magnus Group

Global Conference on

BIOFUELS AND BIOENERGY

21-22 OCT 2022

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BOOK OF ABSTRACTS

GLOBAL CONFERENCE ON

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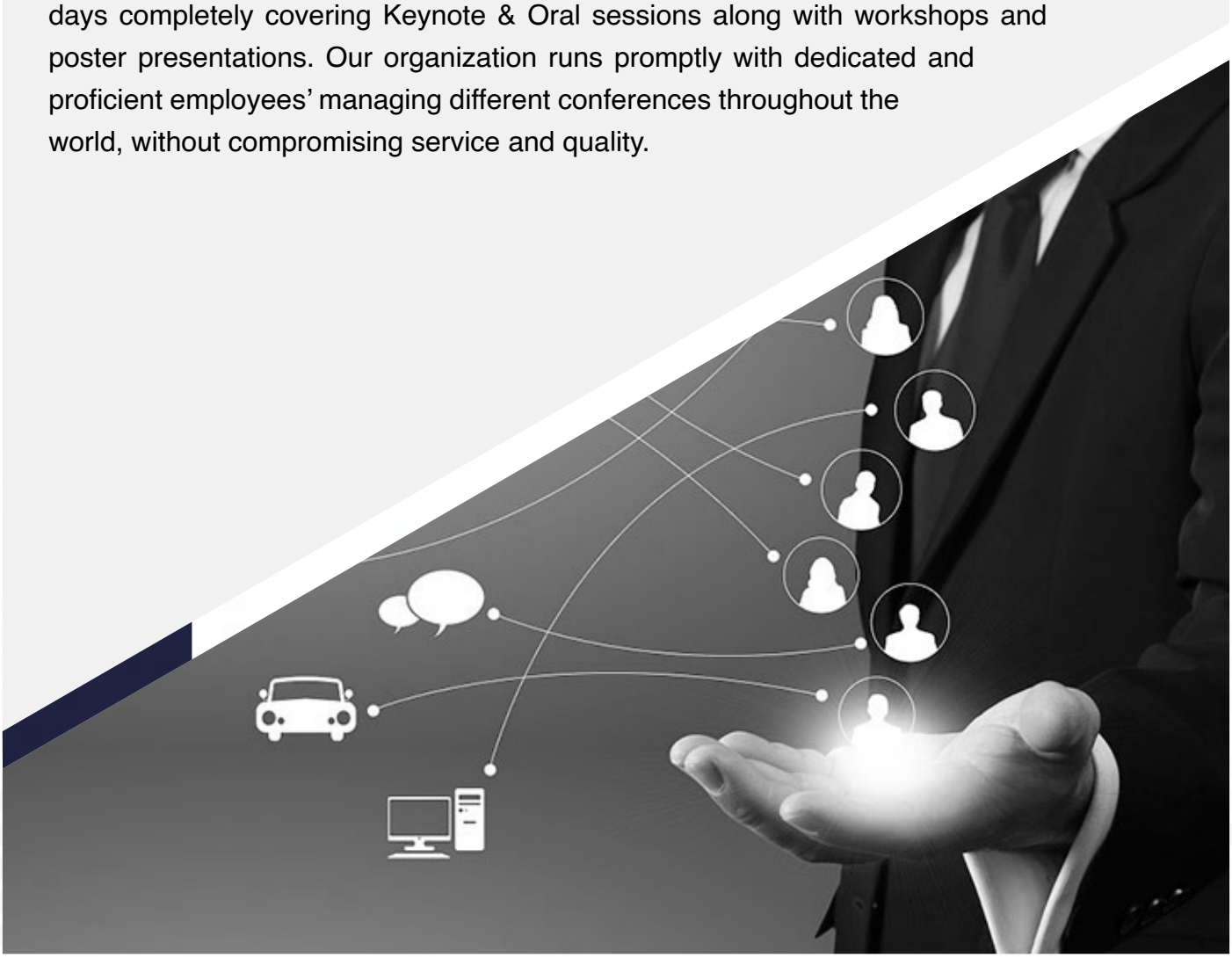
ABOUT MAGNUS GROUP

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 BIOFUELS 2022

With an earnest objective to congregate Biofuels professionals, researchers, Biofuels industry experts and scientists Magnus Group proudly enunciates and welcomes you toits "**Global Conference on Biofuels and Bioenergy**" (Biofuels 2022), which was organized Virtually during **October 21-22, 2022**. This year the global summit will move forward with the theme "*Biofuels and Bioenergy: New Era Technologies Striving for Sustainability"*.

The conference designed to cover current advancements and trends in biofuel and bioenergy production technologies, as well as to keep researchers, academics, and industry up to date on the latest advancements in the field.

The two-day colloquium is designed to foster collaboration and innovation, with Biofuels and Bioenergy poster presentations, interactive panel discussions, and visionary keynotes sessions.

We are confident that our conference will provide you with an incredible

chance to explore new horizons in your field and we hope to see you at our upcoming Biofuels 2023 conference during October 26-28, 2023.

KEYNOTE FORUM

DAY 01

GLOBAL CONFERENCE ON

BIOFUELS AND BIOENERGY

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Hans-Henning Judek

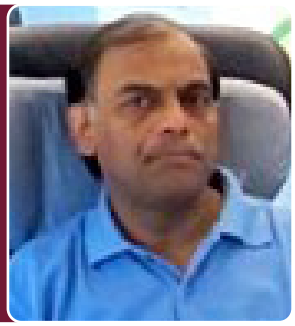
J.E. Access, Japan

Greening the maritime industry with carbon-negative biofuel

Our Bio-Oil Conversion System (BOC) can crack with the help of catalysts, heat, and mechanical stress the long hydrocarbon chains of lignocellulosic biomass into shorter chains in the diesel fuel range. This technology has been proven in multiple tests, and we have now developed a highly efficient technology for the energy input and conversion process. Biofuel is frequently criticized for direct or indirect land-use change and considered not sufficiently scalable without reopening the dilemma "plate-or-tank". To avoid these problems, we are concentrating on biomass waste, like sugarcane trash, rice and wheat straw, etc., from customarily field-incinerated agricultural crop waste. According to United Nations' UNEP and the CCAC based on NASA satellite photos, every year about 10.5 billion metric tons of waste are worldwide incinerated. The fires release approximately 16.6 billion tons of CO_2, and emit 9.8 billion tons CO_2eq (CO, methane), 1.1 billion tons of smog precursors, and 66 million tons of PM2.5 and other harmful substances causing air pollution and approximately 1 million premature deaths.Theoretically, we can convert this material with minimal CO_2 emissions for collecting and preprocessing and no land-use change into 2.5-3 billion tons of fuel oil conforming to ISO 8217, while the maritime industry consumes "only" 300,000 t/a. Avoided CO_2 emissions are considered for the LCA, rendering our footprint carbon-negative (climate, positive). Further refined road diesel according to EN 590/ASTM D 975 and even aviation fuel SAF could be possible.

Biography:

CEO of J.E. Access Ltd., CEO of Next Generation Solar Technologies Pvt. Ltd. Singapore and Executive Chairman of Verde Visions LLC, New York, U.S.A.Trained by 38 years of experience in technology transfer, Hans has developed a 'nose' for new technologies with high potential. He has arranged numerous technology transfers and trade relationships, worldwide, from his office in Yokohama, Japan.During the last 16 years, he shifted his interest fully to environmental technology and is now working in renewable energy projects, namely floating solar, and carbon-neutral fuel for the maritime industry. He cooperates with joint venture partners in the Philippines, Singapore, India, and the US. He is on LinkedIn connected to over 18,000 renewable energy professionals.He holds a Bachelor's degree in economics and a Master's degree in law from German Goettingen University 2 ½ years of post-graduate legal research at Keio University in Tokyo.



R. P. Singh* and Jyoti Singh

Department of Biosciences and Bioengineering,Indian Institute of Technology Roorkee, Roorkee, Uttarakhand, India

Microalgal biodiesel: Nutritional and molecular strategies for enhanced lipid production

The urge for sustainable bioenergy production can be gratified through microalgae as it has come out as a promising renewable feedstock for biofuel generation. The rapid growth rate, CO_2 fixation ability, flexible adaptation, and capability to grow in non-arable lands make microalgae one of the most potential feedstocks for biofuel production. However, to achieve the economic feasibility of the low-value, high-volume product, the technological challenge related to the mass production of microalgae with elevated lipid content needs to be addressed. Therefore, various strategies to augment biomass with elevated lipid production were assessed, which are vital for improving the economics of microalgae-based biofuels. To accomplish this, bioprospecting prospective algal strains (ideally from native habitats), derivation of pre-eminent nutritional parameters, and exogenous supplementation of phytohormones to regulate metabolic flux for enhanced lipid accumulation were achieved. Moreover, the molecular mechanism of lipid metabolism in response to nitrogen limitation in *Desmodesmus* sp. JS07, was studied by lipidomics and transcriptomic analysis. Lipidome analysis of *Desmodesmus* sp. JS07 exhibited a diverse spectrum of lipids, indicating 8 lipid classes and 87 lipid species consisting of polar and neutral lipids. Further, the transcriptome profiling of *Desmodesmus* sp. JS07 indicated the up-regulation of potential genes related to fatty acid and TAG biosynthesis. Both the analysis delivers a basis for refining our understanding of TAG synthesis, identifying the key enzymes involved in TAG production, and their overexpression in microalgae. Furthermore, the molecular modification of *Desmodesmus* sp. JS07 was carried out by heterologous and homologous expression of *Bn*DGAT2 and *Cv*GPD1constructs to augment lipid accumulation. Therefore, the present work outlines the strategies for enhanced lipid accumulation in microalgae for sustainable biofuel production.

Audience Take Away:

- The undergraduate and postgraduate students, research scholars, faculty and researcher from academia, and scientists from research labs and industries may learn and improve their knowledge about the fundamentals and various strategies for augmentation of lipid accumulation in microalgae for sustainable biofuel production
- Provide insight into the lipidomics, transcriptomics, and molecular modification of Desmodesmus sp. JS07 for enhanced lipid production

Biography :

Prof. R. P. Singh has contributed over three decades of his dedicated service for research and science education. He is currently an Emeritus Professor at Department of Biosciences and Bioengineering, Indian Institute of Technology Roorkee, India. Prof. Singh received his Master's in Biochemistry from G.B. Pant University of Agriculture & Technology, India and Doctoral degree in Microbial biochemistry from Central Drug Research Institute, Lucknow, India. He had continued as a Research Associate at Institute of Microbial Technology, Chandigarh. Further he worked at National Institutes of Health, USA and Harvard Medical School, USA as a Visiting Fellow and as a Research Officer for more than five years. He was also a visiting faculty for a year at University of Arkansas for Medical Sciences, USA. His research interests primarily include enzyme engineering, biofuels, biopolymers and targeted drug delivery. He is associated with several International and National organizations mainly Process Innovation and Process Intensification Network, UK; European Federation of Biotechnology, Committees on Genetically Modified Organisms and Food, Food Safety and Standards Authority of India ; Expert Committees of Department of Science & Technology and Department of Biotechnology, Govt. of India and Life Science Research Board, DRDO, Govt. of India. He is a member of editorial board of journals and had served as a reviewer for several reputed international journals. He has authored several original research articles, review papers and book chapters and has one US patent to his credit. He has supervised 20 doctoral thesis and several Master's and Undergraduate dissertations. Prof. Singh had delivered several invited lectures and had visited countries mainly USA, UK and Germany. He has handled various research projects till date. He is life member of several scientific bodies and is on the board and committees of several institutions.

SPEAKERS

DAY 01

GLOBAL CONFERENCE ON

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Multiple strategies for carbon capture and its utilization from biogas generated by anaerobic digestion in wastewater treatment sectors

Ijaz Fazil Syed Ahmed Kabir*[1], Leow Jun Wei[2], Huang Yimin[3] and Aisueni Tosh[4]
[1]CFD Engineer, Red Engineering Asia Pacific Pte Ltd, Singapore, Ijazfazil
[2]Electrical Engineer, Red Engineering Asia Pacific Pte Ltd, Singapore
[3]Mechanical Associate, Red Engineering Asia Pacific Pte Ltd, Singapore
[4]Technical Director, Red Engineering Asia Pacific Pte Ltd, Singapore

It is contradictory to efforts to achieve net zero carbon emissions by 2050 since the wastewater treatment sectors' energy consumption is leading to a rise in global power consumption and contributing to greenhouse gas emissions. Bacteria in the Anaerobic Digestor (AD) in wastewater treatment plant decompose organic solid waste and create biogas consisting of approximately 60% methane and 40% carbon dioxide. The biogas that is being produced currently has been let off into the atmosphere. Once Carbon Capture And Utilization (CCU) technology implemented next to an AD plant, it is feasible to simultaneously reduce greenhouse gas emissions and boost profitability. This is performed by turning carbon dioxide into products that have a commercial value, such as concrete construction materials, as well as alternative energy sources derived from biomethane, such as syn gas, fuel cells etc. There are a handful distinct tactics that carbon may be captured, and it all depends on how biogas is utilized. This research demonstrates various techniques for disintegrating biomethane and carbon dioxide from biogas, as well as various strategies for carbon capture from biomethane during pre- and post-combustion, and effective utilization in the production of alternative fuel sources that can be reused to generate electricity and reduce reliance on conventional fossil fuels. This work also provides an overview of the efficient usage of carbon dioxide in a variety of industries, including the wastewater treatment facility. Therefore, effective integration of CCU with AD plant reduces the consumption of conventional fuels, which in turn raises the level of sustainability and helps minimize emissions of greenhouse gases into the atmosphere.

Audience Take Away:

- Necessity for carbon capture and utilization
- Different strategies for disintegrating CH_4 and CO_2 from biogas
- Various carbon capture technologies from the biomethane combustion
- Discussion on different utilization tactics such as alternative energy sources such as fuel cells, syn gas, hydrogen gas turbine
- Different methodologies for the utilization of CO_2 as a commercial product

Biography:

Dr. Ijaz Fazil Syed Ahmed Kabir completed his Ph.D. at Nanyang Technological University (NTU), Singapore in 2018. He received his Master of Science in Mechanical Engineering from National University of Singapore (NUS), Singapore in July 2010. Recently his work was awarded as 'HIGHLY COMMENDED' in E&T Innovation Awards 2020. He previously worked as Research Fellow in Nanyang Technological University (NTU), Singapore. He currently works as CFD Building Physics Engineer in Red Engineering Asia Pacific Pte Ltd (a trading brand of ENGIE Impact Pte Ltd). In 2008, he appeared and scored 93.94 percentiles in the Graduate Aptitude Test for Engineers (GATE) exam "An Exam for Categorization of Engineers in India". On the research front, he has six high quality journal papers.

Renewable fuels, the need for of provenance and quality to power adoption

Nick Molden
Emissions Analytics, UK

As demonstrated with Dieselgate, trust built over decades can be lost in a moment. As we enter an exciting new era of renewable fuels, they must be clean in all respects to build win the faith of the next generation.In is reasonable to estimate that greater variety of fuels multiplies the risk that exists for issues concerning quality, fraud and confusion through the supply chain, not least with the consumer at the pump. All stakeholders must be vigilant and take every reasonable measure to avoid stories regarding contamination, feedstock provenance and authenticity. Some may confidently suggest that safeguards already exist and that the market can easily evolve and migrate to handle renewable fuels. Our presentation will demonstrate, using the example of diesel, the industries most established fuel - Quality is not as consistent as we should expect. We will identify the differences between diesel samples independently sourced and tested by Emissions Analytics in our laboratory and also demonstrate the real world emissions impact on the road.Emissions Analytics took four different diesels on sale in different parts of the United Kingdom and subjected them to two-dimensional gas chromatography and time-of-flight mass spectrometry - using equipment from Markes International and SepSolve Analytical - in order to separate, identify and quantify organic compounds present. On average, 1,015 different organic compounds were identified across the four different diesel fuels.Emissions Analytics will present the variance of certain key compound groups including aromatics, aliphatics and non-hydrocarbons including carbonyls. The latter includes air pollutants with human health effects such as formaldehyde and acetaldehyde.Within the pollutant groups, it is then possible to show the most prevalent individual compounds.

For example, the most prominent aromatics including variations of Benzene and Naphthalene. Having studied the fuel that goes into the engine, the next stage is to use similar techniques to analyse what comes out of the tailpipe after combustion. As with fuels, we are looking for organic compounds, although post-combustion they will be characterised by volatile and semi-volatile compounds in the gas phase due to the temperature. To illustrate this, one newer and one older diesel vehicle were tested by Emissions Analytics for their cold start emissions for two minutes from key-on. Complementing the standard gas Portable Emissions Measurement System (PEMS) was our proprietary system for diluting the exhaust and capturing samples onto desorption tubes. The samples were then subject to the same two-dimensional chromatography as for the fuels. Our presentation will share those results and also reference results from our wider independent test program, EOUA.While the challenge withe-fuels is to have access to sufficient low-carbon electricity to create the fuels, with biofuels it is the origin and content of the biocomponents. Their provenance is important to verify that they do contribute to real-world CO2 reductions and, with the pressure to decarbonise, there is a growing risk of exploiting the current rules or even fraud in blending illegitimate or dangerous biocomponents into market fuel. The techniques we will present allow detailed analysis of what goes into the fuels, and the emissions created when the fuels are used.

Biography:

Nick founded Emissions Analytics in 2011 to understand real-World emissions and fuel economy and emissions from vehicles. Its EQUA Index database of thousands of independently conducted tests is an international performance benchmark. The wider mission is to understand the holistic environmental impact of vehicles on air, soil and water, from tyre wear rates to volatile organic compound emissions.Nick is chairman of the European standardization CEN Workshop 90 on collecting real driving emissions data, which has led to the publication of the AIR Index. He is also chairman of CEN Workshop 103 on standardizing the collection of vehicle interior air quality data. He is a specialist in data analytics, particularly in the automotive market, through his prior work at Oxford Indices Ltd, a data specialist, United Business plc. and Haymarket Media Group. Nick is a graduate of the University of Oxford, and an Honorary Research Fellow at Imperial College London.

Torrefaction and gasification of coconut shells for electricity production

Randell U. Espina*[1], Renyl B. Baroca[2], Charlemagne Von M. Ranuell Espina[3]
[1]Department of Electronics Engineering, Ateneo de Davao University, Davao City, Philippines
[2]Department of Mechanical Engineering, Ateneo de Davao University, Davao City, Philippines
[3]Department of Entrepreneurship, Ateneo de Davao University, Davao City, Philippines

Introduction: Globalization and exponential growth of population demand the development and use of alternative resources to produce electricity, as fossil-based fuels contaminate the environment and are draining. Biomass is a renewable resource that, in addition to sunlight, wind, water, the ocean, and the earth's heat, can support world economic growth. Biomass is a non-fossilized, biodegradable organic material derived from abundant, clean, and carbon-neutral plants, algae, and animals that has the potential to replace fossil fuels as a bioenergy source. Coconut is a biomass resource that is abundant in tropical areas. The Philippines produces 2.2 million tons of coconut shells from 347 million coconut trees that produce 14.7 million tons of nuts every year. Coconut shells considered a waste resource, can be utilized to generate electricity. The purpose of the study was to use coconut shells as a biomass resource to generate power using a gasification process. **Methodology:** The coconut shells were collected, crushed, torrefied, and fed into the designed and fabricated 1.8-kVA biomass gasification power system (BGPS). The BGPS was run, and its performance was evaluated.

Findings: The calorific value of raw coconut shells is 8.55 kWh/kg. After being torrefied at 275°C for 30 minutes, the calorific value climbed to an optimum of 9.55 kWh/kg, implying an increase of 11.70 percent. At the optimal calorific value, the mass yield was 90.10 percent, while the energy density was 111.64 percent, indicating a total energy yield of 100.59 percent. The torrefied coconut shells were heated to 904°C in the gasifier, causing a thermochemical transition that released producer gas resulting in a thermal efficiency of 64.51 percent. The producer gas was converted to synthesis gas using the chiller, filters, and other components, resulting in an overall thermal efficiency of 62.67 percent. The overall energy conversion efficiency of the BGPS was 13.06 percent. **Conclusion:** Torrefaction improved the calorific value of coconut shells by 11.70 percent, resulting in the energy generation of the BGPS to 1.247 kWh per kilogram. The created BGPS could be expanded in the future to supply electrification in rural and urban areas.

Audience Take Away:

- Usage of coconut shells as an excellent resource to produce electricity
- Apply the appropriate torrefaction procedure to achieve the optimal calorific value of the coconut shell or to any biomass feedstocks
- Understand the principle and operation of a micro-scale biomass gasification power system
- Utilization of torrefied coconut shells both for heating and power purposes

Biography:

Dr. Espina attended the University of San Carlos and majored in electronics and electrical engineering. He earned a master's degree in electrical engineering from the Ateneo de Davao University in the Philippines (1998) and a master's degree in system engineering from the Australian National University in Australia (2008). Dr.Espina has a doctorate in educational management and an energy system engineering doctorate. Dr. Espina is the Ateneo de Davao University's School of Engineering and Architecture Dean and a full-fledged professor. He is the leading researcher on renewable energy technology at the Ateneo de Davao University, Philippines.

Modern concept of biofuel production from organic waste materials for economic development

Kishalay Paria[*1], Sayan Jana[1], Pijus Mondal[1], Swadhin Maity[1], Ananya Gantait[2]

[1]Department of Biotechnology Oriental Institute of Science and Technology, Vidyasagar University, Midnapore, West Bengal, India

[2]Department of Life science Vidyasagar University Midnapore, West Bengal, India

There is a shortage of fossil fuels from all over the world and as a result, monetary policy is collapsing. It is estimated that if fossil fuels burn such wise in the current rate, then all the fossil fuels will be exhausted by approximately in the year of 2060 and biofuel can solve something. Biofuels are pollution free and dominant over current fuels. Although some countries of the world are relying on biofuel but all countries should come forward. Several ways already established for preparation of biofuel like utilization of plant product. Our target is reduction of pollution cum biofuel production in a cost effective way that should be more eco-sustainable. Huge amount of waste matter that releases from fruit processing industry, fish processing industry, municipal waste, sugarcane bagasse, corn grain and other many resources. Biofuel means biologically derived fuel that may be liquid or solid. India basically depends upon agriculture but huge amount of trash fish also available in coastal region of India. Although several researchershave proved that liquid biofuel is produced from polythin. Gobar gas production is the primary conceptof developing countries but some region of our world use human faecal matter for that purpose. The waste materials of fishery industry or fish by-products or trash fish can be utilized for producing biofuel as these are non-toxic and biodegradable in nature.In modern liquid biofuel in the form of ethanol can be produced from various municipal wastes, organic wastes like trash fish, waste parts of fishery industry, food industry etc. Every year billions of tons of wastes from fishery industry are produced by fish processing units. When these wastes are discarded into the environment, a huge amount of pollution creates. Biofuel production can easily solve this problem. This concept is trending now and also can be an alternative for fossil fuels.This will be very much helpful for our mother nature as well as for the upcoming future. The primary products of biofuel may be in a gas, liquid or solid form. These products can be converted by biochemical, physical, and thermochemical methods. Biodiesel produces less air toxins, CO_2, hydrocarbons and other particulates in comparison to the fossil fuel or diesel. The process of converting fish wastes into biofuel or biodiesel involves extraction of fish oil from the waste of the fishery industry. Fish oil contains fatty acid. The easiest way to convert fish oil to bio fuels is transesterification, using the base as a catalyst. Transesterification of 1 litre of fish oil can give up to 0.9 litre of biofuel. Thus biofuel production from waste can implement social economy.

Biography:

Dr. Kishalay Paria completed the Ph.D. degree from Vidyasagar University, India. Now He join as Assistant Professor of Biotechnology, OIST, Vidyasagar University. He has published some research papers and few book chapters in reputed international journal. Recently he selected as Bentham Ambassador. He is life member of Biotech Research Society, India. He serve as reviewer for scholarly journals such as: Phytotherapy Research (Wiley) ,Heliyon (Elsevier),Recent Patents on nanotechnology (Bentham Science) ,Sustainability, Agriculture, Food and Environmental Research, International Journal of Optics and Photonic Engineering, VIBGYOR. He serves as Editorial board member of SCIREA Journal of Environment. He serves as Research consultant in Tarama Feed Product for more than 10 years. He selected as invited speaker International Conference and Expo on Applied Microbiology" at Rome, Italy during June 17-18, 2022 and Global Meet on Food Science and Technology (GMFST2023).

Discerning microbes from different environments for enzymatic saccharification of lignocellulosic biomass

J. Beslin Joshi
Department of Plant Biotechnology, Centre for Plant Molecular Biology and Bioinformatics, Tamil Nadu Agricultural University, Coimbatore, Tamilnadu, India

Besides the rise in crude oil price and depletion of the fossil fuel, its growing demand had accelerated the research in bioenergy. Among the different potential sources for biofuel production, the lignocellulosic biomass is promising feedstock for biofuel industry. Huge availability of lignocellulosic biomass at low cost and simple process for conversion cellulose to fermentable sugars is an added advantage of lignocellulosic feedstock over other available biofuel resources. Lignocelluloses are a complex carbohydrate polymer comprises of about 40–50% cellulose, 20–40% hemicelluloses, 18–25% lignin and other extractable components on dry matter basis. The complex polymer composition makes plant biomass recalcitrant and their abundance negatively affects land use. Nature had bestowed several microorganisms capable of digesting those complex carbohydrates into simple sugars. The major groups of microbes producing lignocellulosic degrading enzymes are bacteria and fungi. The cellulase (exocellulases, endocellulases and β-glucosidases) and xylanase enzymes produced by microbes hydrolyze the cellulose and hemicelluloses complexes of lignocellulosic biomass into simple sugars for ethanol production. The bacterial cellulases are produced as multi-enzyme complexes.

Enzyme production rate of the microbe is governed by its genetics and environment; whereas the enzymatic biomass conversion efficiency by several physical and chemical parameters. Hence in recent years, more research had been focused on identifying the microbial strains with higher potential for production of biomass degrading enzymes that are active at extreme temperature and pH suitable for industrial processes. In this context, the present talk is on "discerning microbes from different environments for enzymatic saccharification of lignocellulosic biomass". Microbes from our surrounding environment like water, soil and waste were reported to produce cellulase and xylanase enzymes. But scientist search for several biomass degrading enzyme producing microbes from different sources like gut of animals and insects, ocean, hot springs, compost pit, mines, endophytes etc. Biotrap is a technique popularly used to enrich the substrate with biomass degrading glycosyl hydrolase enzyme producing microbes. Biotrap at extreme environments had favored the isolation of microbes producing thermo-stable and alkali tolerant enzymes. These novel microbes either directly or their purified enzymes can be used for enzymatic saccharification of lignocellulosic biomass for biofuel production. With the advances in biotechnology the gene coding for those enzymes were expressed ectopically in different expression system for large scale production. Through CRISPER-Cas9 technology, manipulation of genes belonging to the genera Bacillus, Clostridium, Corynebacterium, Escherichia coli, Lactobacillus, Mycobacterium, Pseudomonas, Staphylococcus, and Streptomyces was carried out for high biofuel production abilities. Hence identification and manipulation of novel microbes for enzymatic saccharification and fuel production will revolutionize the biofuel industry.

Audience Take Away:

- Motivated to explore different environment for biomass degrading microbe identification
- Technique for biomass degradation can be developed using microbes or purified enzymes
- Research on recombinant protein / enzyme for biomass conversion can be initiated

Biography:

Dr. J. Beslin Joshi studied Agriculture at the Tamil Nadu Agriucltural University, India and graduated in 2007. She then joined the research group of Prof. Krishnaveni (Biochemistry) at the Institute. She received her PhD (Biotechnology) degree in 2013 under the supervision of Prof. Sudhakar at the same institution Later she worked as research associate in Biocatalyst Laboratory, TNAU during which she worked on identifying several thermophilic bacterial isolates for biomass conversion, gene isolation and protein pourificaton. Later her PDF, she joined as Assistant Professor at KITS, Coimbatore. Later she received funding from Government of Tamilnadu for post doctoral fellowship for 2 years. She had published 12 research paper, 4 review papers, 10 book chapters, a book and attended several national and international conferences. She is holds membership Association of Microbiologists of India and National Academy of Biological Sciences. Recently she was recognized as the Fellow of Scholars Academic and Scientific Society, India.

Strain improvement of chlorella SP. Km504965 by radiation breeding for biofuel production

Senthamilselvi D*, Anandham R, Kalaiselvi T
Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Overexploitation of fossil fuels necessitated alternative sustainable feedstock for biofuel production. Biofuels are one among promising alternative renewable energy reserves. Among biofuels, microbial oils would serve as a suitable renewable feedstock for biodiesel production. The involvement of microorganisms in the development of first, second, third and fourth generation biofuels is well known. Microorganisms with the inherent ability to accumulate > 20 % lipid of their biomass are termed oleaginous. Among oleaginous microorganisms, microalgae are a very important component for future biofuel production because they are phototrophic, grow rapidly, synthesize and accumulate huge amounts of neutral lipids (mostly triacylglycerol) in the cytosol by efficient conversion of solar energy, water, and carbon dioxide into lipids and carbohydrates. Moreover, the cultivation of microalgae requires lesser arable land, water, and other inputs than non-edible oil-yielding crops like jatropha (Jatropha *curcas)*, karanj (Millettia pinnata*)*, mahua (Madhuca longifolia) and laurel (Laurus nobilis*)* and do not compete with crops. They are also capable of utilizing CO_2 or flue gases and thus help to mitigate greenhouse gas emissions. Although microalgae as a feedstock for biodiesel production was initiated in 1970's during the energy crisis by the US Department of Energy, (DOE) at NREL, Colorado as Aquatic Species Program (ASP), till now the technology has not reached the industrial application due to many hurdles like lower biomass and lipid productivity. To meet the requirement, several studies are underway. Strain improvement through either classical or molecular genetic approaches such as random mutagenesis, gene transfer, and adaptive laboratory evolution (ALE) can be exploited to achieve future needs. Genetic manipulation through mutagenesis is a rapid, viable, and environment-friendly approach for enhancing biomass and lipid content. Random mutagenesis is considered to be ideal because it is highly efficient, requires only little genetic information about the organism, and is free from Genetically Modified Organisms (GMO) related biosafety issues.

Gamma rays are suitable for generating stable mutants due to chromosomal aberration caused by these ionizing radiants and their inability to induce photoreactivation, unlike UV mutagenesis. Gamma-ray is being used to generate microalgal mutants for many industrial applications in the past decades. With this view, an attempt was made to improve the strain with enhanced lipid and biomass productivity of *Chlorella* sp. KM504965 for cost-effective biofuel production by gamma irradiation. Further morphological, physiological, biochemical and molecular characterization studies were performed with the evolved mutants and the wild type in order to select suitable mutants for future sustainable biofuel production. This novel strategy of using gamma radiation for strain improvement in terms of biomass, macromolecular composition and lipid accumulation capacity will meet the future requirement of industrial biofuel production.

Audience Take Away:

- Way back to 1978, the US Department of Energy (DOE) launched a project "Aquatic Species Program" (ASP) to utilize biologicals mainly microalgae as a feedstock for biofuel production to meet the energy crisis occurred during early 1970s. However, till now the algae based biofuel did not reach commercial/ industrial scale due to

several bottlenecks. Despite their advantages, lot of basic research on microalgae is still underway mainly to increase biomass and lipid yield so that the technology becomes economically viable.

- Only a few microalgae are reported to produce substantial quantity of lipid - green microalgae. Other side random or site directed mutagenesis was done with only limited species of microalgae – Scenedesmus, Dunaliella and Chlamydomonas reinhardtii. Unfortunately none of the mutants are in industrial scale utility not only for biofuel production, even for other industrial purposes like carotenoids, astaxanthin, / nutraeuticals application.
- Hence, there is a paucity of natural strains as well as mutants with higher lipid yield. Till we evolve a superior strain of natural or modified by either classical or molecular genetics approaches, research on this area has to be continued. With this background, this mutation study was carried out to uplift algae-based biofuel production to an industrial scale.

Biography:

Senthamilselvi Dhandapani is doing her Ph.D in Agricultural Microbiology at the Tamil Nadu Agriucltural University, India under the supervision of Prof. Kalaiselvi Thangavel. She obtained her master's in agricultural microbiology during which she was on a GOI-MHRD student research fellowship at the same institute. She had published 2 research papers, 2 book chapters and attended several national and international conferences. She was awarded the best presenter at an international conference and has passed the ICAR National Eligibility Test (NET).

Elucidating the bioenergy potential of raw, hydrothermally carbonized and torrefied waste arundo donax biomass in terms of physicochemical characterization, kinetic and thermodynamic parameters

Ahmad Nawaz*, Pradeep Kumar
Department of Chemical Engineering & Technology, Indian Institute of Technology (BHU), Varanasi, India

The present investigation aimed to understand the pyrolysis kinetic behavior of raw *Arundo donax* (Raw-AD), hydrothermally carbonized *Arundo donax* (HTC-AD), and torrefied *Arundo donax* (TOR-AD) in a thermogravimetric analyzer at dynamic heating rates. The physicochemical characterization analysis revealed that fuel properties have been enhanced after hydrothermal carbonization and torrefaction.The characterization techniques such as FE-SEM, EDX, FTIR, and XRD have been used to investigate the biomass surface morphology, inorganic elements, functional groups, and crystallinity. The kinetic parameters were calculated using the model-free methods of Ozawa-Flynn-Wall (OFW), Kissinger-Akahira-Sunose (KAS), and Vyazovkin (VZK), whereas Criado's z(α) master plot was used to elucidate the reaction mechanism. The average activation energy was obtained to be 259.11, 262.53, and 250.13 kJ/mol for Raw-AD, 115.31, 110.39, and 107.26 kJ/mol for HTC-AD, and 243.46, 242.68, and 233.79 kJ/mol for TOR-AD using OFW, KAS, and VZK method respectively. The thermodynamic analysis divulged that pyrolysis proceeded through various reaction mechanisms.

Audience Take Away:

- Waste *Arundo donax* was employed as a pyrolysis feedstock to generate bioenergy
- Fuel properties after HTC and torrefaction was studied
- Kinetic study utilizing the OFW, KAS, and Vyazovkin Iso-Conversional models
- Reaction mechanism using Criado's master plot
- Thermodynamic study was conducted to understand the feasibility of process

Biography :

Dr. Ahmad Nawaz graduated in chemical engineering from UIET CSJM University Kanpur in 2015. He then did his masters from IIT BHU Varanasi in 2017 and then enrolled in the same institution as research scholar and graduated in 2022. His current research area is pyrolysis of agricultural waste into cleaner fuel and value added chemicals. He has currently 7 publications.).

Social-cost benefit analysis of sewage treatment plant

Pooja Sharma
Department of Economics, Daulat Ram College, University of Delhi, Delhi, India

The objective of the study is to analyze the Socio-Economic impact of the two sewage treatment plants using Social-Cost Benefit analysis to compare the costs and benefits of plants in Delhi. The aim is to comprehend the economic, health, environmental, and ecological impact of these sewage treatment plants. Based on data collected, the benefits such as social, economic, environmental, and ecological have been analyzed in the study along with the total cost comprising of fixed costs such as construction cost and cost of land and operating costs consisting of the maintenance cost, cost of electricity consumption, cost of chemicals used and manpower employed, the cost involved in the dumping of manure. The study reveals that the benefits remain underestimated in both the plants and suggests several policy implications such as more efficient utilization of effluents, non-drinking water, and sludge. The role of clean and renewable energy is highlighted by identifying the potential for electricity generation through a biogas plant and a stand-alone solar plant.Thus, industrial wastewater is converted into electricity which will not only be used by the sewage treatment plant but can also feed the excess electricity generated to the main grid.

Audience Take Away:

- Explain how the method of Social Cost Benefit analysis can be adopted to evaluate the impact of social goods such as Sewage treatment plants
- The role a Sewage Treatment Plant can play in generating electricity in addition to clean water
- In the present context of sustainability, climate change, water scarcity, and clean energy an analysis presented in the lecture highlights the cradle-to-cradle concept of sustainability and depicts cleaner methods of energy production along with water conservation
- The presentation also highlights the significance of stand-alone electricity generation and the potential of feeding to the grid

Biography:

Associate Professor, Department of Economics, Daulat Ram College, University of Delhi. An alumnus of Miranda House, University of Delhi, she completed her Masters in Economics from Delhi School of Economics, MPhil and Ph.D. from Jawaharlal Nehru University (JNU), and Ph.D. fellow at the University of Agder (Norway). An avid Gandhian, her contribution varies in the field of Energy security, Energy transition, Renewable energy, Human Capital, and Gandhian perspective on energy transition. Also engaged in CEC UGC live lecture series related to Environmental Economics, Climate change, and Sustainability. She has published papers in reputed journals such as Elsevier, IOP, Wiley, and Springer.

From acetic acid production by bacteria to hydrogen production in chlamydomonas reinhardtii

Neda Fakhimi*[1], Alexandra Dubini[2], David Gonzalez-Ballester[2]

[1]Department of Plant Biology, Carnegie Institution for Science, Stanford Campus, Stanford, California, USA

[2]Departamento de Bioquimica y Biologia Molecular, Facultad de Ciencias, Universidad de Cordoba, Campus de Rabanales, Edif, Severo Ochoa, Cordoba, Spain

Due to the critical level of CO_2 contamination in the environment, limited resources of fossil fuels and increasing demand of energy in the world, attention is being paid to clean and sustainable alternatives for sources of energy. Hydrogen is a potential non-carbon-based energy carrier with high energy content per mass (120 MJ/kg). Green algae can produce H_2 under certain conditions in presence of light, however this clean and renewable method for H_2 generation is still far from commercialization due to the low yield and rate of the process. One of the main bottlenecks is that hydrogenases, the enzymes in charge of H_2 production are strongly inhibited by oxygen (O_2) which is inevitably produced during photosynthesis. Chlamydomonas reinhardtii (Chlamydomonas) is a unicellular green microalga that has been widely studied for photobiological H_2 production, due to its rapid growth, known genetics and high hydrogenase activity. Recently, algae-bacteria consortia have attracted attention in the area of bio-H_2 production. O_2 respiration by bacteria can facilitate the hypoxic condition required for the hydrogenases to produce H_2 and improves algal H_2 production in algae-bacteria consortia, especially when the cultures are provided with acetate. In this study we investigated the influence of acetic acid on algal H_2 production in Chlamydomonas-bacteria co-cultures.

Audience Take Away:

- Bottlenecks ahead of photobiological hydrogen production to be commercialized as a clean and renewable source of energy
- Algae-bacteria consortia can be a promising biological system for bio-hydrogen production
- How waste bioremediation can be integrated to bio-hydrogen production

Biography :

Dr. Neda Fakhimi studied Chemical Engineering at the Ferdowsi University of Mashhad, Iran. She got a master in Chemical Engineering-Biotechnology at University of Tehran, Iran. Later, she did a join PhD in Chemical Engineering-biotechnology at University of Tehran, Iran and in Biosciences and Agri-Food Sciences at University of Cordoba, Spain. In 2019, she graduated from both universities with a dual PhD degree. In her first postdoc she worked with Dr. David Gonzalez-Ballester at Prof. Emilio Fernandez laboratory, Spain, and after one year she moved to Arthur Grossman laboratory at Carnegie Institution for science, USA for her second postdoctoral position.

Large-eddy simulations of ammonia spray combustion under direct injection engine-like conditions using a hybrid stochastic fields/flamelet progress variable methods

Mehdi Jangi
Dept. of Mechanical Eng., School of Eng., University of Birmingham, UK

For the first time, liquid ammonia spray combustion in engine-like conditions using Large-Eddy Simulations (LES) approach based on a hybrid Stochastic Fields (SF)/Flamelet Progress Variable (FPV) method is presented. Ammonia has been identified as "the low hanging fruit" for carbon-free hydrogen alternative energy carriers for the following reasons because:

(1) Compared to hydrogen, ammonia storage is easily achievable. It is liquefied at room temperature at 9.90 atm (similar to propane, a fuel with widespread domestic applications), whereas hydrogen storage essentially requires very low temperature (below -239.95 C) or very high pressure (e.g., 700 atm in fuel cell vehicles).

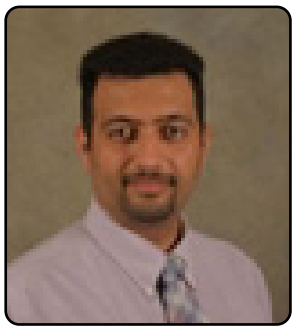
(2) Liquid ammonia has a very high hydrogen density (kg H_2 per litter of liquid ammonia), even higher than liquid hydrogen.
(3) Mass production and shipping technologies of ammonia have been long established due to its applications in the fertilizer industry. Despite great economic and technological advantages, ammonia cannot be directly used in conventional-based Internal Combustion Engines. The main problem is that these engines have been traditionally designed to operate with highly reactive fossil-based fuels which are not compatible with the fundamental combustion characteristics of ammonia. Nonetheless, a very long Ignition Delay Time (IDT) of ammonia/air mixture compared to most hydrocarbon-based fuel counterparties makes is an ideal fuel for future engines that are operating with advanced modes of combustions, namely, the Homogeneous Charge Compression Ignition (HCCI) engines and its derivates. To date, there is very little known about the structure of ammonia spray combustion under practical ICEs conditions. For example, it is not very clear how IDT of ammonia can affect the structure of ammonia spray when it is injected into an engine-like environment. Whether the mixture reaches to a homogeneously mixed condition, as it is intended in an HCCI engine, or it involves some levels of stratification in mixture' temperature or composition, is predominately affects the combustion progress and its efficiency. In this paper, first, we formulate a new spray combustion modeling approach based on our previous work in which a hybrid (ES/FPV) was developed and used for modeling non-premixed jet flames. The method is then used to simulate the so- called Sandia' Spray A - a benchmark for diesel spray combustion in modern engine-like conditions. This follows by modeling ammonia spray in an advanced DI-engine like conditions. The results will be analyzed and the dominate combustion modes in each case are identified. We shall discuss the combustion performance of each case in terms of heat release modulations, combustion efficiency, and NOx emissions.

Audience Take Away:

- LES for spray
- 2-The concept of tabulated stochastic field method
- LES for LNH_3 in engine conditions
- Awareness of LNH_3 as a liquid fuel hydrogen alternative
- Challenges associated with LNH_3 as a carbon-free engine fuel
- The potential of detailed three-dimensional and unsteady numerical simulation for the future engine design

Biography:

Dr. Mehdi Jangi is a lecturer in thermofluids at the University of Birmingham. He has more than 15 years of experience in clean combustion technology. He has published 70> academic journal papers and five specially invited Keynotes/Lectures with a Scopus H-index of 18. He has led several research projects (grants over £7.15m), supported by EU/EPSRC and the Swedish Research Council (VR), including three ongoing projects on decarbonisation using NH_3 and H_2: (EU/1425863, as the PI), (EU/1867729, as the PI), and (EP/1567661, as the Co-I).



The influence of blending diesel fuel with methanol or kerosene on the environment

Hayder Alalwan
Department of Petrochemical Techniques, Middle Technical University, Kut, Wasit, Iraq

Improving the quality of the fuel has attracted a lot of attention due to increase the concerns about greenhouse gas emissions. Unfortunately, in contrast to other green energy resources, only biofuels can provide liquid fuels which are essential for transportation. Thus, it is important to improve the quality of the exist liquid fuels to minimize their emissions without lowering their performances. The impact of blending diesel fuel with different ratios of methanol or kerosene was investigated in internal combustion diesel engine which is a Single-Cylinder, four-strokes, and pneumatic cooling. This study investigated the influence of the blending on the engine performance. This was done by testing The Brake-Specific Fuel Consumption (BSFC), engine effective power (Ne), Brake-Specific Energy Consumption (BSEC), Brake Thermal Efficiency (BTE), and noise level of the tested engine and comparing them with unbending fuel. In addition, the exhaust was analyzed to determine the impact of the blending process on the emssions. The results showed that blending diesel can be blended with small ratios of methanol or kerosene (up to 14%) to minimizes the carbon oxides, hydrocarbons, and Particular Maters (PM) as well as the engine noise and exhaust temperature without serious lowering to the engine performance. This improving is due to properties of these additives such as the high oxygen content of methanol.

Audience Take Away:

- Researchers will have insight information about the influence of fuel blending method on environment
- Researchers will be emphasized to find solutions to obstacles that limit the adaption of this method
- Researchers will be encouraged to investigates other additives such as ethanol
- Mechanical engineers will be aware about the engine requirements to adapt the blending fuels

Biography:

Dr. Hayder A. Alalwan is an Associate Professor at the Middle Technical University, Technical Institute, Kut, since 2006. He is the Chairman of the Petrochemical Techniques Department since 2018. He has received his PhD in Chemical Engineering from The University of Iowa. Iowa City, Iowa, USA in 2018. His research focuses mainly on water treatment using adsorption method, but he is also doing research in other chemical engineering fields such as catalyst, adsorption, water treatment, and investigating reaction mechanisms.

Sustainable production of biodiesel from used cooking oil utilizing waste ostrich (Struthio camelus) bones as catalyst

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Department of Chemical, Polymer and Composite Materials Engineering, University of Engineering & Technology, New Campus, KSK, Lahore, Pakistan

Sustainability has become a slogan and guiding principle for present day society. In this scenario, the anthropogenic 'waste', in all its diverse forms, can propound a significant source of energy, building materials, chemicals and high worth practical items. With regards to chemical transformations, waste substances not only deliver alternative renewable feedstocks for bio-fuel production, yet in addition a resource from which to synthesize catalysts. The application of heterogeneous catalysts derived from waste to produce biodiesel utilizing waste-based feedstock can potentially improve the overall energy efficiency of existing and novel chemical processes. This investigation presents biodiesel production from Waste Cooking Oils (WCO) *via* cheap heterogeneous catalyst obtained from waste Ostrich (Struthio camelus) bones. In the first section, waste cooking oils have been recommended as a suitable option for biodiesel production. The quantification of annual waste cooking oil generation in Pakistan has been carried out if not utilized for resourceful purpose would create disposal problems. In the second section, the catalyst was synthesized from waste Ostrich bones and characterized by Thermogravimetric Analysis/Differential Scanning Calorimetry (TGA/DSC), X-Ray Diffraction (XRD), Fourier-Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Spectroscopy (EDX), X-Ray Fluorescence (XRF), Hammett indicator method and surface area calculations. The powdered ostrich bones were calcined at different temperatures, ranging from 600 to 1000 °C. Upon temperature rise, sharp peaks of Hydroxyapatite (HAp) appeared as observed by XRD. The reaction parameters have been optimized in presence of the synthesized catalyst to maximize biodiesel yield. The optimum biodiesel yield of 90.56 % was attained at methanol/oil ratio 15/1, process temperature 60 °C, catalyst loading 5wt. % within reaction duration of 4 h. It concludes that Hydroxyapatite (HAp) derived from ostrich bones showed good catalytic performance to produce biodiesel from WCO. The synthesized catalyst sustained adequate catalytic activity even after being repeatedly recycled four times, which infers low-cost biodiesel production opportunities.

Audience Take Away:

- Process of Synthesis of the heterogeneous catalyst using waste animal hard tissues
- Optimization of reaction parameters for maximizing biodiesel yield using a heterogeneous catalyst
- Characterization of biodiesel produced in compliance with international standards
- Pakistan's data of Waste Cooking Oil (WCO) is shared and is dealt with sustainable solution to counter environmental concerns posed by dumping of WCO in the environment

Biography:

Dr. Chaudhry Haider Ali studied Chemical Engineering at the UET, Lahore, Pakistan and graduated as MS Chemical Engineering with specialization in Energy in 2009 from KTH, Stockholm, Sweden. After that he joined his parent institute UET, New Campus, KSK, Pakistan. He received his PhD in 2015 at the ECUST, Shanghai, China. Dr. Ch. Haider Ali is serving as an Associate Professor and has more than 30 research publications in Biodiesel, Enzymatic catalysis, Biodiesel production from waste cooking oil using enzymes and waste animal bones-based catalysts.

KEYNOTE FORUM

DAY 02

GLOBAL CONFERENCE ON

BIOFUELS AND BIOENERGY

21-22 OCT

Delia Teresa Sponza

Dokuz Eylul University, Engineering Faculty, Environmental Engineering Department, Buca –Izmir TURKEY

Photoreduction of CO_2 into CH_3OH and CH_4 using BI_2S_3/CEO_2 nanocatalyst

High utilization of fossil fuels causes global warming due to a dramatic increase of the Carbon Dioxide (CO_2) level in the atmosphere. Thus, it becomes essential to explore new energy resources. Several ways have been explored to cope with these issues, such as utilization of carbon-free alternative energy sources, increase in efficiency of carbon-based energy systems and recycling of CO_2. One economically feasible pathway is the photochemical conversion of CO_2 into readily transportable and stable fuels, i.e., solar fuels (Methane (CH_4), Methanol (CH_3OH), and 1-Butanol ($C_4H_{10}O$). Bi_2S_3 and CeO_2, and Bi_2S_3/CeO_2 nanocatalyst were produced under laboratory conditions. X-ray diffraction, high resolution transmission electron microscopy and scanning electron microscopy and UV/visible absorption spectroscopy and photoluminescence spectroscopy analysis were performed to determine and exhibits the physicochemical properties of Bi_2S_3/CeO_2 nanocatalyst. Effects of Bi_2S_3 /CeO_2 ratios (0,2, 0,4 and 0,6), Bi_2S_3/CeO_2 nanocatalyst concentrations (0,2, 0,5, 0,7, 1,0 and 1,5 mg/l), photocatalytic contact time (5, 10, 15, 20 and 25 min), photoconversion power (0,5 , 1, 2, 5, 10 and 15 W/m2, temperature (15, 21, 30 and ^oC) and pH(6, 7, 10) on the yields of CO_2,methane, CO_2/ methanol, CO_2/ butanol were studied. A cost analysis were performed for these studies.

Biography:

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

Qingyu Wu

Tsinghua University, Beijing, P.R.China

Microalgae for oil accumulation and biodiesel production

Heterotrophic algal cultivation resulted in higher cell yield and oil content than photo-autotrophic approach. To realize industrial production of algal biomass, Pilot-Scale production of heterotrophic alga were completed. Whole chain of algal biomass production included heterotrophic cultivation of Chlorella protothecoides in industrial fermentors, cell harvest natural drying system. Based on basic studies we set up a photosynthesis-Fermentation model to combine the both advantages from photosynthesis and fermentation. It resulted in higher cell and oil yield than that of fermentation.

Biography :

Professor of School of Life Sciences,Tsinghua University, China. Winner of the National Science Foundation for Outstanding Young Scientists of China, Award of National Famous Teacher in Universities. Major research fields:

(1) Technology of algae-based bioenergy

(2) Molecule biology of algae Teaching Courses

(1) Life Science and Engineering

(2) Introduction to Biology

POSTERS

DAY 02

GLOBAL CONFERENCE ON

BIOFUELS AND BIOENERGY

21-22 OCT

Effective anaerobic digestion of waste activated sludge using the combined ultrasonic and alkaline pretreatment

Minjun Sohn
Saint Paul Preparatory Seoul, Seoul, Republic of Korea

Waste Activated Sludge (WAS) as a By-Product from sewage treatment plant should be treated to manage the environmental problems such as water pollution and human health risks. Anaerobic Digestion (AD) is one of the treatment methods that is biologically effective technology to produce renewable energy while treating organic waste including WAS. Bioconversion to mainly methane gas from organic waste by AD is an attractive as carbon-neutral technology. However, the AD of WAS should be improved because of low biodegradability.This study investigated that the simultaneous combination effect with low energy consumption was performed for using ultrasonic-alkaline pretreatment in order to enhance the biodegradability of WAS and thus the biomethane production through AD. Alkaline pretreatment with low NaOH dosage (50% w/w, 2 mL/L sludge) was performed for 2 h reaction time and ultrasonic pretreatment with low specific energy (8571 kJ/kg total solid (TS), 20W, 20kHz) was performed for 30 min reaction time. Combination pretreatment was simultaneously accomplished to same NaOH dosage (2mL/L sludge) and ultrasonic specific energy (8571 kJ/kg TS, 20W, 20kHz) for 30 min reaction time. The biochemical methane potential test of the pretreated sludge was experimented during 28 days in order to evaluate the effect of three pretreatment methods.

Alkaline pretreatment was the most solubilization efficiency of 10.4% than 1.9% of ultrasonic pretreatment and 6.4% of combination pretreatment compared to unpretreated sludge. Soluble chemical oxygen demand (SCOD) of alkaline, ultrasonic, and combine methods were 2.0 g/L, 5.0 g/L, and 7.5 g/L, respectively. The methane production of combined pretreatment was 158% higher than unpretreated test, otherwise the results were about 53% of alkaline pretreatment and 20% of ultrasonic pretreatment. These results indicated that simultaneously combined pretreatment with short time could be more effective to biomethane production from WAS compared to each pretreatment methods even though lower solubilization efficiency (6.4%) than alkaline pretreatment (10.4%). It might be that non-biodegradable COD was more released in alkaline pretreatment during longer reaction time which could affect to decrease the bioconversion efficiency of AD. Additionally, low energy input (20W, 8571 kJ/kg TS) of ultrasonic pretreatment without chemical dosage seemed to be slight effect on the hydrolysis of sludge. Therefore, the result suggests that AD with simultaneously combined pretreatment is potential to manage WAS in sustainable and carbon-neutral manners.

Audience Take Away:

- Simultaneous pretreatment with low energy ultrasonic and low dosage alkaline is effective the enhancement of AD from WAS
- Who targeting the solubilization of WAS, alkaline pretreatment is more attractive option
- In order to improve the efficiency of ultrasonic pretreatment, ultrasonic power is important

Biography:

Minjun Sohn is a student at "Saint Paul Preparatory Seoul,". He is really into chemistry and enjoys planning scientific experiments as well as observing the results. Moreover, he searched and read to papers and news about environmental issues and then researched on wastewater treatment and bioenergy. He wondered that biological method such as anaerobic digestion could produce the bioenergy source from treating organic waste. He designed his first anaerobic digestion experiment with various pretreatment methods.

Composition and SEM analysis of biomass of various types after Microwave-Assisted hydrotropic pretreatment

Grzegorz Kłosowski*, Dawid Mikulski
Kazimierz Wielki University, Department of Biotechnology, ul. K. J. Poniatowskiego Bydgoszcz, Poland

WAt present, lignocellulosic biomass is the basic raw material in the production of second-generation biofuels.However, an efficient production of, for instance, bioethanol from lignocellulose as a result of bioconversion processes is hard due to the complex structure of biomass. The effectiveness of the bioconversion of biomass into ethanol mainly depends on the quantity of fermentable sugars acquired in the process of the enzymatic hydrolysis of structural polysaccharides, i.e. cellulose and hemicellulose.To precisely assess the efficiency of pretreatment methods, the structure of lignocellulosic biomass should be analysed in detail. The presented research was aimed at the determination of changes taking place in the composition and structure of softwood, hardwood and non-wood biomass under the influence of microwave-assisted hydrotropic pretreatment using SEM technique. Most susceptible to extraction are wheat straw biomass components, while those of pine chip biomass are the least susceptible to it. As a result of a microwave-assisted pretreatment without NaCS, the content of the hemicellulose decreases by ca. 3% DW for pine and beech chips, and by ca. 14% DW for wheat straw. During microwave-assisted pretreatment, when 40% w/v NaCS is used as a solvent, the hemicellulose in wheat straw and pine chips undergoes complete degradation. In beech chip biomass, its content decreases to 2.41±0.16% DW.The application of microwave-assisted pretreatment using water (0% w/v NaCS) causes an increase in the content of lignins in all types of biomass. This is caused by the high hydrophobicity of lignins and extractability of other biomass components.

A reduction in lignin content in biomass is recorded only when a hydrotrope is used as a solvent. In comparison with biomass after pretreatment using water, the content of lignins decreases by ca. 40-44% for pine and beech chips, and by ca. 71% for wheat straw after microwave-assisted hydrotropic pretreatment. A high degree of extractability of biomass components during microwave-assisted pretreatment is tantamount to a high content of cellulose, which does not undergo degradation during pretreatment. In beech chips and wheat straw biomass, the content of cellulose exceeds 83% DW after microwave-assisted hydrotropic pretreatment and with the lignin content of less than 10% DW, cellulose is the dominating component of the lignocellulose. To explore the physical impact of microwave-assisted hydrotropic pretreatment on the ultrastructure of pine chips, beech chips and wheat straw, biomass before and after pretreatment using SEM was subjected to imaging. Regardless of the type of biomass, micrographs of its samples before pretreatment indicate that the structure is ordered, strongly fibrous, with a smooth and scarcely porous surface. Owing to the presence of lignins and hemicellulose, the structure seems to be rigid and resistant to the impact of cellulolytic enzymes. It was discovered that as a result of pretreatment using microwaves and NaCS, the lignins and hemicellulose underwent degradation, which was responsible directly for the presented look of the biomass samples. The image of the structure after biomass pretreatment using NaCS becomes less ordered, the surface becomes coarser and a fibrous structure can be seen (fibrous nature of lignocellulose). Changes in the ultrastructure of the biomass become clearer along with the enlargement of micrographs. The effect of the removal of lignins and hemicellulose as a result of microwave-assisted hydrotropic pretreatment was reflected in the micrographs and is marked by a greater exposure of fibrous structures and a greater porousness of the surface of biomass. Analyses of the structure of plant biomass of various types (softwood, hardwood and non-wood) subjected to microwave-assisted hydrotropic pretreatment showed that this method has a significant impact on physical and chemical changes of the lignocellulose structure. Funding: The work was supported by the National Science Centre, Poland

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 38 research articles in SCI(E) journals and many other industry and knowledge dissemination publications.

Changes in the structure of lignocellulose as a result of Microwave-Assisted hydrotropic pretreatment

Dawid Mikulski[1]*, Grzegorz Kłosowski[2]
[1]Kazimierz Wielki University, Department of Biotechnology
[2]ul. K. J. Poniatowskiego Bydgoszcz, Poland

Our research was aimed at a comprehensive analysis of changes in the structure of pine chip (softwood), beech chip (hardwood) and wheat straw (non-wood) biomasses resulting from a newly developed pretreatment method combining the use of hydrotrope in the form of sodium cumene sulfonate and microwave radiation. To identify the impact of hydrotrope in the form of sodium cumene sulfonate on various types of biomass during pretreatment, the biomass was analysed before pretreatment, after microwave-assisted pretreatment using water and after microwave-assisted pretreatment using NaCS. An assessment of changes in the structure of lignocellulosic biomass resulting from pretreatment was performed using solid state analysis techniques ^{13}C NMR and FTIR. An analysis of the spectra of pine chips revealed a decreased signal intensity at 56.3, 62.5 and 84.0 ppm in biomass samples subjected to microwave-assisted pretreatment using 40% w/v NaCS in comparison with samples before pretreatment. These peaks are characteristic for structures connected with lignins and hemicellulose and confirm the extraction of some of these structures from pine chip biomass. At the same time, an increase in the hight of peaks at 65.2 and 105.3 ppm was recorded, which indicates an increased content of cellulose, including its crystalline form. NMR spectrum for beech chips after microwave-assisted hydrotropic pretreatment also indicates a lowered intensity at 56.3 and 62.5 ppm, which indicates a removal of a part of the lignins and hemicellulose from the biomass in comparison with the samples without pretreatment. The spectrum of wheat straw sample after pretreatment using hydrotrope indicates the dominating share of cellulose in the biomass, as also confirmed by analyses of biomass composition. The regions 72.2, 74.8, 89.2 and 105.3 ppm characteristic mainly for cellulose are more intense, while area 56.3 ppm is marked by a lowered intensity.

An analysis of the FTIR spectra clearly showed changes of structure in various types of biomass after microwave-assisted hydrotropic pretreatment. A lowered peak at wavenumber 1270 cm^{-1}, equivalent to the aromatic ring of guaiacyl, was observed in the FTIR spectrum of pine chips subjected to pretreatment using 40% w/v NaCS. An analysis of spectra of the basic samples (not subjected to NDF or ADF extraction) also indicates a decreased signal intensity at wavenumber 1630–1660 cm^{-1} (stretching vibrations of groups C=O in lignins) in pine chips samples after microwave-assisted pretreatment. FTIR spectra for beech chips samples show a similar tendency in the area of wavenumber 1250 cm^{-1} as for pine chips. Additionally, changes indicating a reduced content of lignins and hemicellulose were observed in the FTIR spectra in beech chip biomass after hydrotropic pretreatment. As a result of pretreatment using 40% w/v NaCS, the peaks at wavenumbers 1463, 1505, and 1595 cm^{-1} are markedly reduced. Reduced peaks of groups C-H, aromatic rings, and groups C=O characteristic for lignins were observed in the spectrum acquired as a result of the analysis of beech chips samples after hydrotropic pretreatment. The tendency observed for beech chips subjected to pretreatment using hydrotrope and microwaves is shown even more clearly in the FTIR spectra acquired from the analysis of wheat straw samples. In this case, as a result of pretreatment using 40% w/v NaCS, a lowered intensity of peaks characteristic for lignins with wavenumbers 1250, 1250, 1460, and 1600 cm^{-1} was recorded. The process of microwave-assisted hydrotropic pretreatment significantly changed the structure of biomass of various types, which was manifested in the removal of the functional groups characteristic for lignins and hemicellulose. 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 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.

Sargassum biorefineries: From waste to products

Karla J. Azcorra May*[1], Raul Tapia Tussell[1], Edgar Olguin Maciel[1], Rosa Maria Leal Bautista[2]
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In recent years, Sargassum spp. is the new normal on the Caribbean, in the last decade massive blooms of macroalgae arrived, causing alarm among inhabitants, scientist, government and entrepreneurs. Environmental concerns are related to its decomposition which generates leachates and noxious gases which may cause health issues and could compromise water quality on several zones. In 2019, estimations of this macroalgae in ocean were about 20 million tons; affected countries have not appropriate infrastructure for the management of this amount of biomass. This situation motivated local governments and other stakeholders to explore different ways of exploitation. To define the best processes, it is necessary to include the composition of the material; in this study we developed an exhaustive characterization that indicate the presence of polyphenolic compounds which exhibit similarities with terrestrial lignin. Moreover, different carbohydrates were identified that have the potential to be used to produce bioproducts, like alginates and fucoids, also the residual of this biomass could generate clean energy. However, the presence of heavy metals in Sargassum spp. limits these possible applications, thus a traceable process should be implemented to track the mobility of metals. In order to achieve a sustainable exploitation of *Sargassum* spp biomass, we propose a traceable scheme based on an alkaline process that allow the extraction of alginate from Sargasso. where the metal content per kg of alginate in comparison with the initial Sargasso achieves the reduction of all metals on a ratio of 75 to 95%. On the other hand, the waste of this extraction-process was analyzed to define another application, the results indicated that this waste-maintained carbohydrate of interest (glucose, xylose and fucose) and an optimal carbon nitrogen ratio for anaerobic digestion. In summary, this indicates that Sargassum spp could be used as a raw material for biorefineries on vulnerable zones, contributing with the mitigation of negative impacts and transforming the Sargassum crisis into an opportunity for sustainable processes.

Audience Take Away:

- Composition of *Sargassum* biomass and potential applications
- Conversion of biomass in order to offer alternatives to mitigate the Sargasso problematic
- Traceability of metals in processes for obtaining bioproducts

Biography:

Karla Jared Azcorra May is environmental engineer, she obtained their master degree in Renewable Energy from Yucatan Center for Scientific Research (CICY), Yucatan, Mexico, working with energy production using biomass. Nowadays, she is a PhD student in CICY, under the supervision of Doctor Raul Tapia Tussell, her work focuses on sustainable exploitation of Sargassum under a biorefinery scheme.

SPEAKERS

DAY 02

GLOBAL CONFERENCE ON

BIOFUELS AND BIOENERGY

21-22 OCT

Pioneering multidimensional microbial synthetic biology: Systems metabolic engineering and protein engineering for biodiesel production

Juan Octavio Valle-Rodriguez*[1], Shuobo Shi[1,3], Verena Siewers[1,2] and Jens Nielsen[1,2,4]

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[3]Beijing Advanced Innovation Center for Soft Matter Science and Engineering, College of Life Science and Technology, Beijing University of Chemical Technology,Beijing, China

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The continuous requirement of transportation biofuels has brought the necessity to establish alternatives permitting low-cost production of biodiesel while being environmentally friendly. Biodiesel production has been achieved utilizing yeast Saccharomyces cerevisiae by employing respective enzymes that catalyze the synthesis of fatty acid ethyl esters (FAEEs) based on activated fatty acids (as fatty acyl-CoA molecules) and ethanol (ethyl alcohol), as reactants. Several enzymes were tested and successfully heterologously introduced in yeast by expressing their codon-optimized gene for expression in a yeast host under the strong promoter TEF1p using plasmid pSP-GM2; these were wax ester synthases from bacteria Acinetobacter baylyi ADP1, Marinobacter hydrocarbonoclasticus DSM 8798, Rhodococcus opacus PD630, Psychrobacter articus 273-4 and animal Mus musculus C57BL/6. In conclusion the acyltransferase/wax ester synthase MhWS2 from oil bacteria Marinobacter hydrocarbonoclasticus was the highliest active in yeast S. cerevisiae with 8.1 pmol/(mg protein•min). Through metabolically engineering the cell mutants further, metabolism was widely modified for increasing biodiesel production by eliminating fatty acid-consumption competitive pathways, therefore augmenting the fatty acid pool. This was achieved by deleting genes ARE1, ARE2 (responsible for steryl ester biosynthesis), LRO1 and DGA1 (responsible for triacylglycerol biosynthesis) and POX1 (allowing β-oxidation), this conferred a 5-fold increase of FAEEs formation (17.2 mg/L). Right after, the acyltransferase/wax ester synthase MhWS2 was overproduced in yeast cells by chromosomal integration of its codon-optimized gene ws2. Then the gene copy number was enhanced by integrating it in δ-regions, this resulted in 7.5-fold higher biodiesel production in a gradually evolved strain tolerant to 20 mg/mL antibiotic G418 with an enzyme activity of 62 pmol /(mg extract•min). Furthermore, Protein Engineering of two natural catalysts (selected acyltransferase/wax ester synthase MhWS2 from oil bacteria Marinobacter hydrocarbonoclasticus; and α/β-hydrolase Eeb1p homolog to yeast Saccharomyces cerevisiae) was addressed. In these subprojects, directed evolution of these two enzymes was achieved for favoring the synthesis of biodiesel by augmenting their efficiency and altering selectivity towards biocatalyzing FAEEs of desired chain length (C16 and C18, either saturated or monounsaturated). Starting with random mutagenesis of the respective codifying genes (ws2 and EEB1) allowed libraries of random point-mutations. Then library screening was conducted for reducing the CFU (colony formation unit) number; since lipotoxicity was employed as screening method due the condition of the yeast mutants, modifying to a weaker promoter was needed: KEX2p was then further applied. Ultimate selection of the best evolved variants of these enzymes was performed: variants MhWS2-v11 (65.3% increment when compared to natural MhWS2) and Eeb1p-v04 (45.7% increment when compared to natural Eeb1p) were the best candidates for FAEEs biosynthesis, since they evolved toward preferring utilizing as reaction substrates: ethanol and fatty acyl-CoA molecules of 16 to 18 carbon atoms in aliphatic chain. MhWS2-v11 possesses five residue substitutions, while Eeb1p-v04 has 19 residue substitutions. In this case of scientific and technological studies, an advanced biofuel of the third generation has been produced: green biodiesel.

Audience Take Away:

- During this lecture, the audience will be able to learn the basics and principles of this emerging field of Biotechnology, at a first sight
- The overall scientific and technological approach will be presented and described toward the understanding for application of the methods and techniques required for implementing and developing this field at laboratory scale, principles for pilot plant scaling and industry installation
- By employing intellectual assets of the mutants and variants achieved, a more practical method can function and be up-process implemented, making the production process more efficient, reach higher yield and more environmentally friendly with a higher sustainability development

Biography:

Dr. C Juan Valle studied B.Sc Chemical Engineering at University of Guadalajara, Mexico; then he graduated as M.S.T. at CIATEJ research center. Later, he joined the Systems and Synthetic Biology research group of Prof. Jens Nielsen at Chalmers University of Technology, Sweden. Besides performing scientific research, he has developed pedagogically as instructor, coach and teacher in laboratories in matters of genetic and metabolic engineering, qualitative and quantitative chemistry; aimed theoretical teaching in topics and subjects: Mathematics, general chemistry, molecular biology, microbiology, process control, classical physics and modern physics. He has received scholarships, grants and stipendium from Mexico, Sweden and European Union.

Anaerobic digestion of wastes and by-products of the sugar beet industry as a source of gaseous biofuels

Anna Sikora*[1], Anna Detman[1], Ewa Wiktorowska-Sowa[2], Marcin Nosek[2] Marcin Szewczyk[2], Szymon Nowak[2], Jan Piotrowski[2]

[1]Laboratory of White Biotechnology, Institute of Biochemistry and Biophysics, Polish Academy of Sciences, Warsaw, Poland

[2]Polish Sugar Company (Krajowa Grupa Spozywcza S.A.) Dobrzelin Sugar Factory, Warsaw, Poland

Gas biofuels, biohydrogen (energy carrier) and biomethane are the products of the Anaerobic Digestion (AD) of biomass by microorganisms. There are four successive stages: (i) hydrolysis, (ii) acidogenesis, where as a result of dark fermentation biohydrogen is formed, an intermediate product of AD, (iii) acetogenesis and (iv) methanogenesis, with biomethane as the end product. Understanding the complexity of metabolic pathways and chemical reactions carried out by microorganisms allows for the separation of AD stages and the optimization of biohydrogen and biomethane production. Currently, there is a great interest in the development of new technologies for the modernization of wastewater treatment plants in order to control the release of biogas and obtain methane for energy purposes. In addition, as part of the development of innovative technologies based on microbiological processes, modern installations of anaerobic digestion of biomass are built, where the stages of bio-hydrogen production (hydrolysis and acidogenesis) and biomethane production (acetogenesis and methanogenesis) are separated to obtain these two gases under controlled conditions. Multistage systems provide optimal conditions for each stage, stabilize the process, and increase energy recovery from substrates. Hydrogen is considered as an energy carrier of the future. Food industry plants are a very attractive field for the mentioned above activities. Sugar factories are of particular interest. By-products and wastes of the sugar industry, due to the high content of carbohydrates, are a valuable substrate for microorganisms that release biohydrogen and biomethane as a result of their metabolic activities.

Our work encompass three categories:

Basic researches involve biochemical and molecular analysis of anaerobic digestion microbial communities. Our findings concern the metabolic pathways of biohydrogen and biomethane production and new inhibitors of these reactions. At the acidogenic stage, the reaction of lactate and acetate convertion to butyrate, determined by the balance between dark fermentation bacteria and lactic acid bacteria, is important for the production of biohydrogen. At the acetogenic stage it was revealed that the dominant products of acidogenesis determine the type of methane formation pathway. R&D works involve demonstration of an innovative technology for the continuous production of biohydrogen and biomethane in the two-stage anaerobic digestion of molasses (a by-product of the sugar industry). The installation developed on a laboratory scale produces 73.9–122.0 dm^3 biohydrogen and 287.2–398.2 dm^3 biomethane from 1 kg of molasses in the stable conditions. In cooperation with an industrial partner, the installation was scaled up 20- and 200-fold in the Dobrzelin Sugar Factory, maintaining comparable efficiency of biohydrogen and biomethane production. Implementation works include modernization of the wastewater treatment plant in the Dobrzelin Sugar Factory, that processes spent sugar beet transport water. New units: Biogas purification system, biogas storage tank and a co-generator were installed to produce electricity and heat. The generated electricity exceeds twice the demand of the wastewater treatment plant. Energy production from biogas in the sugar factory wastewater treatment plant reduces greenhouse gas emissions and the consumption of fossil fuels, provides distributed energy sources, brings financial benefits and aims to achieve a circular economy.

Audience Take Away:

- Understanding of the complexity and limitation of biohydrogen production during acidogenic step of anaerobic digestion
- Understanding the immaturity of biohydrogen production technology compared to the advanced biogas production solutions

- Presenting different perspectives for sugar factories - as a place for the development of innovative technologies
- An excellent example of fruitful cooperation between a research unit and an industrial partner towards the new solutions allowing for the diversification of the use of by-products and wastes in the sugar factory, demonstration of practical application of scientific findings, creation of the need for qualified staff in rural areas

Biography:

Anna Sikora, microbiologist, professor at the Institute of Biochemistry and Biophysics PAS in Warsaw, leader of Laboratory of White Biotechnology. She is a graduate of the Faculty of Biology, University of Warsaw. She received her PhD and postdoctoral degrees from IBB PAS. She specializes in research on anaerobic digestion, metabolic pathways of acidogenesis, acetogenesis and methanogenesis, interactions between microorganisms in microbial communities generating hydrogen and methane, optimization of hydrogen production in fermentation processes. She has authored papers published in the journals from ISI Master Journal List, chapters in books and conference reports.

Lifecycle-based environmental pollution cost analysis of alternative biofuels at internal combustion engines

Selcuk Sarıkoc
Department of Mechanical Engineering, Faculty of Engineering, Amasya University, Amasya, Turkiye

The main purpose of the study is to explain alternative biofuels' long-period effects on the environment and economy using lifecycle-based analysis. Increasing usage of fossil-based fuels is causing more greenhouse gas emissions, nowadays. Especially, CO_2 emission emerges as the main reason for global warming. Carbon emission is not only caused by climate change but also by health and environmental problems. Thus, Kyoto Protocol countries have a deal with reducing carbon emissions. For this reason, some preventions have been taken by the countries that mitigated the carbon emission. In this respect, the carbon price for each country is a new application for the countries. This carbon market implementation affects the countries economically and environmentally. The study reveals that results of the lifecycle-based environmental pollution cost analysis parameters such as the specific environmental pollution cost (US cent/kWh), lifecycle-based specific environmental pollution cost ($/kW), total environmental pollution cost ($), lifecycle-based total environmental pollution cost ($), total payback period (year), environmental payback period (year), and lifecycle-based environmental payback period (year). This way, researchers can take into consideration not only the instant effect but also the long period effects of alternative biofuels on the environmental and economic at internal combustion engines.

Audience Take Away:

- The study aims to give an insight into alternative biofuels' long-period effects
- This presentation highlights the importance of the alternative biofuels' long period effect on the environment and economy
- Researchers will gain a perspective on alternative biofuels' lifecycle-based environmental pollution cost analysis for internal combustion engines

Biography:

Dr. Selcuk studied Department of Mechanical Engineering, Faculty of Engineering at Amasya University, Turkiye and graduated as MS in 2014. He received his BSc degree from the Energy Division of Mechanical Engineering Department at Erciyes University in 2011. He graduated with his MSc degree in 2014 from the Institute of Natural Science Energy System Engineering Department at Erciyes University. He received his PhD degree in 2019 from the Institute of Natural Science Energy Division of Mechanical Engineering Department. He obtained the position of an Associate Professor degree in 2022 at Amasya University. He studied alternative fuels such as biodiesel, alcohols (methanol and butanol), hydrogen in the internal combustion engine, i.e. diesel engine and spark ignition engine. Besides, he studied also fuel cells, especially solid oxide fuel cells (SOFC). His research interests are as follows: Alternative fuels, fuel additives such as nano additives, oxy fuels, fuels improver and also internal combustion engine, diesel engine, biodiesel, spark-ignition engine, engine performance, combustion, emissions, energy and energy analysis, fuel cell, biofuels, biomass, environmental pollution cost analysis, environment effects, enviro-economic analysis. He has published more 45 academic studies such as article in SCI(E) journals, book chapters, conference papers etc.

Does the collaboration between clean energy and conventional energy abate CO_2 emissions? A comparative study among EU countries

Benjamin Ampomah Asiedu
Faculty of Administration and economics, Cyprus international university, Nicosia, North Cyprus, Turkish republic of north Cyprus

The study sought to uncover the collective impact of Clean energy conventional energy on CO2 emission? A comparative study among EU countries. Our study will employ panel ADF panel IPS approach for stationary checks. Pairwise cointegration test and Granger causality will be utilized in the study finally an impulse response function will be employed. A diagnostic test will be done via the AR approach. The variable will either be cointegration or not, and our diagnostic test will indicate whether all the variables are stable or unstable. Results from the ganger causality test will indicate either unidirectional or bidirectional causality between clean and environmental pollution. Per findings from the granger causality test will attest whether clean energy, conventional energy improve environmental quality in EU countries. The result from the impulse response function will indicate whether one standard deviation shock to clean energy positively impact environmental pollution in the long and short run. The study will prompt many policy directions for EU countries.

Audience Take Away:

- The audience will be able to grasp the dynamic effect of renewable, nonrenewable energy consumption impact among EU countries
- At the end of the day the audience will know that the predetermined notion that renewable energy abate CO_2 emission will be revealed
- Audience will know how important quality environment. The audience will know the t emission free environment ensures quality living of anthropogenic. Many faculty members will get new insight from the research new revealing will appear. Many designer will know how important to adopt ways and adhere to policies that will ensure that their design saves life. Perception about how we view thing about the atmosphere will be highlighted

Biography:

Master Benjamin Ampomah Asiedu, student Cyprus international University, and North Cyprus and graduated as MBA in 2018. She then joined the research group of Prof. Murald at the Institute of administration and economics, Cyprus. He currently a Ph.D student at the same institution. After one year and half year of his studies, he has published many articles in SCI(E) journals.

Preliminary approach of invasive shrubs management to fight forest wildfires and as an available biomass for pellet production

Flavio Espinoza-Monje*[1], Cifuentes G[2], Saiz G[2], & Laura Azocar[2]

[1]Universidad Catolica de la Santisima Concepcion, Facultad de Ciencias, Programa de Doctorado en Ciencias con mencion en Biodiversidad y Biorecursos, Concepcion, Chile

[2]Departamento de Quimica Ambiental, Facultad de Ciencias, Universidad Catolica de la Santisima Concepcion, Concepcion, Chile

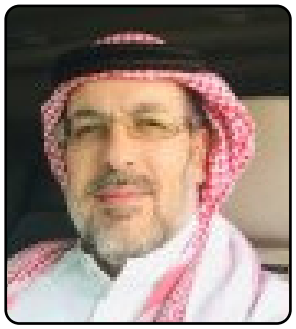
The use of firewood with high moisture content in household heating is responsible for about 80% of air pollution by particulate matter smaller than 2.5 μm (PM2.5) in central-southern Chile. As a way to mitigate atmospheric pollution Plans for Prevention and Atmospheric Decontamination (PPDA) has recently begun to operate in the largest urban regions of Chile. The main focus of these Plans is to replace firewood with more efficient biofuels, like pellets. Nowadays, pellets are produced from pine sawdust, which is a byproduct generated by the cellulose industry. However, the high demand for pellets has generated successive breaks of stock which motivates in looking for new raw and low-cost materials. Furthermore, invasive shrubs are highly available biomass for bioenergy production in central-southern Chile. These shrubs also have increased forest wildfires virulence in mega forest fires that happened in the last years. According to the aforementioned, the study aimed to develop a preliminary approach to determine the effect of invasive shrubs management to fight forest wildfires by evaluating the biomass for pellet production. The biomass management of Teline monspessulana, Ulex europaeus, and Rubus ulmifolius was evaluated in a Wildland-Urban Interface (WUI) in central cities in Chile by applying a fire simulation algorithm using the FLAMMAP 6.1 and ARCGIS PRO tools, the area Modelted for the surrounding areas to Florida, Cabrero and Curanilahue corresponds to 138,651, 142,302 and 147,856 has respectively considering the extraction of biomass type weeds of no more than 2m high. The sample biomass was analyzed according to its physicochemical parameters and then, the shrubs biomass with the best properties was evaluated for pellet production. The obtained results show the effectiveness of the biomass management obtaining a decrease in heat per unit area (kW/m²) 86%, progress line intensity (kW/m) 93%, and flame height (m) 75%. Moreover, the physicochemical properties of *T.* monspessulana, U. europaeus, and R. ulmifolius showed good properties of high heating value (HHV) of 18.5, 18.5, and 18.4 MJ/kg, respectively. However, high ash content was detected in U. europaeus and R. ulmifolius (1.7 and 3.3 %, respectively) compared to the low value obtained for *T.* monspessulana (1%). Due to that a low ash content is a critical parameter in the pellet, *T.* monspessulana was proved for pellet production in a blend of 80% pine sawdust:20% *T.* monspessulana. Then, the pellet produced in a pilot plant showed adequate properties according to normative EN ISO 17225-2. The obtained results are the first approach to the environmental benefit of the shrubs management to fight forest wildfire producing available biomass destined for biofuel production. Further research should be developed to evaluate the combustion performance of the new pellet produced.

Audience Take Away:

- Our results give the viewer a new biomass alternative for the manufacture of a pellet type biofuel for heating
- A new biomass alternative of woody invasive species for pellet production as a novelty for producers worldwide
- Know how the management of a certain type of Bioamsa decreases forest fire virulence
- Know the physicochemical characteristics offered by these new biomass for pellet production

Biography:

The candidate for a doctor of science with mention in biodiversity and biorecursos and academic Dr (c). Jose Flavio Espinoza Monje, studied the Biology career at the University of Concepción worked by determining the biological activity secondary metabolites. The year 2011-2012 He studied Master in Agrobiotechnology at the University of Salamanca Spain investigating in the area of molecular biology. He currently works in the Bioenergy field at the Catholic University of the Blessed Conception with Dr. Laura Azocar Ulloa and a multidisciplinary team looking for new sources of biomass destined to the production of biofuels destined for heating.



Ethics and moral values in the development and production of new biofuels

Abdul-Wali Ajlouni
Physics Department, College of Applied Sciences, Umm Al-Qura University (UQU), Makah, KSA

Biofuels are promoted as one of the few options to replace liquid fossil fuels that offer a reduction in greenhouse gas emissions. But there are serious concerns about negative effects on food security and the environment. Thus, it is very important for biofuel development and production to meet regulatory and ethical conditions that control this type of fuel. Through the development and production of biofuels, two ethical considerations arise, food and nature. The ethical rules regarding food security are obvious, even if their application is not. The ethical imperative here is to improve fundamental food security for all. Rules are not so clear in the natural issue, due to many factors related to preservation and sustainable development as well as the technical improvements in agriculture.

In this presentation, the author introduces some important ethical issues which have also to be considered as selection rules to control the production of biofuel, which is in strong connection with the environment, safety, and security of the human being on earth. As scientific development may carry some risks under its wings, the triangle of ethics, safety, and security will make us sure that any development of any new biofuel is safe, by itself, for humans and the environment, i.e., it will not be a hazardous material as nuclear, radiological, chemical, or biological agents, and will not be used in the future as a tool for destruction in the hands of evil people. Regulations and regulatory bodies are responsible for safety and security measures, while scientists are responsible for the ethical and moral values of the materials in their hands.

Audience Take Away:

- The importance of ethical and moral values in the development of biofuel
- The integration between ethics, safety, and security
- The role of ethics in considering the coming generations and their rights to have a clean earth, and sufficient food, water, and energy resources

Biography:

Expert, Consultant, in Radiation Safety, Nuclear Security and Security in Science, and Assistant Prof. of Radiation and Nuclear Physics working for Umm Al-Qura University. He was working for Naif Arab University for Security Sciences (NAUSS) Sep. 2012 to June 2019 - College of Forensic Sciences (CFS), as assistant prof. of nuclear security and vice dean of the CFS from 2014 to 2018, He served as an assistant Dean of the Faculty of Science, assistant professor of nuclear and radiation physics, and as the chair of the Applied Physics Department of Tafila Technical University, Jordan during the period Sep. 2006- Sep. 2011, And for the Ministry of Energy and Mineral Resources, Jordan from Sep. 2011 to August 2012 and as a researcher on radiation safety from 1990 to 1998 and from 2004 to Sep.2006.He have received training on radiation protection and radiological emergency preparedness in Jordan, Turkey, the United States, Czechoslovakia, Egypt, Iran, and Syria. He have published more than 40 refereed papers and 3 books, on the subject, and presented more than 50 presentations in international conferences on nuclear energy and its applications around the world. He received SCOPUS Scientific Research Award in 2009.

- Founder and chairman of " The Arab Scientific Forum for Radiation Scientists and Professionals"
- Founder and Administrator of the scientific program: Easy Sciences
- Founder and Administrator of the scientific research program: Applications of Nano Forensic Sciences
- Founder and Administrator of the scientific research program: Enhancement of the Security and Safety of Dual-Use Materials: Chemical, Biological, Radiological and Nuclear (CBRN)

Sustainable catalysis of bioplatform molecules to biofuel additives and biobased chemicals

Dhruvi Pithadia* **and Anjali Patel**
Polyoxometalates and catalysis laboratory, Department of Chemistry, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, India

The upsurge in the demand of liquid fuel consumption and the diminishing fossil fuels to supply the global energy demand have attracted a worldwide mass of prospect scientists. This emerging research across the globe is driven by the rising shortage of fossil fuels, concerns regarding global warming and the increase in oil charges. Henceforth this challenging task can be addressed by replacing the Non-Renewable fossils by renewable biomass and inventing excellent sustainable technologies for production of biofuels biofuel additives and valuable chemicals from non-edible feedstock and judiciously selected bio-platforms, thus thereby building a base for future bio-based refineries. Future green and sustainable chemistry will rely on the creation of new product supply chains based on platform molecules derived from biomass. For the production of these molecules, it is very important to develop effective processes for adding value to these compounds through clean and efficient downstream chemistry. This can be achieved by developing catalytic systems which offers relevant possibility for sustainable production.In the present talk, valorization of some selected bioplatform molecules over green and heterogeneous polyoxometalate based catalyst will be discussed. As a case study the development of one such catalyst and its application for synthesis of biofuel additives will be conversed.

Audience Take Away:

- The diversity in possible transformations of bioplatform molecules to biofuels, biofuel additives and other value added products. Also, development of heterogeneous catalyst based on polyoxometalates towards highly product selective catalyst for industrial important reactions
- The present talk will benefit the audience in knowing the current scenario of biomass valorization for synthesis of biofuel additives.The faculty will definitely can use this approach to expand their research for conversion of biobased materials to value added chemicals and also the development of catalytic materials will simplify or make a designer's job more efficient

Biography:

Ms. Dhruvi Pithadia studied Chemistry at The Maharaja Sayajirao University of Baroda, India and graduated as MS (Organic Chemistry) in 2015. After that in the same year she joined as Research Associate in organic synthesis department of MNC Pharmaceutical company and worked for 2 years. She then joined the research group of Prof. Dr. Anjali Patel at Department of Chemistry, The Maharaja Sayajirao University of Baroda, India in 2018. She has five publications in international peer review journals. She has participated in more than 10 international conferences and has been awarded *S.S. Bhavnagar Young Scientist Award* in 2020.

Synthesis of value-added chemicals and fuel additives from renewable sources using heterogenous catalyst

Suman Dutta*, Shireen Quereshi
Department of Chemical Engineering, Indian Institute of Technology (ISM), Dhanbad, India

Lignocellulosic biomass has positioned itself as the most dominant candidate to cater to growing fuel and chemicals demands. Moreover, the production and application of biomass-derived chemicals and fuels could help to reduce greenhouse gases and pollutants emissions that damage the environment. In this context, 5-Hydroxymethylfurfural (HMF), 5-EthoxyMethylfurfural (EMF), Levulinic Acid (LA) and Ethyl Levulinate (EL) have emerged as platform building block molecules to produce wide-ranging commodity chemicals and fuels. However, the production of these chemicals from bio-renewable resources is a challenging task among the optimal operating temperatures, reaction times, reaction mechanisms, heating modes, and other factors. In general, depolymerization, isomerization, dehydration, and rehydration are the major reactions, which necessarily require a suitable acid catalyst containing both Bronsted and Lewis acidic sites. An optimum ratio of Bronsted and Lewis acidic sites is the dominant factor in determining the desired reactant conversion and products selectivity. Therefore, the motive of this paper is to enhance the knowledge about the role of catalysts in value-added chemicals production, particularly HMF, EMF, LA, and EL from various bio-renewable feedstocks using heterogeneous catalyst.

Audience Take Away:

- Production of biofuels and other valuable chemicals from lignocellulosic biomass
- This research provides the information on how the biomass is converted to 5-Hydroxymethylfurfural (HMF), 5-Ethoxymethylfurfural (EMF), levulinic acid (LA) and ethyl levulinate (EL)
- Effect of various reaction conditions and role of catalysts are discussed in this research work
- This presentation will help the audience to understand the basics of biomass to chemicals

Biography:

Dr. Suman Dutta is an Associate Professor in the Department of Chemical Engineering, Indian Institute of Technology (ISM) Dhanbad, India. He received the Ph.D. From Jadavpur University, Kolkata, India. Major research areas are production of renewable energy, photocatalysis, and membrane technology. He has authored one book "Optimization in Chemical Engineering" and edited 2 book "Sustainable Fuel Technologies Handbook" and "Membranes with Functionalized Nanomaterials: Current & Emerging Research Trends in Membrane Technology". He also published almost 50 articles in reputed journals and 10 book chapters in various edited books.

Halophytic plants: An alternative source for biodiesel production

Uroosa Ejaz
Department of Biosciences, Shaheed Zulfikar Ali Bhutto Institute of Science and Technology, Karachi, Pakistan

Biofuel derived from halophytic biomass is getting attention owing to the concerns of energy versus food crisis. The disadvantages associated with edible bioenergy resources necessitate the need to explore new feedstocks for sustainable biofuel production. It becomes imperative because of depletion of reserves and ever so increasing prices of oil, gas, and coal. Additionally, the halophytes wouldn't threaten the food supply of the world, as they don't contend with conventional crops. It can also reduce the relative cost of crop cultivation for the process of bioenergy and biofuel production. Like any other plant material, lignocellulose biomass from halophytes contains lignin along with fermentable and hydrolyzable components. Thus, to remove lignin and to reduce the crystallinity of cellulose, pretreatment methods are essentially required for effective biomass saccharification with reduced operational costs. In this study, biomass from locally available abundant halophytes (*Panicum* antidotale, Phragmites karka, Halopyrum mucronatum, and Desmostachya bipinnata) was screened for saccharification by an enzyme cocktail composed of cellulase, xylanase, and pectinase from thermophilic bacteria. Two types of pretreatments, i.e., with dilute acid and freeze-thaw, were independently applied to the halophytic biomass. Saccharification of acid-pretreated *P. karka* biomass yielded maximum reducing sugars as compared to other plants. Thus, the factors (temperature, pH, substrate concentration, and enzyme units) affecting its saccharification were optimized using central composite design. Scanning electron microscopy and Fourier-transform infrared spectroscopy showed significant structural changes after pretreatment and saccharification. Therefore, halophytes growing in saline, arid, and semi-arid regions can be promising alternative sources for bioenergy production.

Audience Take Away:

- Use of halophytic plants as a potential source for Biodiesel production
- Saccharification of halophytic plants by using enzyme cocktail obtained from thermophilic bacteria
- Statistical optimization of saccharification process by using central composite design

Biography :

Uroosa Ejaz is a highly motivated researcher with a MPhil in Microbiology and over 06 years of research experience. She has published 18 research articles in well reputed International Journals and also wrote 05 book chapters sponsored by Springer and Elsevier. She has work experience from Agha Khan University and Hospital, Patel Hospital, Bahria University and University of Karachi. She also worked as a research assistant in HEC funded NRPU project. Currently, she is serving as a Lecturer at SZABIST and she is also a PhD scholar in University of Karachi, Pakistan.

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