XRD profile (c) and XPS survey spectra (d) of LCC.

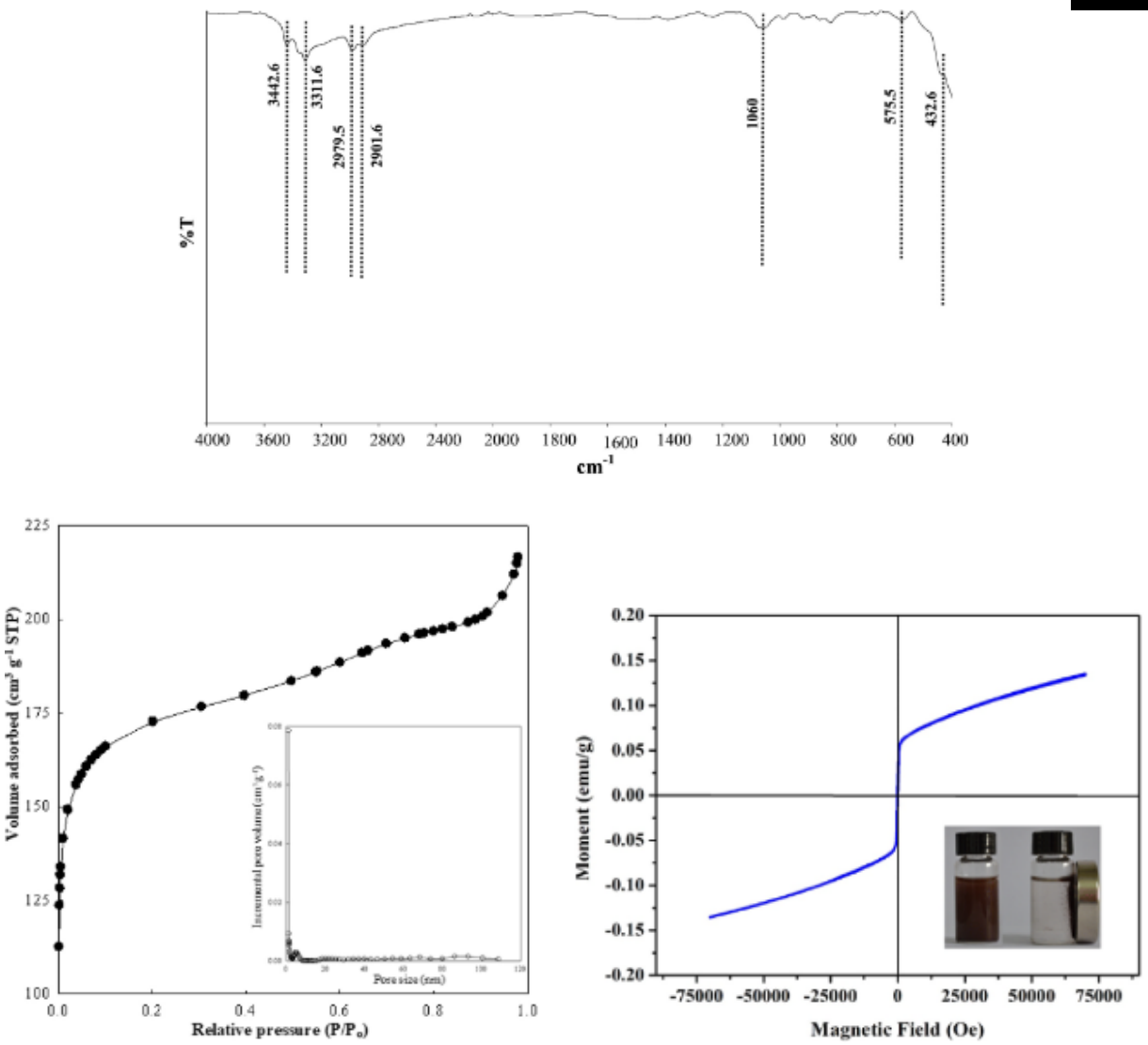

Figure 3. FT-IR spectrum (a), BET results (b) and VSM curve (c) of LCC.

3.2. Batch adsorption results

3.2.1. The effect of pH

The effect of initial solution pH was investigated over a pH range of 2 to 10 with 100 mg/L of 2,4-D solutions and seen in Figure 4. As shown in Figure 4, there is a significant decrease in the adsorption capacity of LCC towards 2,4-D herbicide when the pH value is more than 2. Therefore, pH 2 was selected as optimal pH for isotherm studies.

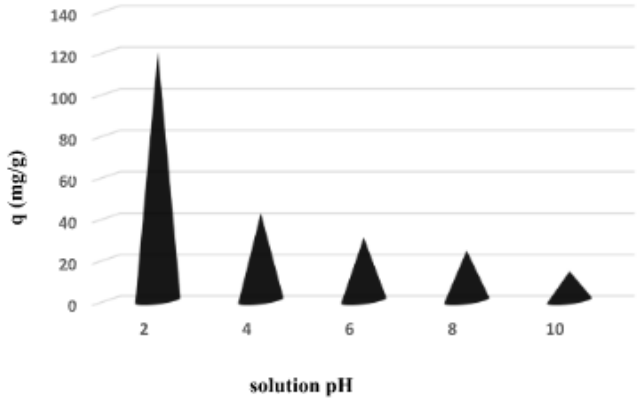

Figure 4. Effect of pH on 2,4-D adsorption.

3.2.2. Adsorption isotherms

Adsorption isotherms are important for evaluating the adsorption mechanism and adsorption capacity of adsorbents in adsorption process. To better understand the characteristics of the adsorption process, the equilibrium adsorption data were analyzed well-known linear models by Langmuir (Eq. 2) and Freundlich (Eq. 3) (Langmuir, 1918; Freundlich, 1906). Table 1 show parameters of both model adjusts in different temperatures. It is observed from Table 1, the R^2 values correct the fact the 2,4-D elimination by LCC obeyed the Langmuir model that expresses the monolayer adsorption of 2,4-D onto the LCC. The maximum 2,4-D adsorption capacity calculated from the Langmuir model was 400 mg/g at 318 K.

$$\frac{C_e}{q_{en}} = \frac{1}{q_m b} + \frac{C_e}{q} \quad (2)$$

$$In\, q_e = In\, K_F + \frac{1}{n} InC_e \quad (3)$$

where Ce (mg/L) is the equilibrium concentration of 2,4-D remained in the solution, qe (mg/g) is the amount 2,4-D adsorbed on per weight unit of solid after equilibrium, q_m (mg/g) is the maximum adsorption capacity, b is adsorbate/adsorbent interaction constant (L/mg); K_F is a measure of adsorbent capacity and the slope 1/n is the adsorption intensity.

Table 1. Isotherm parameters of Langmuir and Freundlich models of 2,4-D.

Langmuir model					Freundlich model		
T (K)	q_m	b	R_L	R^2	K_F	$1/n$	R^2
298	263.16	3.71×10^{-3}	0.31	0.9900	4.94	0.46	0.9840
308	370.37	2.93×10^{-3}	0.36	0.9858	7.93	0.63	0.9797
318	400	0.0101	0.14	0.9940	14.79	0.56	0.9710

Conclusion

In summary, LCC was successfully prepared and utilized as adsorbent for removing 2,4-D from solution. It showed the best performance at pH 2. The isotherm data fitted well with Langmuir isotherm model. The Langmuir model correlated to the experimental data showing an adsorption uptake of 400 mg/g for 2,4-D at 318 K. Thus, LCC can be effectively used as an adsorbent for the removal of 2,4-D from contaminated waters.

Acknowledgements

This work was supported by Dicle University Scientific Research Projects Unit [grant number: ZGEF.16.014].

Audience Take Away:

- Lentil waste-based carbon composite material (LCC) is a new green biomaterial for environmental protection. Its application potential was studied in this work and will be presented in the conference.
- Synthesis and characterization are critical for application of magnetic carbon composite in adsorption of 2,4-D herbicide.
- Lentil waste activated carbon and copper ferrite react when mechanically mixed in a mortar.
- Synergy between activated carbon and $CuFe_2O_4$ on magnetic adsorbent contributes to herbicide removal.
- Lentil waste-based carbon composite (LCC) could be considered as a promising adsorbent to remove herbicides from the wastewater.

Biography

Dr. Hasan SAYĞILI is currently working as an Assoc.Prof. in the Chemistry and Chemical Process Technology Department, Vocational School of Technical Sciences, Batman University, Turkey. He has an experience in the field of carbon-based materials for environmental applications. He holds a PhD in activated carbon production from biowastes from Dicle University, Turkey. His primary research interests include carbon nanomaterials, waste minimization, environmental pollution, hydrothermal carbonization, cleaner production technology and wastewater treatment. He has published more than 25 research articles in SCI(E) journals.

Ray Drabble*, John Roberts
University of Southampton, United Kingdom

Over the wall drainage: Sustainable drainage for waterfront developments

The geography of the urban coastal strip of West Sussex presents significant issues for surface water management. During winter months, particularly when ground water levels are high, pluvial run-off from the South Downs drains rapidly onto the coastal flood plain and typically enters culverts that drain via tidally constrained gravity outfalls through sea walls.

Potential flood storage inside the defended coastline is very limited and pressure for housing development is increasingly targeting some of the few remaining undeveloped sites further reducing floodplain storage. The expansion of urban areas over recent decades, in combination with the increased intensity of rainfall events associated with climate change, has resulted in storm water flows entering the system at rates that exceed their capacity to drain. Furthermore, as one looks ahead throughout the lifetime of new developments the constraints on the traditional surface water sewer network will increase as a consequence of sea level rise that will further restrict the period during which existing tidal flaps can operate.

Shoreham Harbour in West Sussex is the subject of a major regeneration forming a key element of the Adur Local Plan and the Joint Area Action.This redevelopment offers a unique opportunity to influence the resilience for waterfront developments that, with appropriate design and timely intervention, can minimise the impact of climate change upon surface water drainage in defended coastal environments.

The Lead Local Flood Authority (LLFA) will share how it has been working with developers and consultants to identify more sustainable approaches to the drainage of tide-locked waterfront developments that can also inform best practice not just within West Sussex but beyond.

Audience Take Away:

- The study is ongoing but the LLFA will share key findings from the work, to date, including:
- Why a step change is required in the UK to minimize flood risk for defended coastal developments;
- How hydraulic modelling has been used to assess the relative merits of traditional subterranean drainage systems with ‘over the wall’ and shallow drainage approaches in minimizing of flood risk;
- How the outputs of the modelling and review of SuDS approaches has been used to identify proposed changes to the design parameters for defended coastal developments; and
- Some case studies illustrating how alternative approaches to drainage design are being taken forward.
- Details of the remaining lines of inquiry will also be shared and an invitation provided to delegates to contribute data / expertise that can be used to inform the final report due to be published later this year.
- This talk should be of particular interest to drainage engineers, urban planners, and landscape architects.

Biography

Ray Drabble is a BSc (Hons) graduate of The City University in Systems & Management. Following a 21 year career as an Officer in the Royal Navy, he studied Integrated Environmental Studies at The University of Southampton graduating with a MSc degree in 2002 focused on the marine and coastal environment. Following 10 years in this field, Ray gravitated to mainstream flood risk management culminating in his current position in 2016 as Principal Engineer within West Sussex Lead Local Flood Authority. Ray sits on the Executive Board for the Association of Sustainable Drainage Authorities and is a chartered member of the institute Water and Environmental Management.

Tran Huu Nghi*, and Maartje de Graaf
Tropenbos International, Vietnam

Impacts of climate changes and adaptation measures of local people in central highlands of Vietnam

Central Highlands is located in the central part of Viet Nam where is the home of difference ethnic minorities groups and have a lot of traditional customs on the agriculture production and society. This is also famous for many perennial crops which contribute to local and national economy and generate income for local communities. There are several major crops including Coffee, black Pepper and Rubber, cultivated in the Central Highlands. These crops have contributed to the economic development of the region but have also created problems and challenges for local communities and authorities as well, including (add challenges – conflict over land? Land degradation?).

In recent years, the impact of climate change is becoming clear in the region: There are more and stronger rains in the rainy season, which cause a lot of landslides and flooding. On the other hand, the longer dry season and stronger winds lead to water scarcity, which has an impact on crop irrigation and has caused more and bigger forest fires.

In response to these changes, local communities have started to apply different measures for adapting to the changes in weather and its impacts. This includes: planting more multipurpose trees (for shade, timber and non-timber products) in the coffee plantation, with the aim to reduce water evaporation under strong sun light, and avoid the soil erosion. Tropenbos Vietnam, through its Green Livelihoods Alliance Programme, has supported in capacity building of farmer associations and communities in these agroforestry practices, and supported the development of demonstration models. We have also organised exchange visits, for farmers from different parts of the landscape to learn from each other, and facilitated the local government in the development of new policies for climate change adaptation.

The presentation will not only address the technical solutions but also talk about the governance and monitoring aspects in the climate change adaptation process in the landscape.

Audience Take Away:

- The audiences will learn more about the impacts of the climate change taken places in the region
- The audience will learn how the local people technically apply the measure on the ground and arrange the crops with different measures.

Biography

Mr. Tran Huu Nghi studied Forestry in the Tropic at The University of Goettingen, for Msc. Degree in Germany 1999. He is recently doing PhD study in Ha Noi, Viet Nam. He worked for German Technical Assistant Agency (GIZ) for ten years in Central Highlands of Viet Nam from 1994 to 2003. He has been working for Tropenbos International Network at program in Viet Nam since 2004. He is a director of Tropenbos Viet Nam since then. He joined several research projects and involved in different papers published in the international journals on the climate change in the region and the country of Viet Nam. Mr. Nghi has many presentations on the climate change topics at the international workshops/conference recently.

Maha Mohamed Abdelrahman

Beni-Suef University, Egypt

Green analytical chemistry metrics and life-cycle assessment approach to analytical method development

The environmental consequences of chemical and analytical research, particularly the use and production of toxic reagents and solvents, have sparked widespread concern. Accordingly, the assessment of analytical techniques' greenness is becoming increasingly relevant in order to evaluate their environmental impact and reveal their validity in establishing sustainable strategies. Therefore, this study will address the state of knowledge of various assessment metric tools adopted for evaluating the greenness profile. Green metric approaches such as the National Environmental Method Index (NEMI), Assessment of Green Profile established by Raynie & Driver, analytical Eco-Scale, HPLC-Environmental Assessment Tool (HPLC-EAT), Analytical Method Volume Intensity (AMVI), Green Analytical Procedure Index (GAPI), Complementary green analytical procedure index (Complex GAPI), Analytical Method Greenness Score (AMGS) Calculator, Analytical Greenness Metric (AGREE), and other tools; will be investigated. All the above metrics will be discussed and compared in terms of their criteria, applicability, benefits, and drawbacks. Concerns have been raised about the potential of understanding how to use such assessment tools to minimize the hazardous environmental effect of harmful chemicals and regulate irresponsible activities, besides the necessity of implementing such metric tools in method development rather than post-analysis evaluation. The application of Life Cycle Assessment for sustainable development and different solvent selection guides for alternative green solvents and reagents will be discussed as well. This study expands researchers' knowledge to comprehend and remain fully up to date with the current greenness evaluation tools, and it helps them to select and apply the most appropriate approach through a realistic examination and comparison of the metric tools.

Audience Take Away:

- This study can help researchers who interested in developing green analytical methodologies by introducing the current available greenness assessment metric tools.
- The study introduces a comparison between the existing greenness assessment tools and their merits and demerits, from which researchers could understand the difference between the assessment tools and how they can apply them in their analytical research.
- This study could help in disseminating concept of green chemistry and significance of applying such greenness evaluation tools in order to protect our ecosystem.
- Additionally, the concept of greenness assessment should be widespread not only to research laboratories, but also it could be expanded to industrial and educational scales to minimize negative impact of chemical processes.

Biography

Dr. Maha is a professor of pharmaceutical Chemistry at Faculty of Pharmacy, Beni-Suef university, Egypt. She is an Egyptian young academy of Sciences Alumnae and received her PhD degree (2011) in analytical chemistry. She has 15 years of research experience in stability studies, water analysis, clinical analysis, and chromatographic separation. Also, she has published 85 international articles and acts as a reviewer for many international journals. Dr. Maha participated as a young scientist in 65th Lindau Nobel Laureate Meeting (Germany, 2015). Besides, she supervised over than 30 MS and PhD theses.

Ashanendu Mandal
University of Calcutta, India

Removal of toxic phenol from wastewater using low-cost adsorbents

Phenol being toxic in nature needs to be removed from industrial wastewater before its discharge. There are several methods developed for phenol removal from wastewater, but adsorption seems to be best because of its simplicity and low-cost. This research aims for removal of phenol using four biological waste adsorbents guava tree bark, rice husk, neem leaves, activated carbon from coconut coir and four industrial waste adsorbents rice husk ash, red mud, clarified sludge from basic oxygen furnace, activated alumina. The surface characterization of adsorbents were carried out by SEM, XRD, FTIR and BET analyzers. The phenol removal percentage were investigated with the variation of initial phenol concentration (5-500 mg/L), initial pH (2-12), adsorbent dose (0.10-20 gm/L), temperature (25-50°C) and contact time (30-600 min). The maximum phenol removal percentage was obtained as high as 97.50%. The experimental results were used for kinetic, isotherm and thermodynamic analysis. The kinetic analysis showed that the pseudo-second order was best fitted for all adsorbents except red mud and the adsorption mechanism was supportive of film diffusion, intra-particle diffusion and chemisorption for all adsorbents. The isotherm analysis suggested that Freundlich isotherm model was best supportive for guava tree bark, rice husk, neem leaves, activated carbon, red mud and activated alumina, whereas Langmuir and D-R isotherm was best supportive for rice husk ash and clarified sludge respectively. The thermodynamic study showed that the adsorption processes were spontaneous, random and endothermic or exothermic in nature. The phenol removal efficiencies were also verified with the real industrial wastewater collected from a coke oven plant. Further the scale-up design, safe disposal and regeneration of adsorbents were carried out to examine their commercial applications. The innovative ANN modeling was also studied using the experimental results which showed that the experimental and predictive data were within allowable range. The research thus concludes that all the adsorbents are substantially effective for phenol removal from industrial wastewater and also have the potential for circular economy.

Biography

Ashanendu Mandal has been an energy professional for more than 34 years. His work for ONGC in offshore and onshore oilfields includes commissioning, modifications, safety, operations, artificial lifts, pressure maintenance, EOR and planning. In addition, Mr. Mandal has more than 10 years' experience in marketing of upstream and downstream products. He has participated in oil and gas events in more than 17 countries as a speaker, panelist, roundtable moderator or session chairman. He has few publications in Chemical Weekly. He is an M.Tech in Chemical Engineering and MBA in Finance, and now pursuing his Doctorate in University of Calcutta.

Yarub Al-Douri

American University of Iraq, Iraq

Alloys nanoparticles for optoelectronic applications

Ceramic-based quaternary II–VI materials have attracted much interests because their constituent elements have important characteristics, high characteristics of structure and optic applicable for digital recording heads, telecommunications, transformers, computers, sensors, photovoltaics, antibacterial and others. The $MgZnFe_2O_3$, $CoZnFe_2O_3$ and $NiZnFe_2O_3$ quaternary alloys nanoparticles are tetrahedral materials of chalcopyrite structure. They have been prepared by green technique; their structural properties are varied as atomic number varies. Due to limited or unavailability resources of the mentioned quaternary alloys nanoparticles, the cost is a challenge. However, green synthesis has reduced their cost.

Audience Take Away:

- Learn more about alloys nanoparticles
- Take more knowledge for optoelectronic application
- Distinguish between toxic and non-toxic nanoparticles

Biography

Prof. Dr. Yarub Al-Douri is from American University of Iraq, Sulaimani. Al-Douri has initiated Nanotechnology Engineering MSc Program and Nano Computing Laboratory. He has received numerous accolades including World's Top 2% Scientists by Stanford University, USA 2021 & 2020, OeAD Award, Austria 2020, JSPS Award 2019, AUA Award 2019, IFIA 2019, TWAS-UNESCO Associateship (Twice) Award 2015 & 2012, the total is 69 awards. Al-Douri is Associate Editor of Nano-Micro Letters (Q1), Editor-in-Chief of Experimental and Theoretical NANOTECHNOLOGY, Editor-in-Chief of World Journal of Nano Science and Engineering.

Chen Xing*, S. Pellet-Rostaing, G. Arrachart

Marcoule Institute in Separation Chemistry (ICSM), France

Application of ultra/nano filtration membrane on mining uranium in seawaters

Nuclear energy is a green and renewable energy. Uranium, as an important resource for nuclear energy, exists in seawater at a concentration of 3.3 μg/L, forming highly stable Ca-UO_2-CO_3 and Mg-UO_2-CO_3 complex. Though dilute, this amounts to an estimated 4.5 billion tons of uranium, which is approximately 1000 times more than that is available from conventional sources such as terrestrial ores. Uranium in seawater will be a near-limitless resource for nuclear fuel in the future, and its recovery will avoid the deleterious effects of terrestrial mining on the environment. Although there are many difficulties to overcome, mining of U from seawater is the most promising.

The objective of this work is to test the possibility to separate Uranium from other salts in natural and recomposed water systems by ultra/nano filtration process realized with inorganic membranes, and to understand the rejection mechanism, the interaction of membrane with solution species. For this goal, various physical-chemical parameters, such as MWCO, pH value of solutions, temperature, applied pressure, ionic strength/salinity, solution composition, are evaluated for their influence on metal rejections. Electric repulsion and steric effect are two mechanisms deducing the interaction of solution species and membrane surface thus the rejections. Speciation distribution of each solution is studied with phreeqC software. Mass conservation law is applied to estimate the error. Concentrations of retentate and permeate are measured by ICPOES and ICPMS for determining the rejections.

Conclusion: Electric repulsion and attraction is the main mechanism of interaction between membranes and solutions species. pH is the principle factor which influences the rejection of every specie. There is a selectively big reject of U(VI) to Na at pH 3 and 8.25 in solutions of U and $NaHCO_3$. MWCO does not influence the rejections of U or Ca except that the IEP of different membranes can be slightly different. The salinity influences a lot the rejection of U in solutions presenting $NaHCO_3$ and NaCl (1-35g/L). U rejection decreases with the increase of salinity, but is still considerably rejected until salinity 10 g/L. With the $CaCl_2$ solutions of increasing concentration at pH 3 and the same for $MgCl_2$ at pH 3, the salt concentration influences a lot the rejection of both Ca and Mg. Both these experiments prove that high salinity shields the electric repulsion, by consequent decreases the rejection. On the other hand, U can be rejected from sodium in solutions contained only U and Na from $NaHCO_3$, NaCl or Na_2SO_4 at pH 8. U can be separated from sodium salts and be concentrated in a concentration experiment, so as Ca and Mg in the solutions respectively of $CaCl_2$ at pH 3 and of $MgCl_2$ at pH 3. Finally, filtration experiments with complicate natural and recomposed solutions including seawaters, Rhone River and theses solutions doped with U are conducted. In all the natural or recomposed seawater solutions, none of the species (U, Na, Mg, Ca, K) is rejected. However, it is proved that with the inorganic membranes, the presence of $CaCl_2$ or $MgCl_2$ hinders the rejection of every specie in solutions including U.

Audience Take Away:

- This presentation will bring the attention to a green and renewable energy resource, nuclear energy, will show the recent research on application of ultra/nano filtration membranes to concentrate Uranium or valuable metal species from nature aqueous solutions, or wastewaters.
- It will also introduce the mechanisms of electric repulsion on membrane surface and help the understanding with the speciation diagrams of Uranium in different solutions.

Biography

C. Xing studied Nuclear Engineering and Technologies at the Sun Yat-Sen University, Guangdong, China and obtained her Master Degree in 2018. She then joined the research group of Prof. Stéphane Pellet-Rostaing at the Marcoule Institute in Separation Chemistry (ICSM) for the research program of concentrating Uranium from seawaters, the doctoral school is Ecole Nationale Supérieure de Chimie de Montpellier. She is now a fourth year PhD student and will make the thesis defense on October 2022. She has two articles to publish before the thesis defense.

Michael Pittroff*, T. Schwarzea, R. Wielandb, F. Niliusc, B. Hodappc, F.Behringerc, B. Shemperd

Solvay, Germany

Environmental-friendly fluorine mixture for CVD cleaning processes to replace C_2F_6 and NF_3 under industrial conditions

During the climate conference in Paris (2015) a binding and universal climate target was established. It was agreed to limit the temperature increase to a maximum of 2 C° until 2100. The most relevant climate gas is CO_2, considered as a primary greenhouse gas with a significant impact on global warming. Although the semiconductor industry is only a small contributor to the global warming, several fluorinated gases having a high global warming potential (GWP), are intensively used. NF_3 is the most frequently used gas, having a GWP of 17200, followed by C_2F_6 and CF_4 with GWPs of 1200 and 7390 respectively. The main application of these gases is to remove residual films remaining inside deposition chambers after a PECVD process (plasma- enhanced chemical vapor deposition). The most important materials to remove are dielectric layers like silicon dioxides (SiO_2), carbon-containing silicon oxides, silicon nitrides (Si_3N_4) and, to a certain extent, conducting films like doped poly-silicon and silicide layers. According to the World Semiconductor Council, the semiconductor industry used in 2018 12696 t NF_3, 2024 t CF_4 and 736 t C_2F_6 on a global basis. Approximately 72% of all semiconductor industry gaseous emissions are caused from these three gases. This article discusses the replacement of C_2F_6 and NF_3 as cleaning gases thru an environmental-friendly gas mixture named Solvaclean®NO (30% F_2, 60%N_2 and 10% Ar).

It could be shown at the production site, which the cleaning was done with Solvaclean®NO achieves similar cleaning time with significant lower gas consumption, appr. 60-70% less gas compared to C_2F_6. The RF-power during cleaning was reduced by 20% and the amount of fluorinated waste water was as well significantly reduced. In addition a Solvaclean®NO supply for a production FAB was installed, based on a bundle delivery system. After a ”craddel to grave” technical check of the gas supply system could be shown, that Solvaclean®NO can be used as a `drop in´ to replace C_2F_6.

Biography

Michael Pittroff currently holds the position as global marketing manager for electronic gases for the business unit electronics of Solvay`s global business unit Special Chem. He started to work on development of environmentally friendly processes in the Solvay group (Laboratoire Central) of Solvay, Brussels Belgium in 1993. Since then, he has developed several new processes or products for Solvay, mainly for gases. In 2006 he joint Solvay Korea to support the group in building up a high purity gases plant for semiconductors and establishing an agent network in Asia. Solvaclean® was developed together with Texas Instruments after his return to Germany in 2012.

Annunziata Soriente*, Margherita De Rosa, Carmine Gaeta, Carmen Talotta and Placido Neri

University of Salerno, Italy

Bioinspired organocatalysis performed by supramolecular host molecules

The achievement of high performances in terms of conversion, selectivity, and safety issues are pivotal to the overwhelming majority of chemical processes. In the last decades, many efforts have been devoted to the development of new synthetic methodologies emulating the high performance of biological processes. In natural biosynthetic processes, enzymes are the natural catalysts that speed up the reactions and water is the medium where they work reaching amazing levels of efficiency, selectivity, and specificity. Water possesses many advantages as a reaction medium, besides being environmentally friendly, in comparison to commonly employed organic solvents: it is nontoxic, nonflammable, and with its high heat capacity, high polarity, large cohesive energy and hydrogen bonding abilities may have significant impact on the reaction outcome delivering unforeseen reactivities and selectivities. On the other hand, enzymes are nano-meter sized molecules with hydrophobic cores surrounded by hydrophilic shells. Inside the hydrophobic pocket substrates are confined and isolated from "bulk" water and placed in an ideal environment for its selective transformation. The synthesis of molecules operating with the same principles used by natural enzymes, artificial enzymes, is a rapidly growing field of research. One such approach is the development of supramolecular host molecules whose reactivity bears clear resemblance to that of enzymatic catalysis. Supramolecular host molecules are constituted by macrocyclic scaffolds in which an internal cavity sequesters the substrates through secondary interactions with functional groups located around the internal cavity, isolating them from the bulk medium and providing a confined reaction environment. In this way, the substrates within the host cavity not only are forced to be close to each other and isolated from the surroundings thus leading to high effective local concentration and to an increase of the reactivity, but the inclusion into a restricted space can also lead the reagent molecules to react each other with specific geometric constraints, leading to products with high regio- and stereo-selectivity. Additionally, reaction in nanoconfined spaces can exert a conformational control over the guest, can affect the stabilization of transition states and reactive intermediates of the reaction thus altering the typical reaction pathways and unlocking novel reaction outcomes to give products that are inaccessible from bulk solution.

Biography

Prof. A. Soriente studied Chemistry at the University f Naple "FedericoII", Italy and graduated in 1988. She then joined the organic chemistry research group of Prof. Sodano at the Department of Chemistry and Biology, University of Salerno (Italy). She obtained the position of an Associate Professor at the University of Salerno in 2001. She has published more than 90 research articles in SCI(E) journals and 57 communications at international conferences and 4 book chapters.

Enas Amdeha*, Rasha S. Mohamed, Abdelghaffar S. Dhmees

Egyptian Petroleum Research Institute (EPRI), Egypt

Photoreduction of Cr (VI) by ZnS–ZnO/MCM-41 based on blast furnace slag and electric arc furnace dust

Iron/ steel production in the electric arc furnace (EAF) produces a dust by-product consisting mainly of iron oxides and non-ferrous metals (ZnO, PbO, CaO,….etc). This industry is a weed that produces large quantities of slag and dust. The objective of the present study was to develop a procedure for obtaining and characterizing photocatalysts derived from this waste for chromium remediation. The MCM-41 was synthesized via sodium silicate (Na_2SiO_3) derived from Blast Furnace Slag (BFS), and ZnO and ZnS were synthesized based on zinc extracted from Electric Arc Furnace Dust (EAFD). Subsequently, ZnS/ZnO were sono-chemically loaded on the MCM-41 and were tested for the Cr (IV) photoreduction, as heavy metal ions are one of the main wastewater pollutants with the development of the industrial revolution. The resultant ZnO, ZnS, MCM-41, and composites were characterized by X-ray diffraction (XRD), Energy-dispersive X-ray spectroscopy (EDX), N_2 adsorption–desorption isotherms, Fourier-transform infrared (FT-IR) spectrometry, Dynamic Light scattering, and Transmission electron microscopy (TEM), and X-ray photoelectron spectroscopy (XPS). A regular hexagonal structure of typical mesoporous MCM-41 had been proven by small-angle XRD, HRTEM, and N_2 adsorption–desorption. The photoreduction activity of ZnS-ZnO/MCM-41 nanocomposite has obvious efficiency compared to ZnO and ZnO/MCM-41, achieving a 94% photoreduction of Cr (VI) in 180 minutes under UV irradiation. The slight activity loss after 4 cycles (84.7 %) reveals the good photoreduction properties of catalysts. Based on these results, ZnS-ZnO/MCM-41 composite material seems to be high efficiency, green, stable, environment, and economical alternative to be used as a photocatalyst for the reduction of Cr (VI).

Audience Take Away:

- The audience will learn the importance of working in wastewater treatment.
- Also, they will learn how to make a good use of solid waste by converting them into valuable materials.
- The take-home message will be how to remove waste by waste, in a trial to attain zero waste.

Biography

Dr. Enas Amdeha, Researcher at Egyptian Petroleum Research Institute, has her B.Sc. degree in special chemistry, from the faculty of science, Al-Azhar University with Very Good with Honor Rank. She got her PhD in Applied Physical Chemistry, 2017, from the faculty of science, Al-Azhar University, in water treatment via photocatalysis using agricultural waste derived activated carbon. She published many articles in international journals and working now in the preparation of nanomaterials and their applications especially in water treatment via different techniques e.g. adsorption and photocatalysis. She is a Mendeley advisor and acts as a reviewer at many international journals.

KEYNOTE FORUM

DAY 02

2ND EDITION OF
INTERNATIONAL CONFERENCE ON

GREEN CHEMISTRY AND RENEWABLE ENERGY

16-17 MAY

Leon Burgess

Technology Director CalAlSil®, Australia

Calalsil® feldspar polymers – sustainable nanomaterials that replace cement, concrete, bricks and composites

Feldspar Polymers are a new class of ceramic pastes that use nano-sized colloids of ceramic oxides to provide a ready-to-use, low embodied energy and low emission construction material. Using ubiquitously sourced raw materials, CalAlSil®'s nano-colloids contain sufficient chemical potential to cure by simple evaporation water as its solvent. Solid microstructures of closely packed micro and nano-spheres are formed during curing of the aqueous alkali silicate hydrogel. The resultant microstructure contains a continuous microstructure of chemically bound feldspar ceramic that has equivalent properties to existing ceramic and polymer cement systems. Pressure casting and vacuum extrusion are two common manufacturing methods that will produce a macrostructural composite with properties that exceed existing composites. Additionally, the addition of a second part that consists of an emulsion resin with alkaline esters to the single pack feldspar emulsion produces a cross-linked and interwoven micro-fibre ceramic-organic composite. The versality of the feldspar emulsion and two-pack composites represents a leap forward in structural, fireproof materials. Applications of CalAlSil® feldspar formulations are targeted at the circular economy as they act as universal binder materials for recycling of all forms of waste. By using product from waste streams from other industries like silica fume and coal combustion products, CalAlSil®'s carbon emissions are better than the best Ordinary Portland Cement formulation with high-calcium fly ash and activated magnesia. Since all raw materials are produced at relatively low temperatures, future production of CalAlSil® feldspar polymer resins will be accomplished with a zero-carbon emission profile and the lowest embodied energy profile of any construction material. Therefore, CalAlSil®'s ceramic feldspar is both the sustainable keystone formulation for structural construction as well as being the solution to waste re-purposing for the 21st century and beyond.

Audience Take Away:

- CalAlSil® will demonstrate how Alkali-Alumino-Silicate oligomers are the fundamental building blocks of feldspar ceramics which are the green keystone resins for the circular economy.
- CalAlSil® represents the cornerstone of composite formation using a variety of waste streams.
- The primary message from this presentation is that there is a solution to the carbon and energy intensive building and construction industries' use of materials. Further when understood the green chemistry of hybridized silicates provide the basis for all future formulations for industrial and construction materials.

Biography

Dr Leon Burgess-Dean is the creator of CalAlSil®. A management professional, innovator, chemist and materials engineer, Leon has over 25 years of experience in procurement management, technical, research and laboratory management of building products and construction materials facilities. In addition, Leon has specialist and extensive experience in developing solutions to difficult problems in construction, manufacturing and capital projects. Leon has a Bachelor of Applied Chemistry with Honours which was followed by a Doctor of Philosophy in Materials Engineering and a Masters of Business Administration completed in 2005. Leon's expertise is in the complex chemical and material interactions between multi-component aqueous environments and heterogeneous brittle materials.

Cristian Ravariu

Polytechnic University of Bucharest, Romania

Solutions from green chemistry to co-integrate biomaterials near electronic devices

After 2022, when the Moore's law rigorously fulfilled for CMOS technology, the future electronic devices entered into the co-integration period. The Silicon CMOS parts keep the circuit complexity at a low enough price, while the integrated layers can be enzyme membranes to offer sensitive transistors to low analyte concentrations, Organic Thin Film Transistors to put in agreement the Si-circuitry with commended OLEDs for displays, or biomaterials and nano-structured oxides to co-integrate biosensors at low prices and multiple usage for Lab-On-Chip applications. Proposals are multiple, alternative bio-devices are known as work-function, while nanoscale technologies open new facilities to co-immobilize enzymes and antibodies in the CMOS proximity. This work presents solution of co-integration between an enzyme receptor and Silicon MOS device. The final biosensor that works with field effect transistors (FET) as transducers and enzyme as bio-receptor is called EN-FET device. In the actual work, a traditional MOS-FET transistor is co-integrated with the glucose-oxidase enzyme, offering a glucose biosensor. The paper is focused on the manufacturing process optimization of an ENFET. Above the MOS gate oxide, the glucose-oxidase (GOX) receptor is entrapped onto a nano-structured-TiO_2 compound, as a green technological solution, instead of Polycyclic aromatic hydrocarbons PAH functionalization techniques. The paper proposes multiple details for co-integration between MOS devices with enzymatic biosensors. The Ti conversion into nanostructured layer occurs by anodization. Separate situations of GOX entrapment on nanostructured TiO_2 in contact to a Si-wafer are presented. Two cross-linkers are experimental studied for a better enzyme immobilization. The final part of the report combines experimental data with analytical models to extract the calibration curve of the ENFET transistor, prescribing in the same time a design methodology.

Audience Take Away:

- How TiO_2 layers can be attached to Si-wafers.
- How glucose-oxidase enzyme is attached onto nanostructured TiO_2 layer.
- Technological process characterizations are presented.

Biography

Dr. Cristian Ravariu studied Micro-electronics at the Polytechnic University of Bucharest, Romania (UPB-Ro) and graduated as MS in 1993. He then joined the research group of Devices Simulation at the Institute of Microtechnology, Romania (IMT-Bucharest). He received his PhD degree in 2001 at UPB-Ro. After two years postdoctoral fellowship 2010-2012 at UPB-Ro, and foreign stage by Prof. Daniela Dragomirescu at LAAS-CNRS, Toulouse, France he obtained the position of Full Professor at the Polytechnic University of Bucharest, Romania. He has published more than 200 research articles in SCI(E) journals and Proceedings of Conferences.

Tomaz Langenbach

Pontifical Catholic University of Rio de Janeiro, Brazil

Green Chemistry approach by Introduction of biopesticides toward a sustainable agriculture

During decades, many attempts to improve sustainable pest control in agriculture have been tried. Unfortunately, even in the so-called first world countries, results are far from reaching this target; with an overall pesticide consume increase of 15 to 20 times (Report WHO/FAO 2018). Nevertheless, a strong effort is performed to search less harmful pesticides.

A new international trend of Biopesticide occur also in Brazil with an offer of more than 150 new products. Nevertheless, many difficulties needs to be overcome to make possible the use of Biopesticides to substitute in large-scale hazardous chemical pesticides. Some difficulties are related to the nature of biologic living organisms that are only efficient when application is used under biological survival conditions. This demands a knowhow for which is necessary to prepare agronomist and land workers. This involve shareholders with environmental consciousness necessary to change habits. Actually only the most dynamic landowners use these products. Other approaches are in study with “control release pesticides” that avoid the indiscriminate pulverization with pollution of non-target environment.

The amount of hazardous pesticides actually in use worldwide enhance the poisoning of the environment with effects on human health, condition definitively not sustainable.

Biography

Tomaz Langenbach, graduated in Agronomy; Phd Ludwig Maximilian Universität Munich Germany, retired professor in the Institute of Microbiology of the Federal University of Rio de Janeiro; actual invited professor in the Dep. of Civil and Environment Engeneering of Pontifical Catholic University of Rio de Janeiro. The main working activity is related with biodegradation and fate of pesticides in the environment.

Bing Chen*, Zhiwen Zhu, Baiyu Zhang

Memorial University of Newfoundland, Canada

Green solutions for marine oil spill response

The growing offshore oil exploration and transportation activities have raised mounting public concerns over potential offshore oil spill incidents. Therefore, there is an urgent call to develop efficient and environmentally sound oil spill response technologies. Bioremediation, the widely acclaimed green solution to oil pollutions, face challenges from lacking potent oil degrading strains and poor bioavailability of hydrocarbons. Such problems could be exacerbated in extreme environments (e.g., low temperature and high salinity). The production and industrial application of biosurfactants have flourished in the past few years. They are a group of surface-active compounds produced by microbes during their growth. Biosurfactants could reduce the interfacial tension between oil and water, and enhance the emulsification, solubilization, and dispersion of spilled oils when assembled as micelles in the water environment. With an increased bioavailability of spilled oils, the oil removal efficiency could be enhanced.

This presentation features the recent development of biosurfactant based biotechnologies for improved oil spill response. Economic biosurfactant production by marine-originated strains were investigated using wastes material as low-cost substrate. Immobilized robust biocatalyst was employed to boost biosurfactant production rate further. Biosurfactant-based oil spill treating agents, including biodispersants, bioherders, and biodemulsifiers, have been developed via the rational selection of biosurfactant candidates with desired physical and chemical properties. The effects and efficacy of the developed biosurfactant based oil spill treating agents as oil spill response tools were assessed. Herein, we took a deep dive into the assessment of the biosurfactant products and their environmental performance to underpin the development of biosurfactant based remediation technologies. The decontamination mechanism of biosurfactants was probed and the pivotal role of the diverse structures of biosurfactants was identified, which could result in variations in their surface activity and target specificity. The underlying mechanisms concluded in this study could inspire the forthcoming research effects in the advanced environmental application of biosurfactants.

Audience Take Away:

- The study showcases the power of biosurfactants as effective oil spill treating agents. The result is expected to offer valuable insights for developing biosurfactant enhanced bioremediation technologies and extend the toolbox that can be used for oil spill response.
- This study also deepens the understanding of the mechanism of biosurfactant enhanced remediation technologies, and fuels research efforts to screen and produce potent biosurfactant candidates for desired environmental applications.

Biography

Dr. Bing Chen is Professor and UArctic Research Chair in Marine and Coastal Environmental Engineering, and Associate Dean (Acting) of Faculty of Engineering & Applied Sciences at Memorial University, Canada. He also serves as Director of Northern Region Persistent Organic Pollution Control (NRPOP) Laboratory and Director of a global Network on Persistent, Emerging and Organic PoLlution in the Environment (PEOPLE Network). He is a Fellow of Engineering Institute of Canada, Fellow of Canadian Society for Civil Engineering, and Member of Royal Society of Canada. He is an internationally respected leader in environmental engineering research and application with over 460 publications.

Larbi Djabri* and Saad Bouhsina

Annaba University, Algeria

The hydrochemistry, powerful tool to assess the water-rock relationship, case of the alluvial water table of Tebessa (North-East Algeria).

In order to assess the feature of superficial water salinity in the North-East region of Algeria, two methods (principal component analysis and analysis by rare element, Sr^{2+}) have been used. The first one shows that, in the region, the waters are under-saturated with respect to gypsum and anhydrite and underlines the distribution of mineral concentration in Tebessa country as, bicarbonates, sulfates and chlorides. We equally identify pollution by nitrates. The second method indicates evaporitic influence on water mineralization

Audience Take Away:

- The audience will understand that the mineralization of the waters depends on several factors that often remain unknown at the start of the study. This will open several lines of research

Biography

The author holds two doctorates, the first was completed at the University of Franche Comté (France) and the second was acquired in Algeria. The author has been a professor since 2002. The work carried out by Pr Djabri focuses mainly on water quality and particularly on the origins of water salinity. Several publications have been produced on this topic.

SPEAKERS
DAY 02

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16-17 MAY

Md Nurul Islam Siddique* and Zaied Bin Khalid

University Malaysia Terengganu, Malaysia

Supplementation of additional nutrients and intermediate temperature on bio-methane generation from anaerobic digestion of agricultural waste: Feasibility and fertilizer recovery

The increase in demand for organisms drawn in with anaerobic digestion might be the consequence of many substrates being digested at the same time. This study looked at the impact of supplements on the co-digestion of growth substrates. An extra improvement plan that expects a critical occupancy in anaerobic digestion was used in three phases, 37 °C, 40 °C, and 50 °C. Biogas output increased to 1.38 times that of the control at 37 °C as a result of the modifications. Furthermore, the excellent use of this newly found mid-temperature greatly affected an intriguing philosophy as a consequence of 40°C without additions (56 percent of VS end and 8.4 L-biogas). Biogas output surpassed 11.3 L with supplements during anaerobic co-digestion at 50 °C, and mL-CH_4/g-VS was 1.24 times that of the system without any extra improvement. The results reveal that at each temperature, the improved course of action promotes co-digestion. The most generally utilized temperature on the advanced scale was 37 °C, which had the biggest influence on the utilization of improvements during the anaerobic process. Sludge was recovered at a rate of 0.09 m3 sludge/m^3 substrate from the digester, while water was recovered at a rate of 0.86 m3 sludge/m^3 substrate from the digester. The processed sludge may be utilized as compost, and the water can be used to water plants. The time it took to recoup the investment was found to be 3.77 years. As a result, it may be inferred that the current research might soon be recognized as a potential green solution for trash management across the world.

Audience Take Away:

- Anaerobic digestion (AD) collects methane and provides a source of renewable energy that is carbon neutral i.e. provides energy with no net increase in atmospheric CO_2. Fertilizer - compared to undigested slurry, the nitrogen in digestate is more readily available as a plant nutrient.
- Farming waste production around the globe is up to 6 million tons yearly. From these wastes, those that originate from regular trade are yet disposed of in landfills and used for the ignition method with no treatment. This methodology, along these lines, prompts higher GHG emanations and environmental pollution. Anaerobic co-fermentation has been demonstrated to be a successful methodology for improved bio-methane generation from wastes. The mix of different substrates improves nutrition in the digestion system. Thus, microbes have access to supplemented media with an appropriate nutrient equalization. The fundamental targets of co-digestion ought to support valuable associations, keeping away from hindrance and upgrading methane generation. Yes, this research that other faculty could use to expand their research or teaching. Yes, this provides 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 provides new information to assist in a design problem. all other benefits are listed below:
- Improved hydrolysis, pathogen removal, and minimum odor are the key benefits of a thermophilic run.
- On the other hand, the mesophilic run saves energy and is not affected by shock loading than a thermophilic run.
- Besides, a vast microbial community is estimated under a mesophilic state that may help to digest numerous types of organic substances.
- The thermophilic state helps the elimination of pathogens and produces enhanced methane. Nevertheless, the use of intermediate temperatures has not been studied deeply which can influence the system.
- The related works found in the literature didn't study the gap between the feasibility study and fertilizer recovery. Therefore, our work is novel and has detailed data and explanations on the feasibility study and fertilizer recovery.

Biography

Dr. Md Nurul Islam Siddique studied Civil Engineering at the Khulna University of Engineering & Technology, Bangladesh, and graduated as MS in 2012 from University Malaysia Pahang. He then joined the research group of Prof. Zularisam at the Institute of University Malaysia Pahang. He received her Ph.D. degree in 2015 at the same institution. After that, he obtained the position of Assistant Professor at the University Malaysia Pahang. She has published more than 40 research articles in ISI journals.

Kumuthini Chandrasekaram*, Yatimah Alias, Sharifah Mohamad

University of Malaya, Malaysia

Sporopollenin-methylimidazolium biosorbent based mixed matrix membrane for dispersive membrane microextraction.

Biosorbents are biological materials used in the biosorption process for the removal of pollutants from aqueous mediums. Sporopollenin is a natural biopolymer that occurs in the outer membranes of moss, fern spores, and most pollen grains. Sporopollenin exines essentially serve as simple micro-particles that are resilient, uniform, and have a multifunctional and highly decorated surface with an accessible chamber that can be filled with a variety of polar and non-polar actives. The exine thus promotes the possibility of surface modifications aimed towards targeted selectivity. Ionic liquids are distinctively famous for their physicochemical features, which empower them with high potential to work in tandem with various compounds of different polarity, hydrophobicity, and viscosity. Sporopollenin supported ionic liquid is a new venture to obtain liquid containing solid materials that do not evaporate, made through surface modification of the porous biopolymer. The focal point of this study is on the development of sporopollenin- methylimidazolium ionic liquids (Sp-MIM) based mixed matrix membrane (Sp-MIM-MMM) for simultaneous dispersive membrane microextraction (DMME) of nitro- and chloro-substituted phenols from various matrixes followed by determination using high performance liquid chromatography (HPLC). The Sp-MIM particle phase was incorporated through dispersion onto CTA polymer matrix to form Sp-MIM-MMM. Targeted selectivity and sensitivity of the Sp-MIM-MMM towards the mono and disubstituted nitro and chlorophenol analytes were evident in the various sample matrix tested with quantified detection calculated at 14.4-154.7 ng/mL for liquid based-real samples and 17.4-34.4 µg/kg for solid based-real samples. The durability of the Sp-MIM-MMM is evident as it can be reused up to 10 cycles with constant extractive prowess. Whilst Sp-MIM being highly resilient and stable was regenerated from used MMM and recycled into new MMM with the simple approach of dissolution in dichloromethane. The proposed MMM hence eliminates the concern arising on secondary waste generation while promoting enhanced sustainability.

Audience Take Away:

- Surface modification of naturally occurring biopolymer for targeted selectivity.
- Covalent immobilization of ionic liquids onto solid support inhibiting leaching concerns without compromise to the role of ionic liquids in the adsorption.
- Simple and efficient methodology of targeted substituted phenol analyte adsorption from various matrices.
- Encouraging reusability potential with strong prospective biodegradability.

Biography

Ms. Kumuthini is a Research Officer affiliated with University Malaya Centre for Ionic Liquids (UMCiL), Universiti Malaya (UM), Malaysia. She completed her BSc *Chem*. (Hon) from UM and subsequently procured a scholarship with Malaysian Palm Oil Board (MPOB) to complete her MSc *Chem*. (Palm Phytonutrients Analysis). She rejoined UM in 2009 as a Research Officer, prior to which she served as a Lecturer for Foundations and A-Levels Chemistry in a private institution. She has just recently submitted her thesis for her PhD in Analytical Chemistry and is waiting for her viva voce.

Muhammad Salman Haider*, Daniele Castello, and Lasse Rosendahl

Aalborg University, Denmark

Continuous hydroprocessing of sewage sludge and algae hydrothermal liquefaction biocrudes: Challenges and potential of sustainable aviation and diesel fuels

Unprecedented global warming and raising public awareness are the driving factors to decarbonize long- haul transportation sector. In this regard, biomass could be a potential renewable source for the production of sustainable, carbon-neutral liquid fuels. Hydrothermal liquefaction (HTL) followed by catalytic hydrotreatment is one of the most promising pathways to covert varying feedstocks into drop-in fuels. The energetically dense black viscous product from HTL ("biocrude"), contains a diverse organic pool with considerable amount of oxygen (~5-18%), nitrogen (~1-8%) and metallic content (~0.1-0.6%). The presence of these organic contaminants results in poor miscibility with fossil fuels and poses new and exciting challenges e.g. thermal instability of biocrude at high temperatures, which are indispensable for complete hydrodenitrogenation. This is why special attention is needed not only to realize this complex biocrude mixture but also to select different catalysts, which performs best to saturate and remove certain organic contaminants under optimized conditions.

In this work, we utilized advanced analytical tools (i.e. FT-ICR MS etc.) and observed different classes of organometallics and nitrogen compounds from sewage sludge and *Spirulina* algae and biocrude. From these results, we utilized three different types hydrotreating catalysts based on their porosity and nickel loading on γ-Al2O3 support and successfully demonstrate smooth continuous hydroprocessing operations for hundreds of hours (165 and 335 hours respectively) without coke formation, catalyst deactivation, and reactor plugging. Finally, 100% deoxygenation and ~96% denitrogenation were achieved. Furthermore, hydrotreated products underwent true-boiling point fractional distillation and showed on-spec metal content, density, pour point, cloud point and HHV for diesel and jet fuel. Both aviation and diesel fuels after thorough characterization showed fuel properties in accordance to ASTM D1655 and ASTM D975, the global standard for aviation and diesel fuel. Finally, the produced aviation fuels were tested in a lab-scale jet turbine in blend with conventional Jet-A1 fuel, to prove their good "on-field" performance.

Audience Take Away:

- What is the proper hydrotreating temperature and how to select it?
- Thermal instability of HTL biocrudes and coking propensity during hydrotreatment?
- Potential problems associated with metalloporphyrins, oxygenates, and basic nitrogenates?
- Role of FT-ICR MS and a priori identification of coke precursors and need of catalyst grading in reactor bed?
- First time ever – the physical production and demonstration of clean drop-in bio-fuels from HTL biocrudes and their advanced characterization in the light of international fuel specification.

Biography

Dr. Muhammad Salman Haider studied Advanced Materials and Processes (Nano-technology and technical chemistry) at the University of Erlangen-Nürnber, Germany and graduated as MSc (Hons.) in 2018. He then joined the research group of Prof. Lasse Rosendahl at the Department of AAU Energy, Aalborg University. He received his Ph.D. degree in 2021 at Aalborg University. Currently, he is working at the same institute and his research work is focus on the production of clean renewable biofuel from solid-wastes and the synthesis of bimetallic zeolites for the conversion of water-methanol mixture to liquid hydrocarbons in one-step. He has published eight research articles.

Shiru Lin*, Yekun Wang, Zhongfang Chen

Texas Woman's University, United States

Machine-learning-assisted screening of pure-silica zeolites for effective removal of siloxanes and derivatives

As emerging organic contaminants, siloxanes have severe impacts on the environment and human health. Simple siloxanes and derivates, trimethylsilanol (TMS), dimethylsilanediol (DMSD), and monomethylsilanetriol (MMST), dimethylsulfone ($DMSO_2$), are four persistent and common problematic compounds (PCs) from the hydroxylation and sulfuration of polydimethylsiloxanes. Through a two-step computational process, namely Grand Canonical Monte Carlo (GCMC) simulations and Machine Learning (ML), we systematically screened 50959 hypothetical pure-silica zeolites and identified 230 preeminent zeolites with excellent adsorption performances with all these four siloxanes and derivates. This work vividly demonstrates that the collocation of data-driven science and computational chemistry can significantly accelerate materials discovery and help solve the most challenging separation problems in environmental science.

Audience Take Away:

- The audience can use GCMC computations to compute the adsorption performance of different porous materials.
- The audience can use GCMC computations to compute the adsorption performance of porous materials towards various pollutants.
- The audience can use GCMC computations to compute the adsorption performance of porous materials, which can be used to compare/guide the experimental results.
- The audience can learn to apply machine learning methods to other green chemistry related projects, which will pave a new way for green chemistry.

Biography

Dr. Shiru Lin obtained her bachelor's degree in the Department of Chemistry, Fuzhou University, in China. She graduated for a doctoral degree in the Department of Chemistry, University of Puerto Rico. After two year postdoctoral research at Boston College, She joined the Division of Chemistry and Biochemistry at Texas Woman's University. Dr. Lin is interested in machine learning applications for material science, computational exploration of low-dimensional materials, catalysts energy-related reactions, electrode materials for lithium-ion/sulfur batteries, and interactions between small molecules.

Buddhima Rupasinghe
Bowling Green State University, United States

Catalytic transformations of siloxane-based materials towards a recycling loop

During the presentation, I'm hoping to explain the use of Silicone-based materials (Polysiloxanes). The current synthesis methods of the silicone-based materials. After that, I will explain current methods to depolymerize/ degrade these materials also the gaps involved in those technologies. Next, I'm hoping to deliver a method to over come the mentioned gaps. Then, we can analyse the method efficiency from the scientific results. Finally, our method will briefly discuss how to repolymerize the materials that we depolymerized.

Audience Take Away:

- The audience will be able to know how useful these silicone-based materials.
- How to synthesize these silicone-based materials.
- How to depolymerize these materials.
- Audience will understand the importance of recycling of the siloxane-based materials. This research is providing a practical solution to a problem.

Biography

Dr. Buddhima studied his B.Sc. and M.Sc. in Polymer Science & technology at University of Sri Jayawardenepura, Sri Lanka. He then joined Prof. Joseph Furgal's research group of Silicone materials at Bowling Green State University, USA. He received his PhD degree in 2022 at the same institution. Now he is working at the Charles River Laboratories as a Senior Associate Scientist.

Pieter Samyn*, Joey Bosmans, Patrick Cosemans

SIRRIS – Innovations in Circular Economy and Natural Resources, Belgium

Bio-based acrylate coatings

In a transition towards circular economy, the use of renewable materials is encouraged to replace traditional petrol-based polymers. In particular, it is expected that the processing and performance properties of the bio-based alternatives are similar to the traditional polymers, but often discrepancies related to viscosity, quality procurement, availability and performance of the bio-based materials are encountered. Therefore, care on the exact processing conditions of bio-based alternatives should be taken in order to provide materials with even enhanced properties and functionalities. A comparative study on coating applications is done by making formulations of fossil-based polymers and their bio-based alternatives derived from vegetable feedstock. The processing conditions under UV-curing are evaluated in order to optimize the coating performances. The incorporation of bio-based monomers in coating formulations provides enhanced properties in terms of mechanical resistance against abrasion, reduced brittleness, higher ductility and better water resistance. Under conditions providing fully cured coatings, the bio-based acrylate coatings systematically present lower wear. The internal material structure of coatings with bio-based monomers is characterized through a hierarchical organization within micro- to nanosale entities that improves the mechanical properties. Moreover, the presence of a hydrophobic monolayer at the surface enhances lubricity of the bio-based coatings. In parallel, the curing kinetics of bio-based and fossil-based materials are very similar resulting in comparable cross-linking densities. In this study, the benefits of introducing bio-based chemical building blocks in coating applications are illustrated. This case study serves as a motivation to support a transition into bio-based materials with enhanced properties and functionality.

Audience Take away:

- How to increase bio-based content in wood coatings while enhancing mechanical performance.
- Tuning processing conditions for bio-based coatings with structural characterization.
- Benefits for better durability of bio-based coatings compared to fossil-based coatings.

Biography

Dr. Pieter Samyn received Ph.D. in Materials Science and Engineering in 2007 from Ghent University presenting his research on polymer tribology. He followed an academic career from 2000 to 2020 at Universities of Ghent, Freiburg, Toronto and Hasselt having different positions of assistant professor and visiting professor. In 2021, he joined the collective research centre Sirris as a Senior Researcher in Circular Economy and Renewable Materials. His experiences focus on synthesis, processing and characterization of bio-based materials for composites and coatings. He led research projects on bio-inspired adhesion mechanisms, protective coatings for papers, advanced analytics and processing of nanocomposites from bio-based building blocks. The latter were also used for the fabrication of composites with functional interfaces and in-build sensoring properties. His work was awarded with several distinctions including the Robert-Bosch Juniorprofessorship, Baden-Wurttemberg Juniorprofessorenprogramm, and Heinz-Maier Leibnitz Preis and FRIAS Fellowship. Currently, he assists companies in the implementation of bio-based polymer coatings and paints for industrial applications.

Lejla Klepo*, Azra Jaganjac and Dragan Kresic
University of Sarajevo, Bosnia and Herzegovina

Green chemical aspect of environmental awareness development and antimicrobic influence mechanisms of colloidal silver and copper

UN General Assembly adopted Resolution 57/254 on December 2002 the UN Decade of Education for Sustainable Development 2005-2014. The aim of this strategy is to encourage UNECE members to develop and incorporate education for sustainable development into the formal education system. In B&H 2005-2007, as part of the implementation of the EU CARDS project "Strengthening Environmental Awareness", we have just implemented this UNCE strategy. The printed teacher manual "Living in harmony with the environment" was prepared, printed and promoted through a series of seminars. Unfortunately, today we have testified that environmental awareness is far from developed. This is the case, after all, around the world, which needs to be worked on permanently, and more seriously in the future through formal and non-formal education.

In our laboratory research we have focused on the application of the green chemistry principles, and thus in light of the pandemic we encountered from 2020, it may sometimes be necessary to look for a solution in alternative medicine as the initial arm to solve the problem. Colloidal silver and copper has long been used as an antimicrobial, antiviral and antifungal agents. Knowing their effects on bacteria and viruses, perhaps the use of silver colloidal water can do some extent prevent the spread of the virus? This paper aims to remind what the effects of colloidal silver and copper are and to take us back in the history of its use and give ideas for new research.

Audience Take Away:

- To raise environmental awareness.
- Focus of the impact of colloidal silver and copper on human health.
- Appealing to future environmental awareness development by using Green Chemistry.

Biography

Dr.Sci. Lejla Klepo graduated and post graduated Chemistry at the University of Sarajevo, Faculty of Science, Bosnia and Herzegovina in 2007. and 2011. I got my PhD in Chemistry - Organic chemistry and Biochemistry - also at Faculty of Science,University of Sarajevo, Bosnia and Herzegovina 2016. Since 2021., I am associate professor at Faculty of Science, Department of Chemistry, Division of Organic chemistry and Biochemistry where I started my academic career first as assistant in 2008., senior assistant in 2011, assistant professor in 2016. I also worked as external associate in Faculty of Forestry, Medical faculty, Faculty of Agriculture and food. My field of interest is Organic chemistry (developing new methods, chemistry of natural products, organic pollutants, and green chemistry). Currently I have project financed by Ministry of Education, Science and Youth of Canton Sarajevo that is based on removing of organophosphate pesticide from water via adsorption on phyllosilicate clay. I am author or co-author of four books, 21 manuscript and 41 abstracts from different scientific Conferences from 2008 till today. I am also author of one chapter in the book Organophosphates – detection, exposure and occurrence.

Owais Mohammad
Interdisciplinary Biotechnology Unit, AMU, INDIA

Biomimetic synthesis of drug-nanoparticles: An excipient free novel drug delivery system to treat skin fibrosarcoma in model animals

Nanomedicines have been widely exploited in target specific delivery of core pharmaco-materials. Traditional pharmaceutical approaches, implied in the synthesis of nano-sized formulations, need special types of chemical agents and appliances. The high end infrastructure, special storage conditions and other related matters required in the development of nano-formulations, make the whole process very expensive and thereby cannot be afforded by the common man. Besides, existing methods also rely on usage of additives or excipients, a special class of chemicals. Barring few exceptions, the usage of excipients is curtailed by several undesirable features. Such issues necessitate strategies that lead to development of an excipient free drug delivery system. Considering the fact that plant-based extracts have great potential to induce synthesis of metal core based nano-particles. In the present study, we propose a prototype employing various types of plant extract that facilitates green synthesis of nano-sized supra-molecular assemblies of some potent, organic molecules based, antimicrobial and anticancer drugs. The as-synthesized nanoparticles not only retained the pharmacological activity of the parent compound, however, also improved their efficacy against both cancer as well as microbial diseases.

Patricia J. Kooyman*, Roald Brosius, Jack C.Q. Fletcher

University of Cape Town, South Africa

Tuning hydrocracking process parameters

Gas-to-Liquids (GTL) and Coal-to-Liquids (CTL) processing are attractive routes for the production of clean liquid transportation fuels, in particular middle distillate fuels, as an alternative to crude oil refining. The industrially proven and economically viable route starts with conversion of coal or gas to synthesis gas (syngas; a mixture of CO and H_2) followed by Fischer-Tropsch synthesis (FTS) to hydrocarbons and subsequent product workup, as the FTS is notoriously unselective - producing a product stream with a very wide hydrocarbon chain length distribution. In practice, FTS is being developed towards long hydrocarbon chain (wax) production - followed by hydrocracking to obtain a high yield of transportation fuels.

Hydrocracking of FTS wax (dewaxing) is generally performed using a bifunctional catalyst, containing a hydrogenation/ dehydrogenation function and an acidic function. The presentation will focus on Pt noble metal (de)hydrogenation / zeolite solid acid catalysts.

Two approaches have been studied to improve the yield of transportation fuels in the dewaxing process. One focusses on the synthesis of zeolites with hierarchical pore systems, introducing mesopores next to the inherent micropores. This serves to decrease diffusion limitations and especially the secondary cracking that results from long residence time in the zeolite pores. The other focusses on process parameters. We have studied the presence of water in the feed and the total process pressure.

Water is the main byproduct of FTS, and leaving it in the feed stream to the dewaxing step allows evaluation of the integration of synthesis and hydroprocessing for the potential one-pot production of middle distillates with good cold flow properties. We found the presence of water to decrease the activity and increase the selectivity to linear products, both due to competitive adsorption on the acid sites.

Surprisingly, when using zeolites as a solid acid, we find lowering the total process pressure to atmospheric increases the diesel yield dramatically and makes the whole process much more economical in terms of CAPEX and energy efficient in terms of OPEX and CO_2 footprint. This is in contradiction to previously reported results using amorphous silica-alumina (ASA) as a solid acid, where more diesel is formed at higher pressure.

Audience Take Away:

- Hydrocracking is more efficient at atmospheric pressure, contrary to what is usually assumed.
- Making synthetic fuels from biomass is now feasible using small-scale, stand-alone units that can be operated by semi-skilled workers. This will empower rural communities in underdeveloped countries to store renewable energy from solar and wind sources using their local biomass waste.
- The production of synthetic Jet Fuel will use less energy using these new process optimizations.

Biography

Prof. Kooyman obtained her MSc from Leiden University (The Netherlands), studying the selective reduction of nitrosobenzene over mixed manganese oxides. She obtained her PhD from Delft University of Technology (The Netherlands) studying TS-1 zeolite synthesis and catalytic applications. Following a post-doc at Shell research centre (Amsterdam, The Netherlands), she learned all about TEM during a long post-doc period at the NCHREM (Delft, The Netherlands). Subsequently she was appointed assistant professor at the Chemical Engineering department (catalysis engineering group) at Delft University of Technology (The Netherlands). She came to South Africa in 2015 as SARChI Chair Nanomaterials for Catalysis.

Ahmed I. Khodair
Kafrelsheikh University, Egypt

Synthesis of 5-[4-(4-oxo-2-thioxoimidazolidin-5-ylidenemethyl)benzylidene)]-2-thioxoimidazolidin-4-ones under microwave irradiation

Various 5-[4-(1,3-disubstituted-4-oxo-2-thioxoimidazolidin-5-ylidenemethyl)benzyli-dene]-2- thioxoimidazolidin-4-ones have been synthesized under microwave irradiation. In comparison with the traditional reflux methods, similar or higher yields were obtained.

Biography

Prof. Dr. Ahmed I. Khodair (1962) has been graduated at Faculty of Science; Tanta University, Egypt in 1984 and got has Ph. D. (Org. Chem.) at Faculty of Science, Tanta University, Egypt in 1993. He has been promoted to full Professor of Organic Chemistry at Faculty of Science, Kafrelsheikh University, 2005. He is specialized in the synthesis of heterocyclic organic compounds and their nucleosides. He is a Humboldt fellow since 2001. He served as a referee for many international organization and scientific journals. He is a member of the permanent scientific committee for promotion of Egyptian universities staff members (Organic Chemistry). He has supervised more than ten master and doctoral theses. He has published more than 50 publications in renowned scientific journals. He spent two years in Denmark at Odense University as a Ph. D. student. He spent seven months at Technical University of Copenhagen/Lyngby (Denmark). He spent two years at Poitiers University (France). He spent sixteen months at Konstanz University (Germany). He spent seven years at King Saud University (Saudi Arabia). He is the head of Chemistry Department of Faculty of Science at Kafrelsheikh University since 2010 for three years. He is the Vice Dean for Education and Student Affairs of Faculty of Science at Kafrelsheikh University since 2011 for three years. He is the Dean of Faculty of Science at Kafrelsheikh University since 2015 for three years. He is the head of Chemistry Department of Faculty of Science at Kafrelsheikh University since 2021 until now.

Mohamed Ali Mahmoud El Khateeb

National Research Centre, Egypt

Treatment of domestic wastewater using a novel compact unit

The aim of this work is to examine the new design of a compact unit. The compact unit consists of three consecutive treatment steps. The primary treatment step is vertical settler (VS) followed by the self-aerated chamber (SAC) (secondary treatment). The dimensions of the compact unit are 1*2*2 m for length, width, and height, respectively. The dimension of the vertical settler is 1.25*1*2 m for length, width, and height, respectively. The detention time (DT) was kept constant at 5 hr in the vertical settler chamber. The compact unit was packed with a non-woven fabric material produced from waste plastic bottles. The influent organic concentrations expressed by chemical and biological oxygen demand (COD and BOD) were 367.7 and 254.7 mg/L, respectively. The organic concentrations (COD and BOD) in the final treated effluent were reduced by 78.8 and 80.5% to 36.7 and 16.6 mg/L, respectively. With the exception of fecal coliform (FC), the final treated effluent is complying with the National Regulatory Standards. The area required for this unit is only $2m^2$. This makes such a compact unit attractive to apply in rural and unserved areas in developing countries.

Audience Take Away:

- The audience will be able to deal with the dangers of the discharge of untreated wastewater.
- Attendees will be able to understand the role of integrated treatment plants for development in rural and unserved areas.
- The audience will understand how to valorize the waste plastic bottles.

Biography

Prof Dr. Mohamed El-Khateeb studied Chemistry at the Helwan University, Cairo, and graduated with an MS in 1993. He then joined the National Research Centre, Water Pollution Research Department, Environmental Chemistry. He received his Ph.D. degree in 2005 at Cairo University. He joined several projects (National and International). His work is focusing on wastewater treatment and pollution prevention. He is EIA certified consultant. He was awarded 3 patents. The patents are concerned with the treatment of water and wastewater using compact units.

Sunirmal Jana
CSIR-Central Glass and Ceramic Research Institute, India

Green synthesis of hierarchically structured organic-inorganic nanohybrid on cotton fabric suitable for antimicrobial and oil-water separation applications

In textile and apparel industry, cotton is the most widely used natural fiber owing to its soft, breathable and eco-friendly nature along with ease of mass production. But high moisture absorption and retention capacity make them prone to grow pathogenic bacteria and fungi. These microbial growth and proliferation reduces the shelf-life of the fabric as well as enhances the chance of microbial infections in human beings. Several nanomaterials are being used for obtaining antimicrobial cotton fabrics. Most notable non-metallic nanoparticles are chitosan and graphene / reduced graphene oxide. An extensively used metal or metal oxide nanoparticles are Ag, Cu, Cu_2O, CuO, TiO_2, ZnO and so on. It is to be noted that the antimicrobial activity of the nanoparticles may originate from their high surface to volume ratio owing to their nanodimension for which they can interact and attach closely with the microbial cell membranes. On the other hand, metal and metal oxide nanoparticles (NPs) are known to have antimicrobial activities against a large spectrum of bacteria, fungi and viruses. The mechanism behind this activity involves metal ions release, oxidation stress that generated from reactive oxygen species (ROS), and internalization of NPs resulting to cell death.

In today's world, scientific and technological innovations are taking place. These innovations include development of numerous functional nanomaterials among which hierarchically structured nanomaterials (HSNs) are most important owing to their enormous applications in different areas like biomedical, wastewater management, energy storage, sensing and so on. As an alternative to conventional synthesis methods which can cause harmful effects to human health and environment, several green chemical, physical and biological methods for producing different metal and metal oxide based HSNs are known. The adoption of these methods is found to be increasing rapidly as these methods are environmentally sustainable. Some cases, these are also energy efficient. Green chemical and physical methods involve use of environmentally benign solvents and reagents.

Now-a-days, super-wettable cotton fabrics have gained significant attention towards separation of oil-water mixtures. The reasons behind the popularity are the ease of surface modification, high flexibility and inherent micro-scale roughness of cotton fabric that can reduce the effective contact area between an upcoming liquid with solid surface. In case of on-demand separation of light oil-water and heavy oil-water mixtures, switchable super-wettability (superhydrophobicity) and underwater superoleophobicity is highly advantageous. In this regard, the external stimuli such as light, heat, pH and also partial surface modification or pre-wetting strategy can be used to achieve intelligent surfaces with switchable superwettability. Sometimes, the presence of hollow microstructures in the coating can be beneficial towards obtaining high reusability of filtration materials without losing the separation efficiency.

In this talk, the green synthesis strategy based organic-inorganic nanohybrid and the derived different hierarchical structures with special emphasis on Ag-Cu_2O hollow hierarchical structures on cotton fabric (ACN) along with their challenges and future prospect will be discussed. The role of various reaction parameters upon the formation of such structures, the wetting behaviour of original (ACN) and modified fabric (ACNS) with hexadecyltrimethoxysilane (a low energy material) and the stability of the fabricated coatings will be shared to the august gathering. In addition, the effect of surface modification and the wettability of the kinetics of contact killing of bacteria (*E. coli* and *S. aureus*) and fungi (*C. albicans*) with long term antimicrobial activity of the materials will be discussed. Also, the performance of the coated fabrics employed for on-demand separation of light/heavy oil-water mixtures and their switchable wettability will be shared with the audience. Moreover, the self-cleaning performance of coated fabrics will be discussed. In brief, our research findings on the fabrication of unique structures of the organic-inorganic nanohybrid through green synthesis strategy and the effect of surface modifications towards generating multifunctional material properties will be the goal of this talk.

Audience Take Away:

- A time bound and challenging research is progressing well globally towards development of various kinds of advanced functional nanomaterials adopting green synthesis strategy. This is highly required because of the environmental pollution of hazardous chemicals are being used in different conventional synthesis routes. This talk will primarily cover the use of green chemicals, green solvents etc. to develop the hierarchically structured organic-inorganic hybrid coating materials on cotton fabric with antibacterial and other advanced properties. On the other hand, world is still suffering COVID-19 disease. These organic-inorganic materials, a prime discussion of this talk is very much essential for the society in everywhere including medical purposes. Hence, the developed materials through the facile and cost effective synthesis method will help audience can acquire knowledge and ideas for their career building. In addition, they can learn the present challenges of the functional organic-inorganic hybrids by green synthesis method and their future prospect so that it helps them for further innovation.
- The organic–inorganic nanohybrid materials with hierarchically structures synthesized by green synthesis method have wide applications. As the talk will cover the material fabrication method, the researchers could find out for other of the materials with hierarchical structures for obtaining potential applications in different fields.
- This talk will enrich basics as well as applied knowledge for young researchers on the *state-of-the art* research in hierarchically surface structured organic-inorganic nanohybrid materials (HSOIH) with potential applications.
- Different fabrication strategies including green chemical synthesis method will help the researchers to design different types of novel HSOIH in a facile pathway for future.
- HSOIH can find a huge numbers of applications like antimicrobial, self-cleaning, optical sensing, energy and environmental remediation including oil-water separation applications. Hence, the researchers can find an opportunity to apply the knowledge of the fabricated HSOIH and also they can apply on new and unexplored field of applications.
- To discuss on different HSOIH systems and also to share the expertise amongst the esteemed gathering on this virtual conference towards the researchers who are working in this area of research.

Biography

Dr. Sunirmal Jana, Senior Principal Scientist & Professor presently working at CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI), Kolkata, India, graduated MS degree (Chemistry) in 1991 from University of Kalyani and PhD (Science) in 1998 from Jadavpur University, India. He started his career as a Junior Scientist at CSIR-CGCRI in December 1997. Dr. Jana worked as Invited Visiting Scientists in different countries including Brain Pool Scientist at Korea Research Institute of Chemical Technology, South Korea. He is an Editor/Editorial Board Member of several peer reviewed journals. Dr. Jana is a Life Member of many renowned academic/research organizations/societies. He received several research awards including prestigious Distinguished Scientist Award of Venus International Research Awards (VIRA-2016) by Venus International Foundation, India. He delivered many invited / keynote / plenary talks for National / International conferences / Symposium / Seminars / Webinars held in India and abroad. Presently, Dr. Jana has published about 80 SCI/peer reviewed research papers, more than 100 conference papers / proceedings, 10 book chapters and 4 Indian Patents.

Shumaila Kiran
Government College University, Pakistan

Green synthesis of magnesium oxide nanoparticles using leaves of Iresine herbstii for remediation of Reactive Brown 9 dye

Nanotechnology is the newest and one of the most promising areas of research in modern medical sciences. Metal nanoparticles possess extraordinary optical, thermal, chemical properties and are being widely used in industrial, electronics, and biomedical fields. It has presented its potential to contribute to solving one of the greatest problems of the worldwide wastewater treatment issue. The approach of green synthesis of metal oxide nanoparticles seems to be a cost-efficient, eco-friendly, and easy alternative approach. The current study deals with the synthesis and characterization of Magnesium Oxide nanoparticles (MgO-NPs) using leaves extract of *Iresine herbsti*. The characterization was done by XRD and SEM. Then MgO-NPs were applied for the remediation of Reactive Brown 9 dye following the optimization of reaction parameters (conc. of dye, conc. of nanoparticles, pH, and temperature). The maximum decolorization (95.8%) was obtained at 0.02% dye conc., 0.003 mg/L conc. of MgO-NPs, at pH 4, and temperature 40 °C. TOC and COD were used for mineralization assessment of studied dye samples and their values were found to be 88.56% and 85.34%, respectively. The magnesium oxide nanoparticles could be applied successively for the treatment of other problematic dyes as well.

Audience Take Away:

- Use of nanotechnology in the green synthesis of metal or metal oxide nanoparticles.
- The approach of green synthesis of metal oxide nanoparticles is a cost-efficient, eco-friendly, and easy alternative approach.
- Nanoparticles are helpful in the removal of synthetic dyes, hence controlling water pollution.

Biography

Dr. Shumaila Kiran studied Chemistry at the University of Agriculture, Faisalabad, Pakistan, graduated as MS in 2006. She received her PhD degree in 2012 at the same institution. She obtained the position of an Assistant Professor at the Government College University, Faisalabad, Pakistan in 2012 and currently working as an Associate Professor in the same institution since 2019. She has published more than 65 research articles in well reputed ISI listed international well-reputed journals.

Participants List

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