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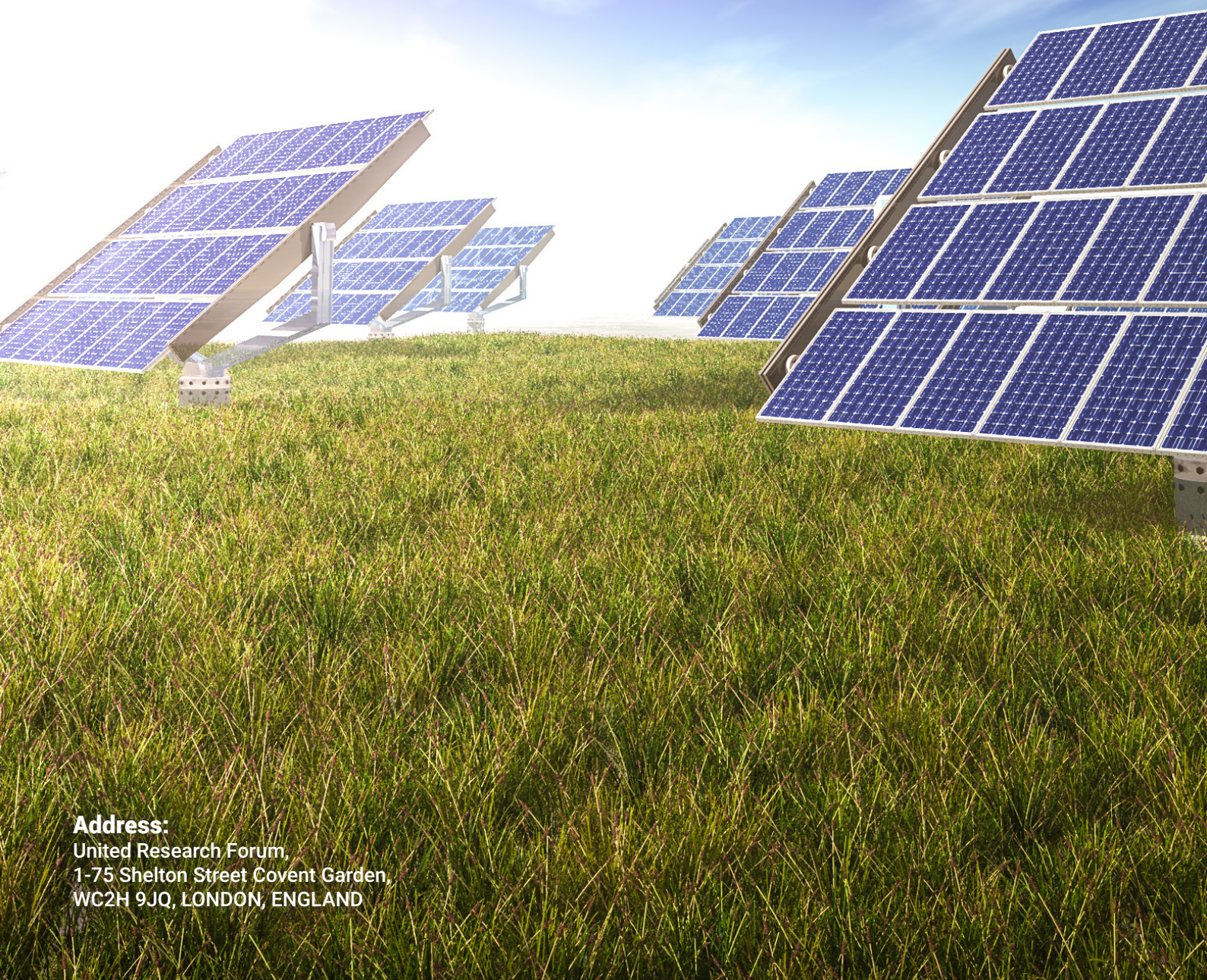
Proceedings of

International E-Conference on

RENEWABLE ENERGY AND RESOURCES

April 26, 2021 I Webinar



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DAY 1

KEYNOTE SPEAKERS

Maya D. Lambreva

Institute for Biological Systems, CNR, Italy

Plant Nanobionics: possible biotechnological solutions for biofuels and bioenergy production

The development of various biohybrid natural or artificial systems for promoting the solar energy conversion is of high priority in contemporary energy research. Plant nanobionics merges plant biotechnology and nanotechnology taking advantage of the fusion of highly dynamic and adaptive cell structures with easily manipulated inorganic material at nanoscale level. This new emerging technology promises not only to improve plant photosynthetic features but also to impart plants with new and enhanced functions. Here we have evaluated the potential of single-walled carbon nanotubes (CNTs) to enhance the photosynthetic performance of algae and thus to open new opportunities for more efficient use of the photosynthesis-based systems in the sustainable production of energy, biomass and high-value compounds was evaluated. Our studies of the effects of CNTs on the photochemical reactions in the unicellular green algae Chlamydomonas reinhardtii pointed out the ability of the nanotubes to modify the growth and photosynthesis of algal cells. Particularly, the characterisation of CNT interaction with photochemical events of photosystem II (PSII) and photosystem I via chlorophyll fluorescence spectroscopy indicated CNT-induced alterations in the PSII electron transport and non-radiative loss of excitation energy in both photosystems. With the scope to gain further insights into the electro-optical interactions of CNTs with light-dependent photosynthetic reactions we used isolated photosynthetic complex (PSCs) with different level of complexity, such as thylakoid membranes, PSII-enriched membrane fragments and light-harvesting complexes of PSII. The energy and electron fluxes in the biohybrid (PSCs/CNTs) systems were analysed by steady-state chlorophyll fluorescence and time-resolved fluorescence spectroscopy. The possible processes involved in the energy excitation decay in the photosynthetic structures in the studded model systems will be discussed.

Keywords: carbon nanotubes, photosynthesis, microalgae, photosynthetic complexes

Biography:

Maya Dimova Lambreva, permanent position as a Researcher at the Institute of Biological Systems, National Research Council of Italy. Dr. Lambreva has a PhD in Plant Physiology from Bulgarian Academy of Sciences. Since 2007 she has been working at the National Research Council of Italy. Her work is focused on the biophysical and biochemical aspects of the light photosynthetic reactions in microalgae and plants with the goal of developing bio-based applications employing photosynthetic organisms or photosynthetic elements. Dr. Lambreva has extensive expertise in different methods of chlorophyll fluorescence spectroscopy and in the quantification of photosynthetic activity. Currently, she is interested in using carbon-based nanomaterials for promoting the solar energy conversion in biohybrid systems based on photosynthetic specimens.

Varun Vohra, Shusei Inaba, Ayumu Kiyokawa, Tomoaki Takada

University of Electro-Communications, Japan

Green & sustainable methods or materials for next-generation photovoltaic device fabrication

Unlike conventional silicon-based photovoltaic technology, organic solar cells (OSCs) can be prepared as semi-transparent or flexible devices and thus display a great potential as next-generation integrated renewable energy technology. However, in addition to the relatively short lifetime of OSCs, conventional OSC fabrication results in a large amount of costly materials and hazardous solvent wastes. The objective of our research is to find innovative green & sustainable solutions for the fabrication or recycling of efficient OSCs. Here, we present two methods to considerably reduce the amount of wasted materials generated during the OSC fabrication or when discarding degraded OSCs. OSC active layers are conventionally fabricated using spin-coating, a deposition technique expels large amounts of costly material and hazardous solvent released in the environment. We developed the push-coating method, in which uniform thin films are produced by spreading small volumes of organic semi- conductor solutions between the substrate and a stamp through capillary forces. This fabrication process does not generate any active material waste and minimizes the use of hazardous solvents. We verified whether push-coating can be applied to OSC fabrication with several state-of-the-art active materials. The second method we focus on is the recycling of costly substrates from degraded OSCs. We demonstrate that with the proper cleaning sequence, the degraded active layers can be removed and the zinc oxide coated indium tin oxide substrates can be reemployed multiple times for the fabrication of new OSCs without major drops in power conversion efficiency. Our results thus considerably decrease the environmental impact of OSC fabrication and elongate the lifecycle of the metal oxide substrates, thus opening the path to sustainable OSC manufacturing.

Keywords: emerging photovoltaics, sustainable manufacturing, thin film, organic semiconductors, organic solar cells, recycling

Biography:

Varun Vohra is a French researcher who completed his PhD in Materials Science from the University of Milan-Bicocca in 2009 at the age of 25. He was a EU Marie-Curie Fellow (2006~2009) and a JSPS Post-doctoral Fellow (2011~2014) before joining the University of Electro-Communications (UEC) in 2014. He established his research group focusing on organic solar cells (OSCs) at UEC, where he obtained tenure as Associate Professor in 2019. He pioneered in fabricating OSCs with efficiencies over 10% and has authored over 40 academic publications including papers on prestigious journals such as *Nature Photonics*.

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DAY 1

KEYNOTE POSTER

Miha Dominko, Kaja Primc, Renata Slabe-Erker

Institute for Economic Research, Slovenia

From Theory to Practice: Bringing Circular Economy to Life

Scientific research on the circular economy focuses heavily on theoretical conceptualizations and technological advances. Although progress in the theoretical field has been remarkable, companies continue to look for evidence of the concept and are primarily concerned with models and strategies bringing such a circular economy to life. To address this issue, we reveal circular economy hotspots and development trends in the fields of business and economics. A resourceful combination of several bibliometric techniques has provided us with valuable references for re-focusing the science into action-oriented research. These include elaborating on the processes that constitute circular supply chains and developing waste management targets and data-driven models for predicting the end-of-life values of products. Moreover, future trends are gravitating towards the systemic perspective, where the operation of companies is strongly intertwined and interdependent.

Keywords: Circular economy; Sustainability; Closed-loop system; Bibliometric analysis; Future research

Biography:

Miha Dominko, PhD, is a research fellow at the Institute of Economic Research in Ljubljana. His research focuses on environmental management, circular economy, energy poverty, as well as subjective well-being. Furthermore, he is an assistant professor at the Faculty of Law and the School of Economics and Business in Ljubljana.

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DAY 1

SPEAKER PRESENTATIONS

Use of filamentous fungi for bioharvesting and pretreatment algal biomass for biogas production

Sanjeev Kumar Prajapati
Indian Institute of Technology (IIT) Roorkee, India

In recent years, significant research attention has been drawn toward biogas production utilizing algal biomass. However, the process of algal biomass-based biogas production is not feasible due to some hurdles. Harvesting and pretreatment are the two major hurdles in microalgal-derived biogas. The present work was therefore focused on systematic and multifarious interventions for the pretreatment and harvesting of algal biomass. The work towards optimization of indigenously produced fungal crude enzymes showed great potential for low-cost algal pretreatment. This strategy coupled with co-digestion resulted in a significant enhancement in digestibility and methane yield was increased by > 63 %. In the parallel attempts, algal biomass harvesting, which is another major hurdle in algal biofuel commercialisation, was dealt with. A novel approach involving the use of pellet forming fungi was investigated for simultaneous harvesting and pretreatment of algal biomass. The fungi showed efficient harvesting (nearly 100 % in 6 h) and incubation of the harvested algal biomass with fungi under controlled conditions resulted in its pretreatment and the methane yield was eventually enhanced by >50 %. This approach can greatly simplify and offer efficient coupling between algal wastewater treatment and biogas production. Further, an interesting concept of the “Closed Loop Process” for algal wastewater treatment and bioenergy production utilizing Rural Sector Wastewater and Livestock waste has been validated. Feasibility analysis for a typical village (population ≈ 4000 adults) showed that the proposed process had renewable power generation potential up to 5413 kWh–1. It also had the capacity to treat > 0.5 MLD of RSW.

Keywords: fungi, algae, biogas, pretreatment, bioharvesting, anaerobic digestion

Biography:

Sanjeev is among the leading expert in the area of algal biomass and biofuel prodcuiton, in India. He has more than 10 years of experience in the area of algal technologies including algal bioprocessing and biogas production. During his Ph.D., he worked on coupling algal biogas production with wastewater treatment. He has more than 30 research papers on various aspects of algal applications in wastewater treatment and biofuel production. At present, Sanjeev is handling 03 bioenergy-centric sponsored research projects and guiding 05 research scholars in his lab. For his outstanding research contribution, he has been awarded various prestigious awards including Distinction in Doctoral Research, Early Career Research Award, Bioenergy-Awards for Cutting Edge Research (B_ACER), and CSIR-Pool Scientist.

Application of renewable energy in heavy oil industry – History of Solar thermal EOR and demonstration of energy and exergy performance of an existing solar steam generator

Ramesh V Kundalamcheery
University of Petroleum and Energy Studies, India

Thermal Enhanced Oil Recovery (EOR) is a tertiary level Improved Oil Recovery (IOR) mechanism employed by upstream oil business to extend the producing field's life by means of injecting high pressure steam to the reservoir. When solar energy is harnessed to produce the required steam, it is named solar thermal EOR. In recent times, as there is quantum leap towards reducing the hydrocarbon footprint and to increase harnessing of renewable energy, this concept has become significant. The concept of solar thermal EOR was introduced as early as 1982. Subsequently, there were several investigations, including the effect of diurnal aspects of solar steam on oil production, along with pilot based selection of technologies like parabolic trough, linear Fresnel, solar tower and GPTC etc for solar steam generations. The present study analyses the historical data of how the solar thermal EOR concept has developed to its current level of maturity and also demonstrates how the energy and exergy performance of the process looks like, based on data collected from an existing Glasshouse enclosed Parabolic Trough Collector (GPTC) installation. GPTC is the latest in the series which is now commercially proven and hence selected for energy and exergy performance analysis. Experimental data were collected from an existing GPTC plant to investigate the energy and exergy performance. It is found that the overall energy efficiency of the system was in the range of 46 -56 %, while the overall exergy efficiency ranged between 34-43%. This analysis would help to mitigate the design challenges and facilitate design improvement and would help to reduce the future capital investment.

Keywords: Solar thermal EOR, Steam generation, GPTC, Energy analysis, Exergy analysis

Biography:

Ramesh V Kundalamcheery is a Chartered Engineer (CEng) and Fellow (FIE) of Institution of Engineers (India). He is an M Tech graduate in Quality Management from Birla Institute of Technology and Science (BITS), Pilani and is a research scholar at University of Petroleum and Energy Studies (UPES), Dehradun, India. He has published a number of papers in solar thermal EOR field and is a senior professional working in the energy industry. His area of expertise is project and contract management. He is a certified Project Management Professional (PMP) and certified Project Risk Management Professional (PMI-RMP) by Project Management Institute, USA.

Back calculation of source intensity and position based on a combined Genetic-Nelder Mead Simplex Algorithm

Shiliang Zhang, Jianwen Zhang, Yongjian Liu
Beijing University Of Chemical Technology, China

In the pollutant control process, it is required to locate the source of pollution first, know the strength of the pollutant leakage source, in order to quickly and effectively prevent the further diffusion of pollution. Atmospheric diffusion model is widely used in traceability of pollutant leakage source. Through the inversion of this model, the source and intensity of leakage can be determined. However, it is always a challenging problem how to carry out reverse optimization quickly and accurately. No matter it is based on probability statistics theory or optimization theory, a single optimization method has its own unavoidable defects. In this study, the genetic algorithm and Nelder Mead simplex algorithm were combined. Firstly, the genetic algorithm was used to accurately narrow the search field, and then the Nelder Mead simplex algorithm was used to quickly obtain the optimal solution, effectively overcoming the defects of the slow convergence speed of the genetic algorithm and the poor convergence quality of the Nelder Mead simplex algorithm. Combined with the experimental data, it is found that the algorithm is fast and accurate in the traceability reverse calculation of the diffusion of pollutants in the atmosphere and the long-distance leakage of dangerous gases, which is not affected by the selection of initial values, and the optimization efficiency and robustness have been significantly improved.

Keywords: pollution control, atmospheric diffusion model, back calculation, genetic algorithm, Nelder Mead simplex algorithm

Biography:

Shiliang Zhang is Graduate student of Beijing University of Chemical Technology. He conducts research on Dangerous gas diffusion and pollution source traceability in Lab of Fluid Flow and Heat Transfer and IGCIT. His research fields include safety engineering, algorithm and Fluid mechanics.

Biodegradability and life cycle analysis of biodiesel-to-diesel fuel mixtures (B10)

Migle Santaraite and Egle Sendzikiene
Vytautas Magnus University Agriculture Academy, Lithuania

The enzyme-catalyzed *in situ* transesterification process was used to produce biodiesel-to-diesel (B10) fuel mixtures. Biodiesel has been synthesized from rapeseed, the oil of which is high in free fatty acids, and is therefore known as poor quality. The biocatalyst used for the reaction, lipase – lipozyme TL IM (*Thermomyces lanuginosus*). Three fuel mixtures were made, consisting of 90 % of diesel, and 10 % of rapeseed oil methyl, ethyl, or butyl esters. The basic conditions of the production process of these fuel mixtures were optimized. The purpose of the study was to determine how the biodegradability of fuel mixtures is improved compared to the degree of biodegradation of diesel. Biodegradation was assessed according to the OECD 301 F methodology "Manometric Respirometry" (assessment of oxygen consumption). After 28 days, pure diesel biodegrades to 20.64 %. The results showed that almost 2 times faster biodegradable are fuel mixtures containing rapeseed oil methyl esters (37.27 %). Fuel mixtures containing of 10 % of rapeseed oil ethyl esters and rapeseed oil butyl esters improved biodegradations by 2.94 % and 2.27 %, respectively. This is due to the shorter methanol radical chain compared to ethanol and butanol esters. All fuel mixtures were evaluated according to the life cycle assessment using the CML-IA baseline V 3.02/EU 25 method at SimaPro software. 10 environmental impact categories have been assessed, such as: global warming, eutrophication, acidification, ozone layer depletion, and so on. The environmental impact was compared to that of pure diesel impacts. Fuel mixtures containing of 10 % of biodiesel have possitive effect and reduced these negative environmental impacts.

Keywords: Diesel, biodegradation, biodiesel, in situ transesterification, life cycle assessment

Biography:

Migle Santaraite is a PhD student in Environmental Engineering in Vytautas Magnus University Agriculture Academy. Her field of study relates to the biodiesel-to-diesel fuel mixtures production by using in situ transesterification process and biocatalysts – lipases. Also the evaluation of physical and environmental properties of products obtained.

Dolomite as heterogeneous catalyst in biodiesel synthesis

Ieva Gaide and Violeta Makareviciene
Vytautas Magnus University Agriculture Academy, Lithuania

The limited reserve of fossil fuels prompts the consideration of alternative fuels from renewables. Most renewables do have environmental advantages over the conventional fuels, such as greenhouse gas and pollution reduction. Biodiesel is a mixture of fatty acid and short-chain alcohol esters, and it is obtained from a transesterification process that uses either vegetable or animal fats, an alcohol and a catalyst. In the present work, we investigated optimum conditions for biodiesel synthesis from rapeseed oil and buthanol using dolomite as a heterogeneous catalyst. Firstly optimum conditions for dolomite preparation was studied. Optimum dolomite fraction size was obtained 0.315–0.1 mm and calcination temperature 850 °C was used to convert CaCO3 and MgCO3 to CaO and MgO, content of oxides in dolomite were investigated. It was obtained that dolomite which we used for rapeseed oil transesterification contained 29.3% of CaO and 19.1% of MgO. Transesterification tests were conducted in a conical flask, which was connected to a condenser, a thermometer with a temperature controller and a mixer (at a constant mixing speed of 350 min–1). Response surface methodology central composite design (CCD) was employed to determine the optimal reaction conditions. The two optimum conditions of transesterification process were obtained. In both cases the optimum reaction duration – 8 hours and the optimum reaction temperature – 110 °C, in one case the molar ratio of methanol to oil – 13.72:1 and the catalyst amount – 5.24 wt%, in another case the molar ratio of methanol to oil – 10.02:1 is enough and the catalyst amount should be – 6.59 wt%. The ester yield obtained was 94.55%.

Keywords: heterogeneous catalysis, dolomite, biodiesel, butanol

Biography:

Ieva Gaide is PhD student in Environmental Engineering in Vytautas Magnus University Agriculture Academy. Her field of study is related to the heterogeneous synthesis of biodiesel using natural rocks as heterogeneous catalysts.

Optimizing of Yttria Modifier for Hydrogen Production over Zirconia-Supported Nickel Catalyst via Dry Reforming of Methane

Abdulrahman N. Kurdi, Anis H. Fakeeha, Ahmed S. Al-fatesh, Ahmed A. Ibrahim, Ahmed E. Abasaeed,
King Saud Universtiy, Saudi Arabia

The worldwide high concern with the environment has urged to search for harmless fuel instead of fossil-based fuels to fulfill the energy demands. The process of dry reforming methane has been established as a method for utilizing carbon dioxide and methane and generating synthesis gas, composed of H2 and CO in a 1:1 molar ratio. The eventually produced H2, after its separation from CO, can be utilized in various petrochemical industries or as a source of energy source. However, DRM suffers from coke deposition and sintering of the nickel active catalyst, which suppresses the catalytic performance and reduces the catalyst's life. Modified mesoporous support on nickel was tested as a viable solution. Thus, the catalytic performance of zirconia supported Ni-based catalyst with the addition of various amounts of yttria modifier was investigated. The Ni was loaded over a mixture of ZrO2 and Y2O3 via the wet impregnation method. Catalysts having 0.0, 5.0, 10.0, 15.0, and 20.0 wt/wt% loadings were prepared.The catalysts were then dried at 120°C and finally were calcined at 700°C for three hours. The crystalline phases of the catalysts were identified by X-ray powder diffraction. The specific surface area and porosity of the catalysts were assessed by nitrogen physisorption. Textural properties of the catalysts were also explored by H2-TPR for investigating the reducibility and the interaction between Ni, Zr, and Y oxides. The surface basicity was studied using CO2-TPD. It was found that 15% Y2O3 enhanced the catalytic conversions of both CO2 and CH4 to 71.8% and 63.5% respectively. The catalytic improvement could be linked to the increase of catalyst surface basicity by Y2O3 modifier, which enhanced subsequently the adsorption of CO2.

Keywords: Dry reforming of methane, Nickel-based catalyst, zirconia support, yttria modifier

Biography:

Mr. Abdulrahman N. Kurdi obtained his B.Sc. degree in chemistry from Taibah University in 2015. Immediately, he worked for "Chem Club" at his university. He expanded his experience by working in the water analysis laboratory of Saudi Binladin Group for three months. He joined Bournemouth University for English classes for a year. Afterwards, he joined the reneawable Energy Master program at King Saud University, where he is doing his research in dry reforming of methane as a tool for hydrogen production.

Application of cleaner energy to enhance oil production using magnets and nanoparticles at optimum concentration

Farida Amrouche, Sina Rezaei Gomari, Meez Islam, Donglai Xu
Teesside University, United Kingdom

There is extensive growing research in using environmentally friendly methods to enhance oil recovery (EOR) from mature reservoirs. In this work, a new study using the combined effect of a magnetic field and nanoparticles (NPs) on oil-wet carbonate reservoirs is investigated. To investigate the effect of magnetic field and aluminium oxide and iron oxide nanoparticles (NPs) on oil recovery based on measurements of contact angle, rock surface charge, and surface tension. To conduct spontaneous imbibition experiments, Amott cells with a surrounding magnetic belt up to 6000 G strength was used. In oil-wet cores with an exceptionally low recovery factor (RF) of 2,73% when samples imbibed by deionized water, adding alumina to magnets led to a substantial increased in incremental RF of 14,7%. However, changing the displacement fluid from deionized water to seawater led to a lower recovery of 9.2% from alumina, which can be attributed to poor dispersion of alumina NPs. The addition of iron oxide NPs to the displacement fluid in the presence of magnets also resulted in higher recovery factors, with increases of 22.27 % and 12.78 % observed for deionized water and seawater respectively. Moreover, aluminum oxide and iron oxide NP concentrations were decreased by factors 40 and 5 relative to previous studies respectively. This technique therefore offers oil industry a cleaner EOR, helps the oil industry to maximize oil production by magnets with the lowest chemical usage and eventually increases revenues in the long term (Amrouche et al., 2021).

Keywords: carbonate rock, enhanced oil recovery, zeta potential, contact angle, surface tension

Biography:

Farida Amrouche has a background in chemical engineering and aeronautical engineering. Farida is a chemical engineering researcher, and a member of the editorial board for the International Journal of Petroleum Technology. Farida is a regular reviewer for the International Journal of Astronautics and Aeronautical Engineering and reviewer for the International Conference on Hydraulic Engineering and Smart Application. She has published several papers in well-known journals, such as the Journal of Cleaner Production, Energy and Fuels and Energies.

Sensitivity of the Moroccan mix to the integration of Thermal and Battery Storage combined with Concentrated Solar Power and Photovoltaics: Design, Dispatch and Optimal Mix Analysis

Ayat-Allah Bouramdane, Alexis Tantet, Philippe Drobinski
Dynamic Meteorology Laboratory of School Polytechnic, France

Concentrated Solar Power (CSP) can shift electricity over time using cheap Thermal Energy Storage (TES). However, the cost of CSP is still high. Conversely, the cost of Photovoltaic (PV) systems have fallen. However, the Battery Energy Storage (BES) used to mitigate the generation variability is uneconomical to utilize as a grid-scale storage. Moreover, in order to increase the operating hours of both solar technologies, one has to increase both TES capacity and CSP solar field compared to the electricity-generating turbine, as measured by the Solar Multiple (SM), and increase the BES capacity and PV module size relative to a fixed inverter capacity, as measured by the Inverter Loading Ratio (ILR). This increase the investment costs although the Levelized Cost of Electricity (LCOE)tends to be lowered by the higher capacity factor (CF). These differences between solar technologies must be accounted when designing an optimal prospective power supply system based on renewable energies (RE). Particularly, the utilization of CSP and PV with storage is widely suggested within the Moroccan strategy that aims at deploying 20% of its electrical capacity from solar energy by 2030. However, the share between PV and CSP and the amount of storage associated is still to be found.

This study discuss objectively scenarios for solar integration in the electricity mix by evaluating the impact of rental cost and storage of CSP and PV on the optimal mixes together with the role of time-space complementarity in reducing the adequacy risk. To do so, we simulate hourly CFs and load curves adjusted to observations for the four Moroccan electrical zones. Our objective is to maximize the RE penetration and minimize the imbalances between RE production and consumption. This bi-objective optimization problem is implemented in the E4CLIM modeling platform. We analyze mixes along Pareto fronts using the Mean-Variance approach in which the total cost of a mix is constrained to be lower than that of the actual 2018 mix. We find that wind gains a higher shares compared to solar technologies because wind is regular on average which involves less capacity to install. However, at low penetrations, the addition of TES to CSP decreases the risk - the more as SM is increased keeping the mean CF fixed - which makes CSP less variable than wind and favors its installation compared to PV. To prevent reaching the maximum-cost sooner at high penetrations, the share of CSP decreases compared to PV and wind. However, the larger the ILR, the larger the share of PV compared to wind and CSP-TES, particularly for SM<4 and CSP tends to replace PV with high ILRs at high penetrations. We also show that a strong RE variability reduction is achieved through spatial diversification and by taking into account correlations between PV and CSP capacities, but less so as the surplus of energy available for TES and BES is increased.

Keywords: renewable energy, concentrating solar power, photovoltaics, storage, electricity mix, Morocco.

Reference: [1]: Bouramdane, A.-A.; Tantet, A.; Drobinski, P. Adequacy of Renewable Energy Mixes with Concentrated Solar Power and Photovoltaic in Morocco: Impact of Thermal Storage and Cost. *Energies* 2020, 13, 5087.

Biography:

Ayat-Allah Bouramdane completed her Engineer's degree in Energy at the School of Energy Engineering of the International University of Rabat (UIR), in 2017, in Morocco, with thesis on the implementation of different structure of hybrid systems in different regions of Morocco at the Green Energy Park platform of the Research Institute for Solar Energy and New Energies (IRESEN). In 2016, Ayat-Allah had the opportunity to participate in an exchange program where she spent six months at the European School of Materials Engineering (EEIGM) and National School of Electricity and Mechanics (ENSEM) of the University of Lorraine in Nancy, France. Then, in 2018, Ayat-Allah completed her master in Energy & Environment: Science Technology & Management «STEEM » at Ecole Polytechnique in Palaiseau (Paris), France, with a thesis on the operation of photovoltaic power plants: Data processing & analysis, modeling and faults diagnosis at GeePs - Group of electrical engineering – Paris of Centrale Supelec. These experiences inspired Ayat-Allah to contribute to a transition towards a greener future. Ayat-Allah is currently PhD student at the Laboratory of Dynamic Meteorology of Ecole Polytechnique (Palaiseau, France). Her research interests lie in the fields of renewable energies and climate change.

Magnetic Reconnection

Somaye Sabri
Somaye Sabri

Interaction of magnetohydrodynamic (MHD) waves with solar atmospheric plasma structures provides insight in the energy transfer mechanisms especially magnetic reconnection. Magnetic reconnection is a key process in space physics especially in the fast evolution of solar flares, coronal jets and in the magnetosphere of Earth. It should be noted that, even when the magnetic reconnection occurs inside relatively small spatial regions, the related changes in the magnetic field topology can substantially affect the evolution and dynamics of the entire system. During magnetic reconnection, a large amount of magentic energy releases and converts to kinetic energy and so on. The sun's corona, with its strong magnetic fields and hot plasma provides the perfect conditions for magnetic reconnection to occur. I try to pursue the behavior of magnetoacoustic waves around the magnetic null point. Interaction of MHD waves with this magnetic structure is inevitable so is arguably a fundamental plasma process in the solar, stellar and also Earth atmosphere. My study deals with the causes and properties of magnetic reconnection and its following effects on plasma heating and coronal jets that impresses our lives on the Earth.

Keywords: writing, template, sixth, edition, self-discipline, good (maximum 6 words)

Biography:

Somaye Sabri was born and bred in Tabriz, Iran. She studied Physics/ Astronomy and graduated her PhD course two years ago. She has been working as Postdoctoral Researcher at the University of Tabriz. During her PhD course, she had an opportunity to be in Leuven/ Belgium in Prof. Dr. Stefaan Poedts team for 6 months.

Biohydrogen production from coffee waste: overcoming challenges through bioprospecting, pretreatment, and optimization

Alejandra Carolina Villa Montoya[ab], Raissa Cristina da Silva Mazareli[b], Edson Luiz Silva[b], Maria Bernadete Amâncio Varesche[b]

Antioquia Institute of Technology / Medellín-Colombia and University of São Paulo/ São Carlos-Brazil

Coffee waste from post-harvest processing contains high carbohydrate content and autochthonous microorganism which can be used in biofuel production. The objective of this study was to screen the factors that affect H2 production from coffee waste, focusing on the bioprospection of a consortium of bacteria and fungi, selection of pretreated conditions in a hydrothermal reactor, optimization of hydrogen production, and taxonomic and functional characterization of the microbial community. Multifactorial experimental designs and response surface were applied to evaluate the effects of pH (4.0-7.0), temperature (30-50°C), agitation (0-180 rpm), headspace (50-70%), percentage of bioaugmentation (without microbial consortium up to 20%), concentration of coffee pulp and husk (2-6 g/L), coffee processing wastewater (7-30 gCOD/L) and yeast extract (0-2 g/L). Husk/pulp hydrothermal pretreatment with a severity between 3.2 and 4.2 and co-digestion of coffee waste (wastewater, pulp and husk, pulp and husk pretreated in the hydrothermal system, and liquid fraction from pretreatment) were studied. Autochthonous consortium (bacteria and fungi) was selected from the waste and the taxonomic and functional profile were analyzed. Hydrothermal pretreatment of 180°C for 15 min and waste co-digestion improved up to 7 times the H2 production when compared to in natura waste. In the optimized reactor were observed Clostridium (87.9%), Lactobacillus (1.7%), Kazachstania (18.6%), and Saccharomyces (16.3%) with genes related to lignin, phenol, cellulose, lignocellulose, and pectin degradation, as well as the production of organic acids, alcohols, and H2. Conditions for maximal hydrogen production of 3.04 LH2/Ld were at a pH 7.0, 7 g/L pulp and husk, and 30% headspace. In conclusion, the application of multifactorial design studies, bioprospection of microorganisms from waste, and pretreatment of lignocellulosic biomass are prominent tools for overcoming challenges of biohydrogen production from agricultural waste such as the coffee industry.

Keywords: codigestion, hydrothermal pretreatmet, metagenomic, microbial consortium, multifactorial design.

Biography:

Alejandra V. Montoya is a microbiologist (Universidad de Antioquia, Colombia), with MSc in Agricultural Microbiology (Universidade Estadual Paulista, UNESP, Brazil) and Ph.D in Sciences emphasized in Sanitary Engineering (Universidade de São Paulo, USP, Brazil). She is currently a Professor and researcher at Tecnológico de Antioquia, Colombia. Her research experience has focused on topics related to the biological production of hydrogen and methane, wastewater treatment, lignocellulosic waste, characterization of microbiomes using molecular tools, the microbiology of aerobic and anaerobic systems, and degradation of inhibitory and toxic compounds.

NOTE:

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