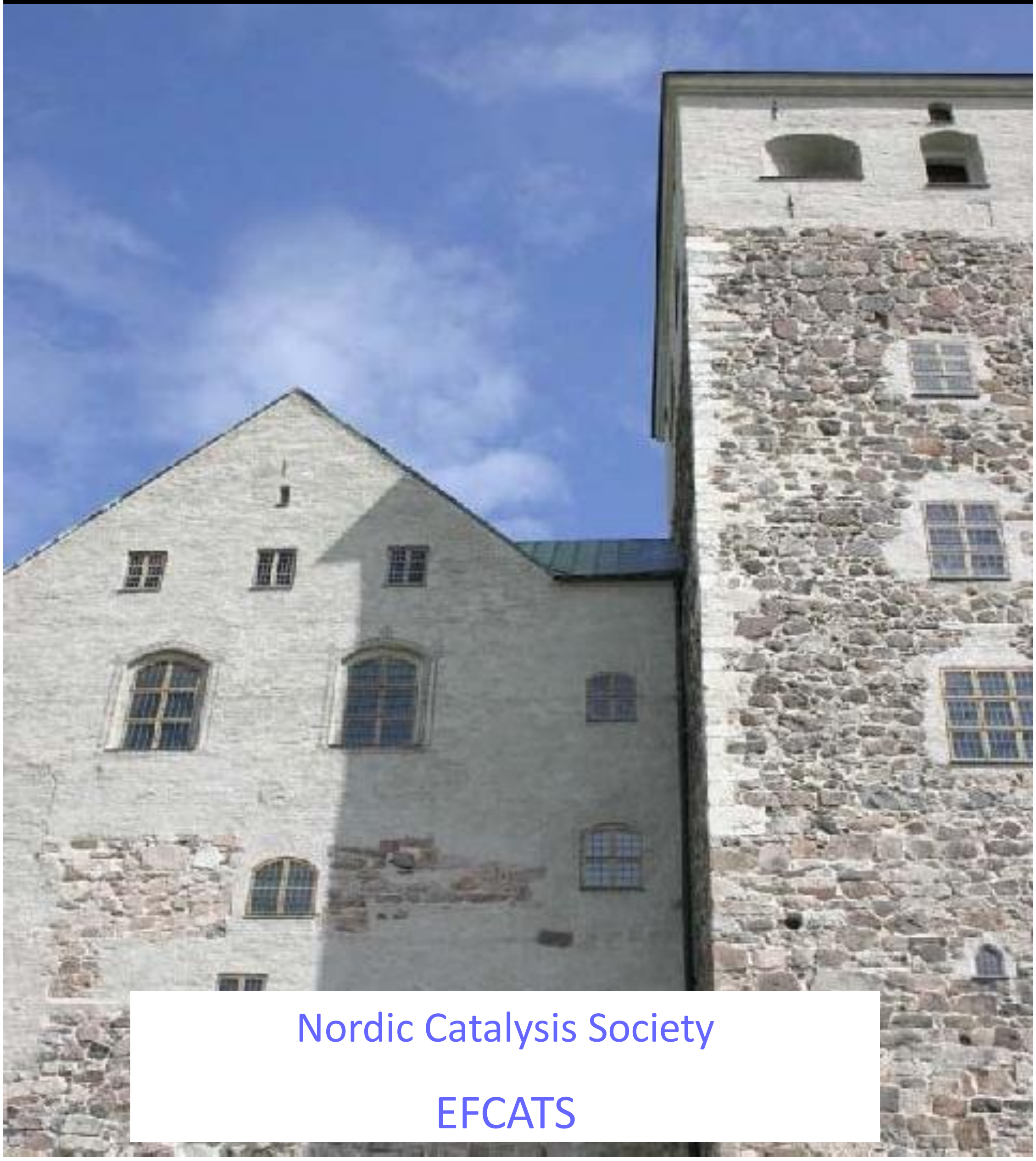
EUROPACAT VIII

26-31 AUGUST
TURKU/ÅBO
FINLAND 2007

EXHIBITION BROCHURE



Nordic Catalysis Society

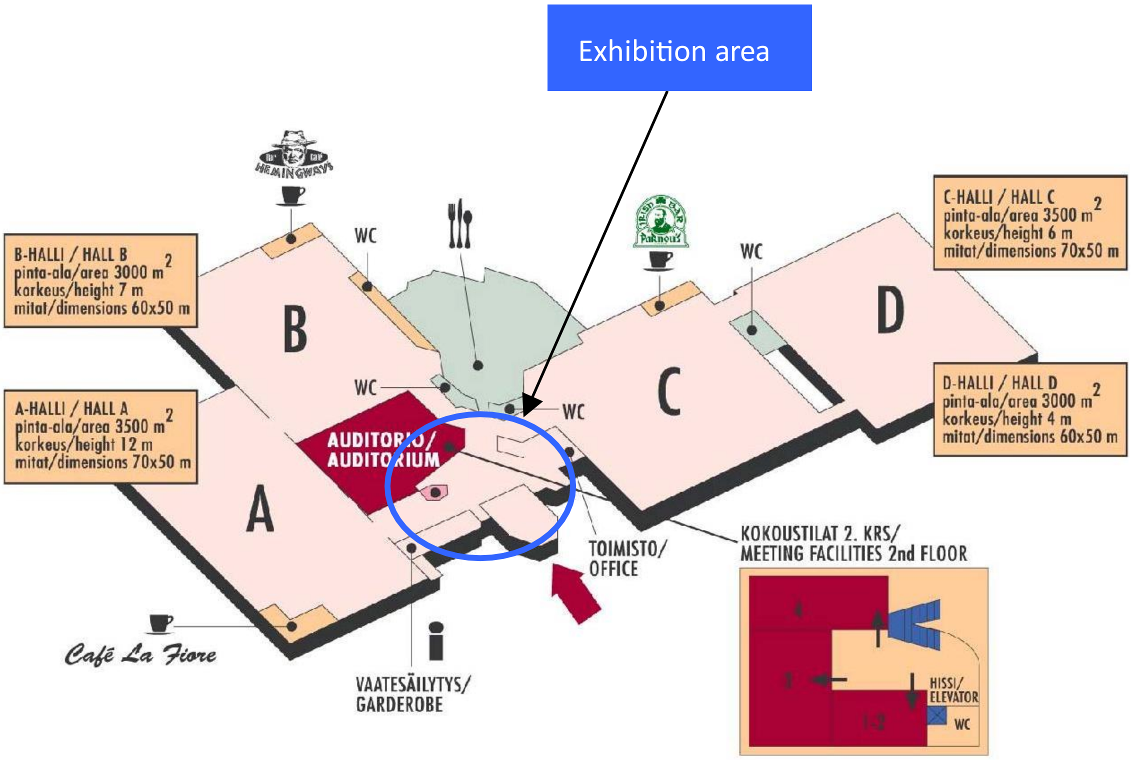
EFCATS

DATE AND VENUE OF THE EXHIBITION

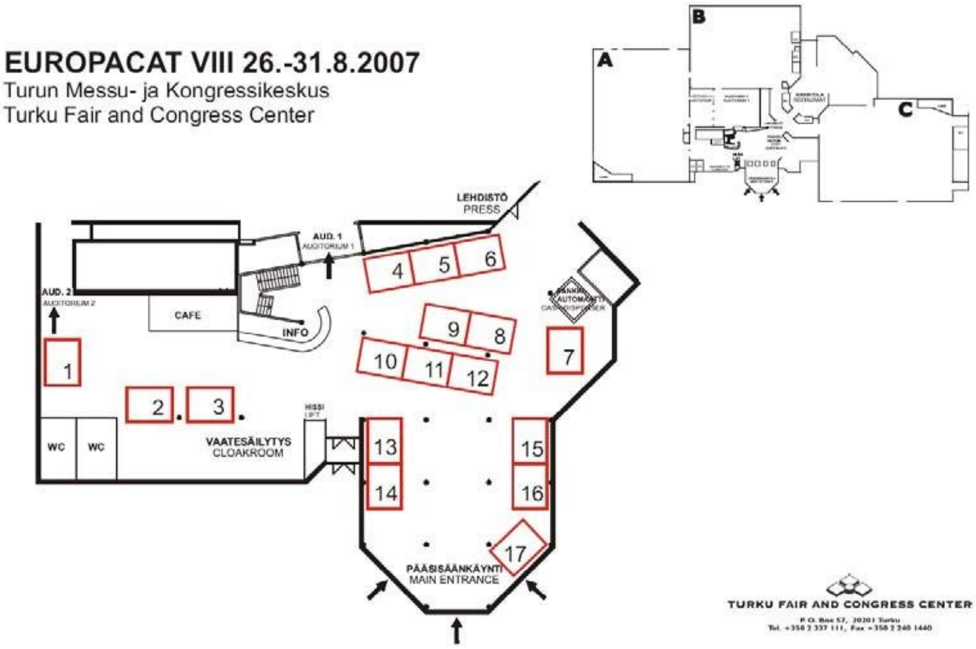
The exhibition of the EUROPACAT VIII congress will take place on 27 to 31 August 2007 at the Turku Fair and Congress Center. The exhibition will be open during the congress hours (Monday to Friday). The address of the Congress Center is:

Turku Fair and Congress Center
Messukentänkatu 9-13
P.O. Box 57
FI-20210 TURKU, FINLAND
Phone: +358 2 337 111
Fax: +358 2 240 1440
info@turunmessukeskus.fi
www.turunmessukeskus.fi

The location of the Exhibition is situated in the Main Aula of the Congress Center as shown in the floor plan:



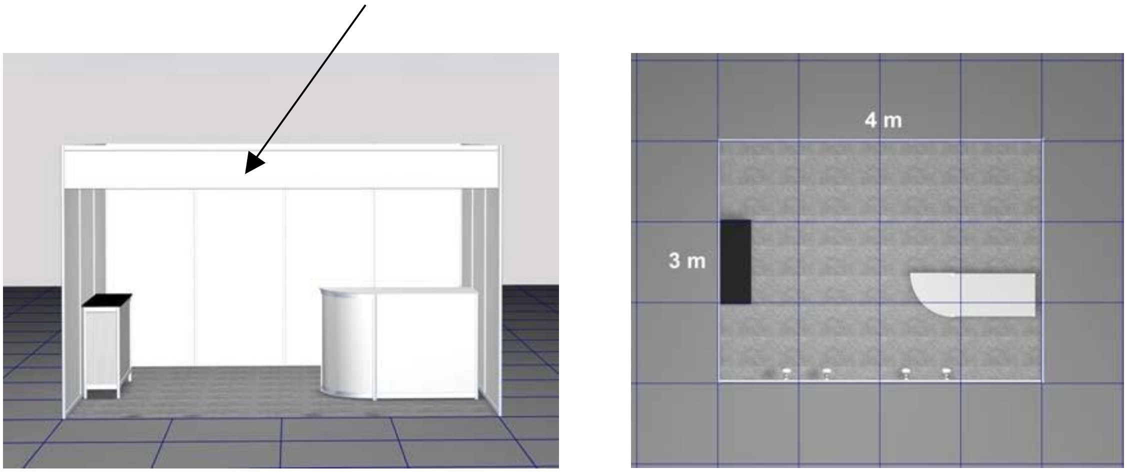
The preliminary setups of the stands are scheduled as shown in the schematic drawing below. Additional stands will be mounted if needed. The reservation of the stands will be based on the “first come, first served” principle, i.e. according to the date of receipt of the signed exhibition contract.



STANDS

The size of a standard exhibition stand is 12 m^2 (3 x 4 m, height 2.5 m). The basic setup includes:

1 Information desk (height 105 cm, top board size 150 x 50 cm)
1 Cabinet (height 90 cm, top board size 95 x 45 cm)
1 Light element (4 halogen spotlights)
1 Electrical wall socket (3 outlets, 230 V)
1 Carpet (3 x 4 m)


Size: 4 x 0.29 m

Basic setup of the stand

Prices

The price for the basic setup is 850 € (22 % VAT included). For additional furniture, the prices are as follows (22 % VAT included):

Bar chair:	41 €
Chair:	6 €
Cabinet (height 90 cm, top board size 95 x 45 cm, max. load 100 kg):	56 €
Table (board size 70 x 70 cm, max. load 100 kg):	30 €
Table (board size 120 x 70 cm, max. load 100 kg):	31 €
Brochure stand:	42 €






Bar chair Chair Cabinet Table 70x70 cm Table 120x70

cm Brochure stand

If you have other requirements we can fulfil them to an additional cost. For more information and to get an offer for your requirements, please contact:

Fair Service, Ms. Seija Partanen
Turku Fair and Congress Center
Messukentänkatu 9-13, P.O. Box 57
FI-20210 TURKU, FINLAND
Phone: +358 2 337 1310, Fax: +358 2 240 1440
E-mail: Seija.Partanen@turunmessukeskus.fi

BUILD-UP AND DISMANTLING OF STANDS

Build–up:

The stands (walls etc.) will be built by the staff at Turku Fair and Congress Center and will be ready by 24 August 2007. You can set up your things, instruments etc. during:

Sunday 26 August 2007 (10.00 - 17.00)

Dismantling:

Friday 31 August 2007 (13.00 - 18.00)

RESTAURANT AND CAFÉ FACILITIES

One can arrange stand-related catering through Restel Ravintolat Oy, which takes care of restaurant-based functions within the indoor facilities. In addition, hospitality lounges are available on special order. Unfortunately the Finnish alcohol law prohibits exhibitors to serve their own alcohol in the stand. If you want to serve alcohol, please contact the restaurant manager.

For additional information or to get an offer please contact:

Restaurant Manager Ms. Maarit Salovaara,
Phone + 358 400 882 887
E-mail: Maarit.Salovaara@restel.fi

DELIVERY OF GOODS

Each exhibitor delivers his products and goods to the Congress Center at his own expense and liability. The Congress organizer shall not bear responsibility for the reception, dismantling, storage or on-ward dispatch of goods. Ascertain beforehand when the goods are to be conveyed that the recipient is on the premises at that time. The staff of Turku Fair and Congress Center is unable to sign for goods received on your behalf. Goods should be delivered to the following address:

Turku Fair and Congress Center
(EUROPACAT VIII, Name of Exhibitor, Stand no.)
Messukentänkatu 9 – 13
FI-20210 Turku, FINLAND

Local forwarding and customs clearance are handled by DHL Fairs & Events (Finland) Oy.

For additional information on this issue please contact:

Mr. Matti Turkia, phone +358 20 533 2255, E-mail: Matti.Turkia@dhl.com or

Ms. May Heikkinen, phone + 358 20 533 2247, E-mail: May.Heikkinen@dhl.com

INSURANCE

The exhibitor must insure the contents of their exhibit against damage, fire and theft. The organizer remits the costs of fair area fire protection, locks the indoor facilities for the night and looks after the general surveillance of the Congress Center, while not being held responsible for potential loss and damage of goods.

Fair-related liability insurance offers third-party coverage on damage caused to the organizer’s equipment and structures. The organizer’s liability insurance does not indemnify harm incurred to the exhibitor’s own equipment and structures; therefore, the exhibitor must arrange for such insurance as required himself (risk, fire, theft, etc.).

EXHIBITOR REGISTRATION

All stand personnel are **required to register and to pay registration fees**. The on-line registering starts 2007.

REGISTRATION FEES

Please select registration package 1 or 2.

PACKAGE 1 (WITHOUT LUNCHES)	
Ordinary participant	
until June 1, 2007	450 €
after June 1, 2007	550 €
PhD student	
until June 1, 2007	350 €
after June 1, 2007	400 €

Participation fees also covering lunches (Monday-Friday) are:

PACKAGE 2	
Ordinary participant	
until June 1, 2007	510 €
after June 1, 2007	610 €
PhD student	
until June 1, 2007	410 €
after June 1, 2007	460 €

On-site lunch tickets will be available.

The registration fee covers the attendance, the proceedings, welcome reception, concert in the Cathedral and coffee breaks.

EXHIBITION CONTRACT

A separate “Exhibition contract” has to be signed by both the Exhibitor and the Congress organisers. The “Exhibition Contract” form can be downloaded from:

http://www.europacat.org

Please fill in, sign and send the contract in two identical copies to:

EUROPACAT VIII/Dr. Kari Eränen
Åbo Akademi
Process Chemistry Centre
Biskopsgatan 8
FI-20500 Turku, Finland
E-mail: Kari.Eranen@abo.fi
Fax: +358 2 215 4479

PAYMENT

The Congress organiser will send you an invoice after the exhibition contract has been signed or as agreed separately.

VAT

Foreign businesses which are not liable to pay tax on sales in Finland and which do not have a permanent establishment in Finland may apply for a refund of the VAT included in the price of goods and services purchased in Finland. This concerns also fairs and exhibitions. For more information on this issue please read the instructions from the Finnish tax administration: http://www.vero.fi/nc/doc/download.asp?id=2846;239749. Links to the instructions as well as to the form “Application for refund of the value added tax” are found on the Congress web site:

http://www.europacat.org

CANCELLATION

Cancellations must be made in writing to:

EUROPACAT VIII/Dr. Kari Eränen Åbo
Akademi
Process Chemistry Centre Biskopsgatan 8
FI-20500 Turku, Finland Fax: +358
2 215 4479

Cancellations made before May 31 2007 will be refunded to 80 % of the paid amount (excluding bank transfer fees). After May 31 2007 no refunding is possible.

WELCOME TO TURKU!

Zeolite geopolymers are formulated using nano-sized colloids of combined metal oxides to provide a green alternative to concrete, brick and fiberglass. While suspended in an aqueous solution, CalAlSil™'s nano-colloids contain sufficient chemical potential to cure to solid structures with physical properties equal or better than standard concrete. This represents a great leap forward in ease of use of structural materials and the ability to produce composites with almost all other granulated materials establish CalAlSil™'s credentials as the green keystone formulation for the circular economy. CalAlSil™'s suspensions are produced using organic and organometallic complexing agents combined with aqueous alkali silicate solutions. Stable suspensions were produced with molar equivalent reactive oxides found in fly ash from black coal fired power stations, ball clay, aluminium trihydrate, and calcium hydroxide. Solutions may be hybridized with a number of biopolymers and standard resins including aqueous acrylic and siloxane suspensions, silicone oil, terpene resin, natural latex, poly lactic acid

and numerous polyethers.

CalAlSil™ non-combustible resins and hybridized resins can be used in a range of applications including as coatings to wood, concrete, masonry, steel, aluminum and medium–high energy plastics as well as combining resins in composites using a wide range of granulated and fibrous materials from almost any waste stream. CalAlSil™. The adhesion and cohesive strength of coatings and composites have been measured and compared with similar carbon and energy intensive materials currently in use. This new class of hybrid polymer between inorganic and organic materials provides the next step in materials development for the industrial and built environments.

Audience Take Away:

- CalAlSil™ will demonstrate how Silicate oligomers are the fundamental building blocks of future green keystone resins for the circular economy. CalAlSil™ represents the cornerstone of composite formation using a variety of waste streams.
- The primary message from this presentation is that there is a solution to the carbon and energy intensive building and construction industries' use of materials. Further when understood the green chemistry of hybridized silicates provide the basis for all future formulations for industrial and construction materials. No longer will a material need to be tested using a multitude of material specific standard test. The chemistry is difficult to resolve using analytical instruments in the suspended colloidal form. However, future collaboration may enhance research efforts by reacting standard solid surfaces with the colloids before using atomic force microscopy colloidal tip and microscopic spectroscopic techniques. CalAlSil™'s material design will provide the basis for future cost effective material use for vehicles, industrial equipment, construction and buildings.

Biography:

Dr. Leon Burgess-Dean is the creator of CalAlSil™. A management professional, innovator, chemist and materials engineer, Leon has over 20 years of experience in procurement management, technical, research and laboratory management of building products and construction materials facilities. In addition, Leon has specialist and extensive experience in developing solutions to difficult problems in construction, manufacturing and capital projects. Leon has a Bachelor of Applied Chemistry with honor which was followed by a Doctor of Philosophy in Materials Engineering and a Masters of Business Administration completed in 2005. Leon's expertise is in the complex chemical and material interactions between multi-component aqueous environments and heterogeneous brittle materials.

The increasing demands for energy consumption worldwide and environmental issues trigger the development of green, renewable energy sources. These demands can be potentially met by organic photovoltaics (OPV), which, in its turn, relies on design of individual building blocks of OPV devices. In this context, two novel concepts of an electrode buffer layer (EBL) materials are presented. The first concepts deals with a polymeric compound PDTON, which can be utilized as a ‘universal’ electrode (either for anode or cathode) buffer layer material. Depending on the preparation procedure, PDTON forms two kinds of nanospheres, serving as building blocks and defining the morphology and properties of the respective materials, which exhibit either hole transporting or reducing electrode work function properties. The second concept deals with a redesign of ZnO, serving usually as electron transport EBL. Establishing a new preparation route, we designed an ultrathin, water-resistant and p-type-like conducting ZnO film serving as a hole transport EBL, solving, thus, the problem of the OPV device stability and making ZnO a ‘universal’ EBL material, analogous to PDTON. Finally, we worked on optimization of organic electronic devices, specifically addressing the energy level alignment between the metal electrodes and adjacent organic semiconductor. For this purpose, we designed novel monomolecular interlayers with embedded dipolar groups. As an example of potential usefulness of this novel class of films in organic electronics, their application in organic field-effect transistors was demonstrated, resulting in decrease of the contact resistance by ca. three orders of magnitude accompanied by significant improvement in the performance and stability of the devices. The high potential of these transistors was highlighted by fabrication of functional electric circuits of their basis.

Audience Take Away:

- The audience will learn the basic principles of design of organic and perovskite solar cells as well as those of thin film organic transistors.
- The audience will be informed on the basis problem of modern organic photovoltaics and electronics.
- The audience will be provided with actual examples of nanoscale/molecular design of novel materials of three different types, viz. polymers, solid state materials and monomolecular films.

Biography:

Michael Zharnikov has received a Master degree (with honor) in Solid State Physics from the Moscow Engineer-Physical Institute in 1981. Afterwards he worked in RSC Kurchatov Institute in Moscow, receiving PhD degree in Experimental Physics in 1989. After 2 post-doctoral stints at the Technical University Munich (1991-1994) and Max-Planck Institute for Mikrostrukturphysik in Halle/Saale (1994-1996), Zharnikov joined the Heidelberg University and become Prof. apl. in 2008. He has published 324 research articles, which have attracted over 9700 citations with a h-index of 50. He also obtained 2 patents and gave over 160 lectures, including 68 invited/keynote/plenary talks at various conferences.

The Tomakomai CCS Demonstration Project was launched in FY2012 by the Ministry of Economy, Trade and Industry (METI), aiming for the practical use of CCS in Japan around 2020. Between FY2012 to FY2017, the project was commissioned to Japan CCS Co, Ltd (JCCS) by METI, and from FY2018, the project has been commissioned by the New

Energy and Industrial Technology Development Organization (NEDO).

CO2 injection was started on April 6, 2016, and on November 22, 2019, the target of 300,000 tonnes of cumulative injection was achieved. The injection has been terminated, whereas monitoring operations are being continued.

The features of the project are summarized below.

- The CO2 containing gas is extracted from a Hydrogen Production Unit (HPU) of an existing petroleum refinery and delivered from downstream of PSA (Pressure Swing Adsorption) of HPU to the capture facilities located outside the refinery boundary via a 1,400m pipeline.

- The CO2 capture, compression and injection activities as well as monitoring of the injected CO2 can be controlled at one location, and the CO2 rate is 25.33 tonnes per hour.

- The PSA off-gas is treated by an activated alkanol amine solution to capture the CO2, which is compressed and injected into two offshore sub-seabed reservoirs by two separate deviated injection wells. The injection well for the shallow reservoir has a vertical depth of 1,188m and horizontal reach of 3,058m, whereas the well for the deep reservoir has a vertical depth of 2,753m and horizontal reach of 4,346m.

An objective of the project was to demonstrate the low heat energy consumption of the CO2 capture process, because the cost of heat energy consumption dominates the OPEX of a CCS project. JCCS conducted an evaluation of several existing processes as well as process configurations over two years, and consequently selected the OASE® process (licensed by BASF). The capture process is comprised of an Absorber, Stripper and Low-Pressure Flash Tower (LPFT). The Absorber has a dual function of bulk absorption (lower part) and lean absorption (upper part). This process is called "Two-stage absorption", whereby the rich amine solution from the bottom of the Absorber is sent to the LPFT where 60-70 % of the absorbed CO2 is flashed without direct heating, achieving a significant reduction in heat energy of the amine reboiler. The Tomakomai Two- stage absorption process achieved an average reboiler heat of 0.907GJ/t-CO2, which was approximately a 50-70 % reduction compared to one-stage absorption processes which require large amounts of heat ranging from 2 to 3 GJ/t-CO2. This result places the heat consumption for the Tomakomai CO2 capture process at the lowest level among operating CCS plants in the world. As a study to further reduce the amine reboiler heat, process simulation studies of an "innovative process layout" were executed. The overall flash effect could be increased by about 10% from the layout with LPFT alone, and the reboiler heat could be further reduced to 0.487 GJ/t-CO2.

Audience Take Away:

- Feasibility Study of Carbon dioxide Capture and Storage (CCS).
- Process selection for Pre-combustion CO2 Capture.
- Design of CO2 Capture Process using alkanol amine solution.
- Energy saving of CO2 Capture Process using alkanol amine solution.

Biography:

Mr. Takashi Sasaki is a regular member of the Society of Chemical Engineers, Japan and a Professional Engineer (Chemistry) of Japan. He was engaged in process engineering work for 38 years and was in charge of Front End Engineering (FEE) of chemical plants for synthesis gas generation and natural gas purification as General Manager of Process Dept. in a Japanese engineering company (JGC Corporation). He joined JCCS 12 years ago and had been involved in engineering management for FEE Design and Construction work of the Tomakomai CCS Demonstration Plant. He is currently engaged in operation data analysis of the demonstration plant.

on-thermal plasma can activate various molecules that are thermally difficult to activate at low (or ambient) temperatures. Recent advances in non-thermal plasma-enhanced catalysis has made it possible to conduct difficult reactions at ambient temperatures for activating molecules such as carbon dioxide (CO2) and sulphur dioxide (SO2). Integrating non- thermal plasma such as dielectric barrier discharge (DBD) plasma with heterogeneous catalysts can enable the conversion of CO2 to chemicals and fuels (C2+ hydrocarbons, or C2+ alcohols) with H2 or H2O. Such a DBD plasma-metal sulfide catalyst combination can also allow direct reduction of SO2 into elemental sulphur in a single stage at low temperature. On the other hand, determining the origin of the plasma–catalysis synergy and reaction mechanisms in non-thermal plasma-enhanced catalytic reactions remains challenging because complex processes take place when coupling plasma with heterogeneous catalysts. We have designed a probe reaction to decouple plasma-induced surface reactions from plasma-phase reactions in SO2 reduction to S. The qualitative and quantitative analyses reveal a new Eley-Rideal reaction between plasma-generated atomic hydrogen in the gas phase and strongly adsorbed SO2 over alumina, a reaction that is not thermally feasible. Both

catalytic advances and mechanistic insights will be discussed.

Audience Take Away:

- Recent advances in plasma-catalysis could allow people to find alternate ways to improve energy efficiency and tailor the reaction pathways in chemical processes.
- This keynote presentation could allow other researchers and (post)graduate research students to expand their research approach in catalysis, energy, CO2 conversion and chemical processing research.
- The new approaches presented provide a practical solution to longstanding problem of acid gas SO2 conversion to elemental sulfur and CO2 conversion to value-added products.
- Advances in this area could enable breakthroughs in plasma catalysis for energy, fuels and CO2 utilization.

Biography:

Dr. Chunshan Song is the Dean of Science and Professor of Chemistry at the Chinese University of Hong Kong and Distinguished Professor Emeritus at the Pennsylvania State University. He received a BS (1982) in chemical engineering from Dalian University of Technology, China, and PhD (1989) in applied chemistry from Osaka University, Japan. His research focuses on chemistry and catalysis for energy and fuels including adsorptive CO2 separation, catalytic CO2 conversion, plasma catalysis, adsorptive and catalytic fuel processing and catalytic materials. He has ~400 articles in refereed journals and received American Chemical Society's George Olah Award and Henry Storch Award.

Few successful semiconductors used in Organic Thin Film Transistors (OTFT) are pentacene, tetracene, Alq3. However, these traditional organic semiconductors are based on polycyclic aromatic hydrocarbons (PAHs) as precursors, with

a high toxic - carcinogenic potential during the technological processing. Therefore, we present in this work, OTFT with green compounds grafted on the Nano Core Shell (NCS) nanomaterials, appealing to green chemistry synthesis routes. For the experimental synthesis of semiconductor for OTFT, we consider ferrite nano-core with organic external shells: para- aminobenzoic acid (PABA) for p-type films and sulpho-salicilic acid (SSA) for n-type films. A review paper from 2015 classified all semiconductor oxides after their bandgap energy, TiO2 (EG=3.2eV), ZnO (EG=3.2eV), Fe3O4 (EG=2.2eV). So, the ferrite nanoparticles with minimum bandgap is an excellent candidate for optimum electronic conduction. The PABA molecules grafted to the external shell of ferrite nano-core shell (PABA-NCS) nanoparticles have been investigated by DLS, FT-IR, SEM, TEM, while the electrical measurements of transistors based on PABA-NCS films have assessed the potential use of this material in p-type organic semiconductor transistors. The synthesis of PABA-NCS nanoparticles is accomplished by the co-precipitation method, as reported in 2020. The fabrication of glass substrate / ITO / Polystyrene / PABA-NCS uses the dip coating technique. This structure has been immediatly operated as an electronic device, by placing two thin probes onto the top of PABA-NCS film, as the Source and Drain contacts, and ITO electrode as Gate contact, based on the pseudo- Metal-Oxide-Semiconductor (pseudo-MOS) transistor technique. The measured currents at VGS = -20V and VSD = 1V for three structures indicated the saturated drain current: 202nA, 14nA and 0,045nA, respectively for PABA-NCS-600nm, 400nm and 200nm. Another non-toxic organic compound, acting as donor of electrons, is Sulpho-Salicylic Acid (SSA). It can be attached to the external shell of ferrite nano-core (Fe3O4), providing SSA-NCS nanoparticles, by self-assembling technique. Our equation provides the electrons mobility of µn,sat = 0.45cm2/Vs in this OTFT biased to VG = 10V and VDS > Vdsat. This value is superior than µn,sat = 0.054cm2/Vs, in n-film OTFT with Pentacene, reported elsewhere. A short discussion concerns the low toxicity of the SSA-NCS compound. By degradation ferrite can generate Fe+, O- ions, usually encountered in human body and environment. The lethal dose LD50 for SSA was established to 700 mg/kg, while LD50 of PAH (like benzo[k] fluoranthene) is 14 µg/kg. On the other hand, the SSA precursor is the salicylic acid, a veritable green compound that acts as plant hormone or vascular drug.

Audience Take Away:

- Explain how the audience will be able to use what they learn? - The audience will be able to contemplate to use traditional organic semiconductors with toxic PAH precursors or not. We start to demonstrate that PABA-NCS and SSA-NCS are green nanomaterials suitable for OTFT.

- Is this research that other faculty could use to expand their research or teaching? Does this provide a practical solution to a problem that could simplify or make a designer’s job more efficient? The audience will be able to use our ideas to develop clean technologies for organic electronics. The simple techniques like dip coating or co-precipitation - are easily to be implemented in faculties labs, too.

- Will it improve the accuracy of a design? Main benefits consist in cheap technology at room temperature and non-toxic OTFT technologies for employers in factories and for students in faculties.

Biography:

Prof. C. Ravariu studied Microelectronics at the Polytechnic University of Bucharest, Romania and graduated as MS in 1993. He worked as scientific researcher first 5 years at Institute of Microtechnology, Bucharest, then joined the Polytechnic University of Bucharest. After multiple foreign stages in Bioelectronics (Patras, Greece), Nano-devices (EPFL, Switzerland), Organic Electronics (LAAS, France), he received PostDoc degree in 2012 in Romania. Since 2013, he obtained the position of Full Professor at the Polytechnic University of Bucharest, Faculty of Electronics, Romania. He has published more than 250 research articles. Since 2014, he is Chairman of the Romanian IEEE Electron Devices Chapter.

A series of 9H-fluorenols and 9H, 9’H-bifluorenyls were irradiated in less polar solvents giving photoproducts derived from their corresponding 9H-fluorenyl radicals. These transient species were directly observed by laser flash photolysis

and their UV/visible spectra compared to those of their corresponding cations. Theoretical calculations (DFT) of these intermediates indicate their destabilizing nature in similar fashion to the antiaromatic character of the corresponding cations.

Audience Take Away:

- The concept of Photochemistry and equipment used.
- The nature of reactive intermediates and how they are useful in understanding mechanisms.
- Substituent effects in predicting stabilities of intermediates.

Biography:

Edward Lee-Ruff is a full Professor at York University since 1969. He obtained B.Sc. and Ph.D. degrees from McGill University. He is NRC Post-Doctoral Fellow Columbia University under Professor Nick Turro and he is a Fellow of Chemical Institute of Canada. He is a Consultant for patent attorneys in drug litigation cases. He is involved in outreach public presentations on brand name vs generic pharmaceutical products. His research interests include Photochemistry, Mechanisms and Organic Synthesis. He has over 130 publications and 2 patents.

In this conference, we would like to give you a short review and also show our current experiences on the development of adsorbents to remove nitrate from water. Starting material for the adsorbents is commercially available air stabilized polyacrylonitrile (PAN) fiber, namely PYROMEX. The PAN fiber contains as much as 20 wt-% nitrogen element in its structure. Some nitrogen species such as protonated amine (R-NH3+) and quaternary nitrogen (>N+=, N-Q) are expected to attract negatively charged nitrate ion (NO3-). Since higher temperature (500-1000°C) have to be used for activation reaction of the PAN fiber to develop pore structure, the amine groups will easily decomposed to ammonia (NH_3) gas. On the contrary, higher temperature is favourable to generate N-Q species; other type of nitrogen like pyrrole (N-5) and pyridine (N-6) will be converted to N-Q by just annealing above 800°C. The other essential factor required for adsorbent is porous properties of high specific surface area. Increasing surface area can be achieved by physical and chemical activations, but leading to decrease in nitrogen content during the activation process. Trial and error experiments demonstrated that zinc chloride ($ZnCl_2$) activation would be an appropriate method to develop porous structure with minimizing the loss of nitrogen element in the PAN structure. Optimum conditions of $ZnCl_2$/PYROMEX ratio and temperature profile for activation and annealing temperature are now investigated to maximize the adsorption capacity of nitrate. For the present, adsorption amount of 0.7-

0.8 mmol/g can be obtained and the value is about a half of maximum adsorption capacity of ion-exchange resin (HP555). Therefore we would like to discuss especially the preparation procedure (e.g.; temperature profiles) to develop porous structure without losing nitrogen content on the surface of resultant carbon adsorbents and other strategies for rise in nitrate adsorption capacity.

Audience Take Away:

- We can show you a possibility of carbon surface to uptake negatively charged ionic pollutants.
- Some audiences feel ion-exchange resin will be replaced with newly developed carbonaceous adsorbents in the near future.
- Carbonaceous materials will be one of the most important sustainable materials; nitrogen doped carbon can be used not only adsorbents but also applied as capacitors, etc.

Biography:

Motoi MACHIDA received Sc.B. degree from Hokkaido University, Sapporo, in 1983 studying on acid-base catalyst under Prof. Kozo Tanabe. He got his job at Idemitsu Co., Ltd., program on hydrotreating catalyst and received Ph.D. in 1998 under Prof. Hideshi Hattori. Then he moved to Chiba University as an associate professor in 2001 to develop adsorbents for water purification and promoted to professor in 2008. He stayed Laurentian University, Ontario, working with Dr. Luis Mercier on meso-porous silica in 2011. They are currently investigating the hetero-atom functionalized adsorbent surface. He has published more than 100 research articles.

Automotive catalysts compose of various kinds of metals and metal oxides. By using multi-scale theoretical method combined with three dimensional Kinetic Monte Carlo method, the sintering behavior of Pt can be explained by the

diffusions on support materials such as ceria, zirconia, and alumina.

Catalyst deactivation, the loss over time of catalytic activity is a problem of great and continuing concern in the practice of industrial catalytic processes. If the efficacies of designed catalysts could be expected and judged prior to a series of experiments and duration with time course, developing process is much earlier and efficiently processed. In this review, our original sintering dynamics simulator provides better understanding of macro-scale deactivation mechanisms.

Based on the micro scale quantum chemical calculations, bond strengths of support oxides and Pt-oxide of supports were investigated. Moreover, sintering simulations were carried out from modeled fresh catalysts referred by TEM microscopic data at 1073K. We investigated the Pt-oxide-support interaction on optimized geometries of Pt/γ-Al2O3 and Pt/CeO2. Pt-support interaction of Pt/CeO2 is much stronger than Pt/γ-Al2O3 represented as adsorption energies, Pt-O binding energies and bond populations. The time-evolution of the platinum dispersion along with support sintering within the three dimensional area, 0.1μm×0.2μm×0.2μm explains how Pt sintering differs on each support. Pt nanoparticles on the γ-Al2O3 support sintered significantly via agglomeration, whereas Pt supported on CeO2 does not sinter and remains almost same diameter as fresh condition. On the other hand, thermal stability of γ-Al2O3 and Pt/CeO2 is different, γ-Al2O3 decreased its specific surface in the rate of 15% and CeO2 decreased in the rate of 60%. This correlates with the binding energy of the oxygen-metal of supports.

Other than automotive catalysts, gradual voltage drop more than 20000 hours usage of high-temperature proton exchange membrane fuel cells was expected.

Audience Take Away:

- So far, sintering of automotive catalyst is solved by try-and error which takes enormous manpower costs. If we introduce theoretical aspects into the catalyst design, we can produce more durable catalyst.
- Break down analysis of gradual voltage drop of the high-temperature proton exchange membrane fuel cells explains the audience which kinds of reasons cause voltage drops during more than 20000 hours usage of high- temperature proton exchange membrane fuel cells.

Biography:

Ai Suzuki is Associate Professor at New Industry Creation Hatchery Center at Tohoku University. She computationally expected gradual voltage drop in long-term, more than 20000 hours usage of high-temperature proton exchange membrane fuel cells. Also, she analyzed the appropriate amount of polymer electrolyte in the polymer electrolyte membrane fuel cell by counting both electron and hydrogen cation flows. Further, she investigated the sintering behavior of Pt on various catalyst supports. Various types of Pt diffusions depending on support materials such as ceria, zirconia, and alumina were confirmed.

wharton's jelly (WJ) is considered a potential scaffold in tissue-engineered trachea for its similar composition and function to cartilage tissue. However, the feasibility of using WJ to construct engineered neocartilage tissue has

not been reported, let alone tubular tracheal cartilage regeneration and segmental tracheal lesion repair. Here, electrospun nanofibrous membranes composed of three different decellularized WJ matrix (DWJM)/poly(ε-caprolactone) (PCL) ratios (8:2, 5:5, and 2:8) are fabricated. The results demonstrate improved degradation speed, absorption, and cell adhesion capacity but weakened mechanical properties with increased DWJM content, but satisfactory homogeneous cartilage regeneration is only achieved in the DWJM/PCL (8:2) group after 12 weeks in vivo culture. Furthermore, homogeneous, 3D, tubular, trachea-shaped cartilage is constructed with a controllable lumen diameter and wall thickness based on the 2D nanofibrous membrane using a modified sandwich model, in which the chondrocyte-membrane construct is rolled around a silicon tube. Most importantly, by combining the above schemes with previously established vascularization and epithelialization techniques, chondrification, vascularization, and epithelialization are achieved simultaneously thus realizing long-term (6 months) circumferential tracheal lesion repair in a rabbit model with a biological structure and function similar to that of native trachea, representing a promising approach for the clinical application of tracheal tissue engineering.

Audience Take Away:

- Wharton’s jelly (WJ) is a suitable native-derived scaffold for cartilage tissue engineering.
- Electrospun nanofibrous membranes composed of three different decellularized WJ matrix (DWJM)/poly(ε-caprolactone) (PCL) could be used for tracheal regeneration.
- By combining the engineered trachea with previously established vascularization and epithelialization techniques, chondrification, vascularization, and epithelialization are achieved simultaneously thus realizing long-term (6 months) circumferential tracheal lesion repair in a rabbit model with a biological structure and function similar to that of native trachea.

Biography:

Yong Xu received his MCs degree from the Department of Thoracic Surgery, Shanghai Pulmonary Hospital, Tongji University School of Medicine in 2018. Now he is continuing to study for a PhD degree in the Department of Thoracic Surgery, Shanghai Pulmonary Hospital, Tongji University School of Medicine. His research interests focus on cartilage regenerative biomaterials and functional tracheal reconstruction.

The principles of process intensification if used on existing processes can lead to development and redesign of existing processes to become more sustainable. This presentation will discuss a process and an adsorbent for the separation of ethanol associated oxygenates from a dilute mixture of ethanol and associated oxygenates in water in the presence of organic compounds derived from a biofermentation process. After pretreatment, the separation is carried out in a simulated moving bed adsorption system employing a stationary phase adsorbent comprising fluorinated carbon or modified C18 silica gel selective for the adsorption of ethanol and associated oxygenates, such as 2,3-butanediol, with a mobile phase desorbent selected from the group consisting of methanol,

ethanol, propanol, and methyl tertiary butyl ether. The process is useful for removing water from dilute aqueous mixtures of organic compounds comprising ethanol in dilute concentration in water and produced by fermentation, biomass extraction, biocatalytic, and enzymatic processes which are not economically recoverable

by conventional distillation methods.

Audience Take Away:

- The audience will learn about ways to achieve process intensification in the industry using simulated moving bed technology (SMB).
- SMB is replacing traditional distillation unit operation in this particular invention outlined.
- This technology outlines an excellent way to capture CO2 by capturing flue gas from power plant exhaust and converting it to ethanol or butanediol. The ethanol and butanediol from the dilute fermentation broth can only be extracted using the unique SMB setup since the traditional distillation rout for ethanol/BDO extraction would not be economical.

Biography:

Deepak Sharma is an experienced Senior Process Engineer presently working with Bayer in their Engineering and Technology division at their corporate office in St. Louis. Deepak is currently pursuing PMBA from Washington University in St. Louis before which he received his master's degree in chemical engineering from Illinois Institute of Technology, Chicago USA and bachelor's degree in chemical engineering from Thapar Institute of Engineering and Technology, Patiala, India. Deepak has about 14 years of work experience in the chemical industry in which he has demonstrated strong skills in process design, scale-up, manufacturing, optimization, purification, research and development and start-up. Deepak has conducted research on simulated moving bed technology to develop processes for the purification of sugars, active pharmaceutical ingredients, bio-fuels, fish oil etc. His research contributions have been recognized through granted process patents: US8704016B2; US20140179933A1; US8658845B2; US8802843B2. The processes developed in these patents have been commercialized and installed in New Zealand, Scotland, Italy, and USA. He has experience of successfully taking a process from lab scale to the manufacturing scale and supporting its operation thereafter. Deepak has worked on various projects including grass-root projects, expansion projects, and managed several Capital investment projects in the chemical industry.

Advanced oxidative processes based on visible light active photocatalysis are particularly promising for water treatment using solar energy. However, especially on large scale, the retrieval and recycling of semiconductor photocatalysts present formidable challenges. In this context, magnetic semiconductors that offer a means to achieve particle recovery, post- treatment is relevant. Herein a perovskite magnetic material, Aluminium Ferrite (AlFeO3) is systematically explored for water

treatment.

Here, AlFeO3 is prepared by the co-precipitation method and followed by the heat treatment process to obtain phase pure powder. The structural property of the as-prepared sample studied with X-Ray Diffraction shows the orthogonal phase formation of AlFeO3. Further, the phase purity and lattice parameters were calculated from Rietveld refinement analysis. The sample was subjected to material characterizations such as SEM, BET to identify the size, morphology, and surface area of the particles respectively. The bandgap of the material was found to be 2.0 eV using UV-Vis DRS. This evidently shows photocatalytic activity at the visible light range.

The photocatalytic efficiency of the material is tested with degradation of Rhodamine B and Methyl Orange, a hazardous cationic and anionic dyes using a Xenon lamp as the visible light (400-700 nm) source. The complete degradation of dye was observed in 180 minutes at static slurry condition. Then the photocatalyst separated using a bar magnet and the reusability of the material is tested. The obtained results show Aluminum ferrite is a promising material for textile wastewater treatment.

Audience Take Away:

- Advantage of perovskite metal oxide materials for photocatalytic application.
- Learn about AlFeO3 synthesis and the feasibility of large-scale production.
- Properties and photocatalytic efficiency of prepared AlFeO3 material.
- The degradation of organic pollutants by AlFeO3 in wastewater treatment.

Biography:

Ms. Bhuvanasundari is a Ph.D. student at IIT Madras, India. She graduated M.Sc. with a specialization in Material Science from Anna University, India. She joined the Applied Nanostructures Engineering and Nanochemistry (ANEN) research group of Dr. Tiju Thomas. Her area research includes materials engineering for photocatalysis, photocatalytic materials for wastewater treatment.

Our research is devoted to the electrochemical processes occurring during polarization by industrial alternating current with frequency of 50 Hz. The possibility of conducting targeted oxidation and reduction processes in the anode and cathode half-cycles of alternating current with the subsequent synthesis of a number of inorganic compounds is shown. Previously, it was considered impossible to purposefully carry out electrolysis under the action of alternating current and to obtain any compounds or substances, since the product obtained as a result of oxidation in the anode half-cycle would be reduced in the cathode half- cycle. As a result of our experiments, it was shown that during polarization with alternating current, the titanium electrode dissolves in aqueous acidic solutions. The discharge of hydrogen ions and partial reduction of the oxide film are possible in the cathode half-cycle. The surface of titanium, freed from the oxide film, is easily dissolved in acid by chemical reaction. The titanium electrode is electrochemically oxidized to form its ions in the anode half-cycle. It is established that after the polarization by alternating current in acidic aqueous solutions, the intensive dissolution of titanium

occurs.

In traditional electrolysis under the action of direct current, the titanium electrode does not dissolve anodically in aqueous solutions of inorganic acids, since an oxide film with semiconducting properties is formed on the metal surface during anodic polarization, and it passivates the electrode. In this regard, the established regularities of the dissolution of titanium in sulfuric acid and hydrochloric acid under alternating current polarization are new and promising. A number of methods for the production of chlorides, sulfates, hydroxides and titanium dioxide have been developed, which are widely used in engineering and industry. Titanium (IV) hydroxide is an active sorbent in the chemical industry, titanium (III) chloride and sulfate are reducing agents and also serve as starting products in the synthesis of other important titanium compounds. Titanium dioxide serves as the starting material for the production of its other compounds, as well as titanium metal. The regularities of dissolution of lead, copper, iron, zinc, chromium, tungsten, platinum, silver, gold and some other metals under the action of alternating current have been established. The dissolution processes of lead, titanium, iron and copper at bipolar connection of electrodes under the alternating current action of industrial frequency have been investigated. In this case, the productivity of electrolysis increases 1.5-2.5 times.

It is shown that during electrolysis under the action of alternating current, two half-cycles can be used simultaneously. This is achieved by the fact that two electrolyzers are connected to the circuit simultaneously and the electrodes are alternately dissolved in the anode half-cycle. The peculiarity of our research and their results is that the developed methods are simple in hardware design, they do not use current rectifiers, which are first, expensive, and second, cumbersome in industrial conditions. The processes take place at room temperature. Metal scrap (shavings, pieces, scraps) can be used as electrodes.The conducted research makes a significant contribution to the theory and practice of electrochemistry.

Biography:

Azhar Bayeshova graduated from the Kazakh National University in Almaty (Kazakhstan, 1974), received the degree of Candidate of Sciences in 1986 and the degree of Doctor of Technical Sciences in 2002. She has been engaged in scientific research for 45 years in the field of electrochemistry together with her husband, Professor Abduali Bayeshov. They study the electrode processes involving many metals during polarization under the action of alternating current. They have developed electrochemical methods for producing many metal compounds that are widely used in various industries and engineering. They have co-authored more than 600 articles and more than 200 inventions.

Catalytic conversion of synthesis gas to higher alcohols has received tremendous interest due to the generation of environmentally benign octane boosters and alternative fuels to supplement the diminishing supply of the world’s finite fossil fuel reserves. K–modified $CoMoS_2$ catalysts supported over carbon-containing materials such as γ-Al_2O_3, Carbon- Coated Alumina (CCA), Graphene coated Alumina (GCA), and different types of powdered and fiber commercial activated carbons were prepared and characterized by BET, XRF, SEM, SEM-EDX, and HRTEM. Supporting efficiency of γ-Al2O3 to synthesis alcohols from syngas via KCoMoS2 catalyst improves after being coated with amorphous carbon and graphene because the carbon materials played a role in decreasing the interaction between alumina and active phase besides it has decreased the hydrogenation reaction. Powdered and fiber commercial activated carbons have shown different activities to increase the yield and selectivity of alcohol products. The catalytic activity increased in the order TCA < OBC-1< DAC < AHM < AG-3 < BAW. It was found that catalysts supported on microporous materials possessed higher catalytic activity in HAS synthesis from syngas than mesoporous materials. We explained this phenomenon by the distribution of the active phase inside the pores and the catalyst acidity. These results give deeper insight into the catalyst design of supported-TMS for HAS.

Biography:

Dr. Osman studied Chemistry at Omdurman Islamic University, Sudan, and graduated as M.Sc. in 2015. He received his PhD degree in 2018 at Sudan University of Science & Technology, Sudan. In the same year, he started his second PhD in Physical Chemistry at Peoples' Friendship University of Russia, Russia under the co-supervision of Prof. V.M. Kogan and Prof. T.F. Sheshko. He then joined the research group of Prof. Victor Kogan at N.D. Zelinsky Institute of Organic, Russia Academy of Sciences (RAS). Also, he is working at RUDN University in the Full Employment PhD Program.

articulate matter (PM) from internal combustion engines such as direct injection petrol engines and diesel engines has generate negative impacts on human health and environment. Diesel particulate filters (DPF), as the most successful technology of removing PM in engine exhaust, encounter the regeneration problems of decreasing engine backpressure in order to keep high fuel economy of internal combustion engines. However, the exhaust temperature of internal combustion engines, especially the diesel engines is lower than PM oxidation temperature under most of the real driving conditions. Usually, more fuel is delivered into the cylinders by post injection to increase the exhaust temperature, which leads to high fuel consumption. In order to keep high fuel economy of internal combustion engines, catalyst is applied to decrease the PM oxidation temperature, achieving DPF regeneration. There are two ways to provide the catalyst to achieve DPF regeneration

(1) fossil fuel additives and (2) catalyst coating on filters. Catalyst additives are homogeneously dispersed in the fossil fuel; during the PM formation process, catalyst additives as one of the ingredients will be in the PM, which continuously oxides the PM in the process of formation and captured in the filters. The backpressure caused by PM capture is kept at a low level. However, the ash generation after PM oxidation is increased by the additives, which to some extend increases the frequency of DPF clean. Catalyst coating on the filters will not generate more ash, however, the catalyst may be aging and inactivated because of long time remaining in the high temperature conditions such as long distance uphill journey.

Audience Take Away:

- High efficiency catalyst helps to achieve continuous regeneration of diesel particulate filters to improve the fuel economy of internal combustion engines.
- Catalyst used for the regeneration of diesel particulate filters can be coated in the filters or be additives of fossil fuels.
- Finding the proper catalyst in terms of price, performance, and, coating technology for diesel particulate filters regeneration is important to keep high fuel economy of internal combustion engines.

Biography:

Dr. Jianbing Gao is currently a research fellow in the Institute for Transport Studies, University of Leeds, UK. He finished his PhD study in 2017 from Beijing Institute of Technology, then joined the University of Surrey as a post-doctorate. He was involved in several H2020 projects: ADVICE, optiTruck and MODALES. He has published more than 30 international journal papers as the first author and corresponding author. His research interest is opposed rotary piston engines, alternative fuel applications to engines, exhaust emission control, ultrafine particulate matters.

The implementation of biorefineries is becoming a reality nowadays, due to the increasing environmental concern of society and institutions. Thus, there are countless ways to produce energy, biofuels or bioproducts from natural feedstocks, which could be integrated in a biorefinery process. The case of biodiesel or biolubricant production through transesterification from vegetable oils is a prime example of a starting point for the implementation of this kind of facilities. Thus, the optimization and the correct monitoring of the process are vital to contribute to the improvement of environmentally friendly industries. The aim of this research work was the assessment of different kinds of monitoring techniques (methanol collection, viscosity determination of the final mixture and methyl oleate or FAME content through gas chromatography) applied to the production of biolubricants from cardoon and saffiower oil with two different superior alcohols. As a result, different advantages and disadvantages were found concerning each monitoring technique. Thus, viscosity and methyl oleate determination offered more advantages compared to the rest of techniques, especially concerning to their possible implementation in a large-scale facility and their immediacy of results. Also, the nature of the superior alcohol played an important role in the production of

biolubricant, which should be taken into account in the implementation of biorefineries.

Audience Take Away:

- Different monitoring methods are proposed for a specific case, like the biolubricant production from vegetable oils through transesterification.
- Main pros and cons are assessed for each method, according to our laboratory experience.
- The audience will learn about the need of using easy and sustainable methods to monitor complex processes.

Biography:

Dr. Sergio Nogales studied Chemistry at the University of Extremadura and graduated as MS in 2007. He received his PhD degree in 2016 at the same institution. He has been working as a technologist at the Agricultural Technological Institute of Extremadura, studying minimally processed fruits and vegetables. Also, he joined the Department of Power Engines and Machines at University of Extremadura, researching about biomass. Finally, he currently belongs to the Department of Chemical Engineering and Physical-Chemistry, where he is currently working with biodiesel and biolubricants, studying its production and main properties, especially during oxidation/storage. He has published more than 30 research articles in international journals and 50 communications in international conferences.

Metallosupramolecular chemistry area has grown exponentially with a key role of multinuclear metal complexes (MMC) [1,2].The most interesting and challenging MMS are metal-organic frameworks (MOF) and self-assembled supramolecular coordination complexes (SCC), applied for sensing and molecular recognition. SSC are very interesting for their catalytic performance.S ingle- or mixed-linker tetrahedral coordination cages (Mn,Cr,Fe) with Mn(salen) and Cr(salen) moieties catalysed sequential asymmetric epoxidation/epoxide ring-opening reaction [3], while trinuclear Zr catalyst was active for ethylene polymerization. Inspired by the latter, we tested tetranuclear molybdenum(VI) aroylhydrazonato compounds, [MoO4L], as cyclooctene and cyclohexene epoxidation (pre)catalysts, with tert-butyl hydroperoxide available in

water or decane. No organic solvent was added, following the green quote: The best solvent is no solvent.

With cyclooctene, catalysts showed very good activity and selectivity towards epoxide with both oxidants. In cyclohexene (ep) oxidation, with TBHP in decane, catalytic activity was moderate with good selectivity towards epoxide, while with TBHPaq catalytic results were interesting in terms of diol formation, furtherly employed for adipic acid production. DFT calculations were used to support and explain experimental catalytic result for tetranuclear self-assembled systems.

Acknowledgement: This work has been supported in part by Croatian Science Foundation under the project (IP-2016-06- 4221). LCC CNRS and IUT Chem Dept are acknowledged for the facilities in terms of calculation time and equipment for the catalysis experiments.

Audience Take Away:

- Tetranuclear complexes are the area of rapidly growing metallosupramolecular chemistry.

- Catalysis under environmentally friendlier conditions with the use of TBHP in decane and TBHP in water.
- Green metrics parameters discussed and explained in details.
- This is research that other faculty could use to expand their research or teaching. Furthermore, it provides a practical solution to a problem and gives insight in a detailed calculation of green metrics of the process on a lab-scale.

Biography:

Dr. Pisk studied at Department of Physics, Faculty of Science, University of Zagreb. She received her PhD Degree in Chemistry, in 2012. She is Assistant Professor from 2018, at the Department of Chemistry, Faculty of Science, University of Zagreb. In 2010, she was a member of prof. Poli group in Toulouse, France, and she got Postdoctoral fellowship for the project "Diligent search for chemical bio-sources: Solventfree homogeneous and heterogeneous oxidation processes catalysed by polyoxometalates (PomFree)", Newfelpro and Marie Curie Cofound in the same group. J. Pisk published 24 research articles.

A fundamental of the physics and chemistry of solids is the understanding that most of their properties depend significantly on the size of a solid particle in one, two, or three dimensions. Whether it can be called a revolution or simply continuous evolution, the development of new materials and their understanding on an increasingly smaller length scale is clearly at the root of progress in many areas of materials science. The 21 century is marked by technological and medical developments that reflect our daily life. Nanoscience and nanotechnology (NST) are at the forefront of currently modern science and has a significant role in these developments. NST deals with "unseen" materials and structures that have great effect on different scientific and technological aspects, it deals with creation of materials, systems, and devices having fundamentally new properties and functions. The new properties are utilized for developing new applications that affect our lives and daily needs in different domains includes, nano devices and tools, energy, environment, medicine, and bioengineering. The rapid

expanding field of NST increased its impact on society and the potential for improving our daily life.

From an educational point of view, there is a great importance in keeping up with scientific developments in education and reforms in pedagogical aspects of teaching. As John Dewey stated (1852): “If we teach today`s students as we taught yesterday`s, we rob our children of tomorrow”. The teachers of todays must be aware and in sense with the scientific and technological developments, which has “a fingerprint” in our lives, in the present and in the future. several lab experiments were developed for undergraduates according to which various metal nanoparticles were synthesized for technological and medical applications. The lab activities consist of different parts, In the first, electrically conductive films made of silver nanoparticles were fabricated. The silver nanoparticles were protected against aggregation using electrically conductive polymer, which acts also as conductive bridge between them. The experiment shows a simpler way for fabricating conductive thin film than the much more complicated and costly conventional method. The second lab activity focused on using natural materials for producing micro-scale liposome structures and converting it to nanoscale one by simple methods, followed by demonstrating its application as “drug-vehicle” by integrating colored hydrophilic drugs into its interior hydrophilic part. The lab activities presented here, enabled the participants reveal the “magic” of materials when it is at the nanoscale, and the unusual applications of it.

Audience Take Away:

- The presentation contributes to nanoscience and nanotechnology education and underlying its basic aspects.
- It provides an idea for developing laboratory experiments as an effective method for teaching nanoscience and nanotechnology.
- Providing the skills of transforming a complex scientific experiment into a simple one with educational objectives.

Biography:

Dr. Riam is currently the Head of the Chemistry Department at The Academic Arab College of Education in Haifa, Israel. and a Senior Lecturer at the same college. She earned her Ph.D. degree in Chemistry (Nanoscience and Nanotechnology) from Bar-Ilan University, she also received her

M.Sc. and BSc. in Chemistry from the Hebrew University of Jerusalem. In 2008-2009 she was a post-doctoral fellow in Chemistry on Bar-Ilan University and served as teaching assistant at Bar-Ilan University. Recently, she started to deal with Nano Education. Among the awards she has received is the "Best Paper Award" for the best paper presented at any of the ICSEETS 2017.

In order to obtain desired properties of oligomers, modification process is used to change their structure and composition. In this matter, using traditional technology equipments and methods is more suitable. Lately to eliminate deficiencies of known oligomers, the process of modification with compounds of different nature is broadly studied. It is not always possible to reach the properties given for the particular oligomer material during the synthesis of oligomer material in industrial conditions, moreover, these processes are not always economical enough. Therefore, the modification processes of traditional industrial oligomer are being investigated more intensively with the purpose of obtaining oligomer compositions on their base with the given properties. In solution of this problem, great attention is being given to oligomer materials on the base of phenol-formaldehyde oligomers having available wide raw material base and reactivity, heat-resistance, satisfactory dielectric properties and cake formation ability. However, this oligomer has a number of disadvantages: low molecular mass, high flow in uncured state, brittleness, presence of free phenol in the composition and so on. Ever-growing demand for the quality of oligomer materials engendered by the acceleration of the scientific and technical progress stimulates development of the investigations in the field of chemistry of phenol-formaldehyde oligomers. These investigations are being carried out in some directions and the more vital of them in modification of phenol-formaldehyde oligomers with the purpose of regulation of the above mentioned disadvantages, and giving more functionality to these oligomers.

For the first-time modification of phenol-formaldehyde oligomers was carried out by benzoguanamine, benzylamine, benzamide, acetamide, oxamide, terephtaldiamide, propargyl-glycidyl ether and other organic compounds. Mechanism of phenol-formaldehyde oligomers modification has been studied. Detailed investigation of the structure and properties of the obtained oligomers had been cited depending from different parameters. Modification of phenol-formaldehyde was carried out at constant phenol and formaldehyde molar ratio, 1.15:1.45 and quantity of modifier in reaction mass was changed in the 0.05-1.0 molar interval. Change of the modifier content has an effect upon the process rate strongly, consequently, on the yield of soluble fraction of modified oligomer. It has been determined that using modifier in the 0.05-0.5 molar interval at constant phenol and formaldehyde ratio: [C6H5OH]=1.15 mole and [CH2O]=1.45 mole, basic part of the reaction products are substances of viscous consistency from yellow colour up to brown, well soluble in acetone, ethanol tetrahydrofuran and dioxane. When modifier is used at amount more than 0.75 mole, solid, insoluble mass is obtained. The composition and structure of synthesized modified oligomers was confirmed by the IR-, UV-, NMR-methods, physico-chemical and element analyses. It has been shown that the products of phenol-formaldehyde oligomers modification are oligomers incorporating with structural fragments of phenol formaldehyde and corresponding modifier.

In order to obtain ecologically friendly composition, as a liasion modified phenol-formaldehyde oligomer and as a filler biopolymers were used. Main properties of obtained coating and adhesive compositions were studied. New composite, ecologically friendly coating and adhesive compositions are recommended to be used in many fields of industry.

Keywords: phenol-formaldehyde oligomers, polycondensation process, modification, fillers, binder, nut, biopolymers, composite.

Audience Take Away:

- The audience will learn about the modification process of phenol-formaldehyde oligomers with organic compounds and use this process in their research and teaching.
- It is possible to eliminate the deficiency of phenol-formaldehyde oligomers using our modification process and most importantly, as a result, the amount of free phenol is decreased five times.
- They will learn about obtaining environmentally friendly coating and adhesives using oligomers as a liaison and biopolymers as a filler.
- The obtained environmentally friendly compositions based on oligomers may be used in many different fields of the industry.

Biography:

Dr. Naibova studied Chemical Engineering at the Azerbaijan Oil and Chemistry Institute named M. Azizbayov, Azerbaijan and graduated as MS in 1973 and PhD in 1987. She joined the laboratory of "Protective coatings" at the Oil Engineering Institute of the All-Union Scientific research and worked there from 1973 to 1976. From 1976 to 1994, she worked as a senior laborant, laboratory assistant, assistant, senior teacher at the Azerbaijan State Oil and Industry University (ASOIU). As of 1994, she has been working ASOIU as an associate professor. She is the author of 150 research articles, 25 patents, and 18 books and textbooks.

Globally, there is depletion of fossil fuels and rise in energy demand due to population and industrial growth and this has caused a need for finding alternative fuels that are less harmful and can bring about energy security within a country. These findings have been going under intensive search leading to biofuels such as "Biodiesel" which has been proved to be fossil that is promising for the future however due to the fact that different feedstocks with different origins are used within the production, an issue has been risen with regards to metal contents which is said to be a downfall as it cause damage in engines and decrease the longevity as well as the quality of the fuel. This study presents the types of catalyst required for production

of an efficient and effective biodiesel from waste vegetable oils as well as the sources and effects of metals in the biodiesel.

Audience Take Away:

- The findings of catalyst preparation for biodiesel production?
- The elemental analysis of the biodiesel from different blends.
- The effects of the elements in the biodiesel.

Biography:

Dr. Adelaja Otolorin Osibote completed her undergraduate studies at Ogun State University, Nigeria (now Olabisi Onabanjo University) in Physics in 1992 and received her M.Sc. in Engineering Physics (Medical and Health Physics Option) from Obafemi Awolowo University, also in Nigeria in 1999. She obtained her Ph.D (Medical Physics) from Escola Nacional de Saude Publica -FIOCRUZ, Brazil in 2006. She was a Postdoctoral Research Fellow in the Department of

Nuclear Energy, Universidade Federal de Pernambuco (Federal University of Pernambuco), Brazil in 2007 and in the Department of Human Biology (Biomedical Engineering) of University of Cape Town, South Africa in 2008. She was a Junior Research Associate, of the Abdus Salam International Center for Theoretical Physics from 2002 to 2006. She has published more than 50 papers in international journals and conference proceedings.

It is shown that bacteria Bradyrhizobium japonicum 273 are capable of degrading phenol at moderate concentrations either in a free culture or by immobilized cells on granulated activated carbon particles. The application of a constant electric field during cultivation leads to enhanced phenol biodegradation in free culture and for immobilized cells attached to granulated activated carbon. The combination of immobilization and application of a constant electric field gives synergic results: for the same time the degraded amount of phenol was about 7 times higher than at free culture with no electric field application. It is proven that the effect of enhanced biodegradation is not because of electrochemical processes but because of

bioelectrochemical stimulation of certain enzyme activities.

It is observed that the enzyme activities for phenol oxidation and benzene ring cleavage by free cells are very sensitive to the anode potential for the first two steps of the metabolic pathway of phenol biodegradation: phenol oxidation and catechol ortho- and/or meta-oxidation. These processes are catalyzed by the enzymes phenol hydroxylase, catechol-1,2-dioxygenase and catechol-2,3-dioxygenase. The enzyme activities vary in time and with the anode potential. It was observed that at an anode potential of 0.8 V/S.H.E. the meta-pathway of cleavage of the benzene ring is catalyzed by catechol-2,3-dioxygenase. The obtained synergic results for phenol biodegradation may provoke further studies on continuous processes with constant electric field application on immobilized cell cultures.

Acknowledgement: This work was supported by the Fund for Scientific Research, Republic of Bulgaria by grant DN 17/4, 2017.

Audience Take Away:

- The results of this study can be useful for microbiologists and biochemists interested in the kinetics of biochemical conversions. The effect of bioelectrochemical stimulation is applicable for many other microbial processes.

- The results of this study belong to the area of “microbial electrolysis cells”. They can be useful and to provoke new energy saving methods for wastewater treatment or organic syntheses. Possible practical applications will open the door for new design of wastewater treatment facilities.

Biography:

Venko Beschkov, PhD was born in 1946 in Sofia, Bulgaria. He has got his PhD in 1978 and his DSc degree in 1996 in the Bulgarian Academy of Sciences. His present interests are chemical and biochemical processes for environment protection and for utilization of renewable energy sources. He participates in 30 scientific projects and in 18 applied ones. He published over 210 scientific papers, 2 monographs and 10 chapters in selected issues. He has been Head of the Institute of Chemical Engineering at the Bulgarian Academy of Sciences for 21 years (1993/2014) and deputy-minister of environment (1991/92).

Pulsed laser ablation in liquid (PLAL) is green technique for synthesis of nanoparticles. In PLAL, the solid target immersed in liquid is irradiated by pulsed laser beam. Plasma plume is formed during the interaction between laser pulse and target, which after its collapse releases the nanoparticles in liquid, resulting in colloidal solution of nanoparticles. The advantages of PLAL when compared to chemical synthesis of nanoparticles are the very high purity of synthesized nanoparticles, absence of any residual byproducts, cost-effectiveness, nanoparticles properties engineering possibility through modification of PLAL parameters and possibility of nanoparticles synthesis from large variety of materials due to fact that any solid material can be ablated. In this paper the TiO2 and ZnO nanoparticles are synthesized with PLAL and used as catalyst for Methylene Blue and Rhodamine B photodegradation during the UV and visible light irradiation. The photodegradation rate dependence on different catalyst and dye concentrations is studied. The obtained dependences are discussed and explained by recognizing and summing up the effects of various physical and chemical processes contributing to the value of photodegradation rate in each analysed case. Both, UV and visible photocatalytic efficiency of laser synthesized TiO2 nanoparticles in this paper are much higher when compared to the ones obtained with same amounts of commercial Aeroxide P25 nanoparticles. The photocatalytic efficiency of ZnO nanoparticles is higher than one obtained with the same amount of ZnO nanoparticles synthesized by sol-gel method. It was also found that heating of as-synthesized TiO2 nanoparticles can lead to improvement

of their photocatalytic efficiency due to changes in crystal structure.

Audience Take Away:

- High photocatalytic efficiency TiO2 and ZnO nanoparticles synthesized by pulsed laser ablation in water points to possibility of wider application of this method in production of photocatalytic materials.
- The recognition of various effects contributing to TiO2 and ZnO photocatalytic efficiency is helpful for purposes of photocatalytic systems optimization, especially those applied in water purification.
- How to prepare TiO2 and ZnO nanoparticles by laser ablation in liquid.

Biography:

Mag.phys. Damjan Blažeka studied Physics at the Faculty of Science, Zagreb, Croatia and graduated as MS in 2017. He then joined the research group of Dr. Niksa Krstulović at the Institute of Physics, Zagreb, Croatia as the PhD student. His main scientific interests are laser synthesis of nanoparticles and their application in photocatalysis. He has published 4 research articles in SCI(E) journals.

In this work, an effective methodology was applied to analyze the well-known (but not reproduced by anyone) data on the “super” sorption of hydrogen in the know-how activated graphite nanofibers (GNF). Such processing of the thermal desorption and thermogravimetric data made it possible for the first time to determine (by two independent methods) the characteristics of the main hydrogen desorption peak, namely: the temperature of the highest desorption rate Tmax = 914- 950 K, the activation energy of desorption Q = 39 ± 3 kJ/mol(H2), the frequency factor of the rate constant of the desorption process K0 ≈ 0.15 s-1, the amount of released hydrogen ~ 7 wt%. These results are in satisfactory agreement with the results of the analysis of the data. At the same time, it should be noted that a large number of attempts to reproduce experimental data. The know-how technology of GNV activation in works can be disclosed by analyzing experimental data, especially electron microscopic data. The role and atomic mechanism of the spillover effect in the "super" sorption are considered. Some specific

factors and aspects associated with anomalous results are considered in reviews.

Audience Take Away:

- The audience will learn about such effective approach, methodology and new results, which could be used in their studies.
- The audience and other faculty could use such approach, methodology and results in their research and/or teaching. It could provide a practical solution to a problem, it could simplify or make a designer's job more efficient, and it could improve the accuracy of a design, or provide new information to assist in a design problem.

Biography:

Yury S. Nechaev is a chief researcher-analyst (from 1998) in Kurdjumov Centre of Metals Science and Physics, within Bardin Central Research Institute for Ferrous Metallurgy, Moscow, Russia. He is Professor of materials science and metals physics (Dpt.), Doctor of physical-mathematical sciences . He has published more than 150 research articles in scientific journals.

Thermohydraulic design of energy-efficient devices (in chemical industry as well) is based on a combination of flow and heat transfer control methods using additive technologies for designing reliefs with ordered surface vortex generators

- dimples. In the proposed multi-row inclined oval-trench dimples, powerful tornado-like vortex structures with extremely high secondary and return flow velocities comparable with the characteristic flow rate and multiple growth of heat flows in comparison with flows over a flat plate are initiated. Mechanism of intensification of flow and heat transfer in inclined dimples has been discovered, which is related to the appearance of total pressure drop between the closely located braking zone of the external flow entering into the dimple and low-pressure region in tornado vortex generation area. Dimpled surfaces of effective heat transfer on a flat plate and a wall of narrow channel for laminar and turbulent regimes are discussed. Influence on the intensification of low-velocity air flow and heat transfer of density of the dimples, their inclination, elongation, depth and radius of rounding of the edges, relative channel height, Reynolds number, and boundary layer thickness are analyzed. Several computation examples demonstrate an increase of heat transfer and thermohydraulic efficiency on the inclined area of the channel and in the contour of the dimple.

The research was sponsored by the Russian Science Foundation (the grant number 19-19-00259).

Audience Take Away:

- Nowadays intensification of heat and mass transfer is one of the main directions in thermodynamics. The article describes most modern approaches to this problem.
- New effective shapes of dimples that are inclined to the oval-trench dimple flow are introduced, which can be used for ordered relief production with the help of additive technologies.
- New physical phenomenon of anomalous intensification of separated flow and heat transfer in an inclined multi-row oval-trench dimple is discussed; The phenomenon is related to the significant total pressure drop in areas of high pressure brake point at interferention of external flow with curvilinear inflow dimple surface and decreased negative pressure in center of tornado-like vortex generation at inlet spherical dimple segment.

Biography:

Dr. Sc. Dmitry Nikushchenko studied fluid dynamics at Saint-Petersburg State Marine Technical University, St. Petersburg, Russia. Received Ph.D. degree in 1999 and Dr. Sc. degree in 2011 year. He worked as assistant professor, associated professor of Department of Ship Hydrodynamics of State Marine Technical University and since 2017 year became the vice-rector for research of SMTU. He is an author of more than 100 publications in areas of computation fluid dynamics, turbulence, heat transfer.

Changes in surface and bulk structures of rutile, anatase and brookite titania particles induced by braying up to 10 d and post calcination in air at 773 K were analyzed by reversed double-beam photoacoustic spectroscopy (RDB-PAS).

The observed energy-resolved distribution of electron traps indicated that the surface was amorphized by braying to give rutile-core amorphous-shell structure and the amorphous layer was partly recrystallized by post-calcination leaving grain boundaries in the surface layers, both of them may cause the observed markedly decreased photocatalytic activities. A significant point is that the conventional analyses such as XRD (X-ray diffractometry) or specific surface-area measurement could not give any direct information on the surface structure of brayed materials, but only energy-resolved distribution of electron traps (ERDT) measured by RDB-PAS indicated the formation of the amorphous-titania layers on the particle surface. In other word, RDB-PAS is a powerful tool for macroscopic analysis of surface structure, which predominantly governs the performance of material, such as photocatalysts used in this study, even if a material contains amorphous or non-crystalline components. One of the examples of such amorphous materials is electrochemically fabricated self-organized titania nanotubes, which have totally amorphous phases, and the study on this material is now in progress. Thus, the present study may open up the characterization of amorphous materials which have not been analyzed precisely. Furthermore, materials which have been recognized not to have amorphous components based on the conventional analytical techniques could be clarified to be amorphous in the near future.

Audience Take Away:

- Qualitative and quantitative analysis of amorphous phases included in almost all the solid materials.
- Reversed double-beam spectroscopy as a powerful tool for solid materials.

Biography:

The research by Professor Ohtani started in 1981 when he was a Ph. D. student in Kyoto University. Since then he has been studying photocatalysis and related topics for more than 40 years and published more than 300 original papers (h-index: 70). After gaining his Ph. D. degree from Kyoto

University in 1985, he became an assistant professor in the university. In 1996, he was promoted to an associate professor in Graduate School of Science, Hokkaido University and was then awarded a full professor position in Institute for Catalysis, Hokkaido University in 1998. He was awarded several awards from societies.

Strain sensors in the form of Buckypaper (BP) infiltrated with various polymers are considered a viable option for strain sensor applications such as structural health monitoring and human motion detection. Graphene has outstanding properties in terms of strength, heat and current conduction, optics, and many more. However, graphene in the form of BP has not been considered earlier for strain sensing applications. In this work, graphene-based BP infiltrated with polyvinyl alcohol (PVA) was synthesized by vacuum filtration technique and polymer intercalation. First, Graphene oxide (GO) was prepared via treatment with sulphuric acid and nitric acid. Whereas, to obtain high-quality BP, GO was sonicated in ethanol for 20 minutes with sonication intensity of 60%. FTIR studies confirmed the oxygenated groups on the surface of GO while the dispersion characteristics were validated using zeta potential analysis. The nanocomposite was synthesized by varying BP and PVA concentrations. Mechanical and electrical properties were measured using a computerized tensile testing machine, two probe method, and hall effect, respectively. The electrical conducting properties of the nanocomposites decreased with increasing PVA content; likewise, electron mobility also decreased while electrical resistance increased. The optimization study reports the highest mechanical properties such as tensile strength, Young's Modulus, and elongation at break of 200.55 MPa, 6.59 GPa, and 6.79%, respectively. Finally, electrochemical testing in a strain range of ε~4% also testifies superior strain sensing properties of 60 wt% graphene BP/PVA with a demonstration of repeatability, accuracy, and preciseness for five loading and unloading cycles with a gauge factor of 1.33. Thus, results prove the usefulness of the nanocomposite for

commercial and industrial applications.

Audience Take Away:

- Graphene based buckypaper infiltrated strain sensor exhibited a good sensibility and stretch ability in good linear strain range.

- Graphene based buckypaper infiltrated with poly vinyl alcohol can be synthesized by simple vacuum filtration and infiltration technique.
- The sensor demonstrated a linear and quick response to applied strain with no hysteresis.
- It has high durability and excellent recovery performance.
- The sensor shows ability to detect complex deformations.

Biography:

Dr. Nabisab Mujawar Mubarak is an Associate Professor in the Faculty of Engineering and Science, Curtin University, Malaysia. He serves as a scientific reviewer in numerous journals in the area of Chemical Engineering and Nano Technology. In research, Dr. Mubarak has published more than 190 journal papers, 23 conference proceedings and authored 25 book chapters. His area of interest is carbon nanomaterials synthesis, magnetic biochar production using microwave and wastewater treatment using advanced materials. He is a recipient of the Curtin Malaysia Most Productive Research award, outstanding faculty of Chemical Engineering award, Best Scientific Research Award London and outstanding scientist in publication and citation by i- Proclaim, Malaysia. Dr. Mubarak is a Fellow Member of The Institution of Engineers Australia, Chartered Professional Engineer (CPEng) of The Institution of Engineers Australia and also a Chartered Chemical Engineer of the Institute of Chemical Engineering (IChemE) UK.

Rhizosphere bioremediation is a plant assisted bioremediation which has multiple effects in the bioremediation process due to symbiotic association of mycorrhizal fungi, bacteria, actinomyces along the root zone in the mycorhizal soil. Rhizosphere considered as an Ecological Remediation Unit to treat the contaminated soil containing complex organic compounds including toxic metals in the rhizosphere. The plant releases exudates such as short chain organic acids, phenolics, sugars, alcohols, enzymes and proteins. Plant releases enzymes like laccase, dehalogenase, nitrilase, nitroreductase and peroxidise are beneficial in enhancing bioremediation of organic compounds.The plant exudates as well as enzymes released by the plant and microbial interaction and their enzyme secretion make it possible to bio-remediate organic compounds, and bioaccumulation & uptake of metals thus converts into environmental friendly compounds, biomass, nutrients and CO2.

Environmental variation takes place depending upon the factors prevailing in the field.

Research paper highlights industrial waste – pesticides, organic dye stuff compounds and petrochemical compounds

- rhizosphere bioremediation and their bioaugmentation to develop effective and efficient techniques and methods for decontamination of soil - water environment. The technology has been transferred from Lab to Land as a novel and innovative measures to cleanup environment. Further, rhizo-bio-nano technology is being developed for industrial waste treatment.

Audience Take Away:

- Industrial waste : Soil water contaminants – environmental problem
- Rhizosphere bioremediation a Green Technology would remediate contaminant in soil water environment.
- This will help to include the innovative Green Technology (Rhizosphere bioremediation) in their academic curriculum to understand the environmental hazards and techniques and methods to clean up the environment.
- Learning Green Technology – methods process for remediation of contaminants would help to get the jobs in industry as environmentalist.
- Further the Rhizosphere bioremediation a Green Technology can be expanded in the research as Rhizo-Bio-Nano Technology.
- Transfer of technology from Lab to Land.

Biography:

Prof. Madhusudan Hiraman Fulekar, M.Sc. (Chemistry), MPhil. & Ph.D (Environment Science), LLB, MBA (HRD), D.Sc. (Life Science) submitted. He is an Environmentalist and he has worked as a faculty – Delhi Technological University, Delhi and University Department of Chemical

Technology, Mumbai. He was also a Professor & Head, Life Sciences (Environmental Biotechnology), University of Mumbai

- 2002 to 2011 and as Senior Professor & Dean, School of Environment and Sustainable Development, Central University of Gujarat (2011-2019) & Director Central University of Gujarat. He was also Vice-Chancellor (I/C), Central University of Gujarat, Gandhinagar. At present Prof. M.H.Fulekar is working as Senior Professor cum Joint Director (R&D), Center of Research for Development, Parul University, Gujarat, India.

Over the past few years, significant research has been directed toward the development of new methods for synthetic efficiency and atom economical processes. Among them, the potential of transition metal--catalyzed reactions has been steadily demonstrated, as they provide a direct and selective way toward the synthesis of highly valuable products. We have been engaged in a project dedicated to the development of catalytic methods for the synthesis of bio--relevant targets. More specifically, we have been interested in asymmetric reductions such as hydrogenation and transfer hydrogenation reactions, which provide important catalytic approaches to fine chemicals. In this context, our contribution to this field is the development of novel organometallic complexes for C-H bond forming processes to access biorelevant targets. Some recent

applications in this field will be presented.

Audience Take Away:

- Catalysis is one of the most effective methods to produce a single enantiomer by using cost--effective and environmentally sound method and is key point for sustainable chemistry.
- Asymmetric synthesis is a major research field: pharmaceuticals, agrochemicals, flavors, and fragrances are increasingly produced as enantiomerically pure compounds.
- Asymmetric hydrogenation is widely used in fine chemical industry.

Biography:

Dr. Virginie VIDAL is Research Director at the CNRS in France (National Center of the Scientific Research) and head of the group « Catalysis, Synthesis of Biomolecules and Sustainable

Development » at Chimie ParisTech-PSL Research University in Paris. She received a PhD degree in Chemistry from Paris Sud University, France. Her research interests focus on transition-metal catalysis. The synthesis of bio-relevant targets targets is also a focus in her group. She was Chair of the Division of Organic Chemistry of the French Chemical Society. She has published 175 research articles, patents and chapters and has been serving as member in the board of EuChemS Organic Division.

A global transition to low carbon technologies is required to mitigate the effects of climate change. According to the world resource institute, the energy sector contributed 72% of the global human made greenhouse emissions in 2020.

To combat the rising CO2 emission from the transportation and electricity generation sectors, various merging applications, such as electric vehicles (EVs) and energy storage systems (ESSs) have been growing significantly in the past decade. These applications lead to rapid growth, demand and production of batteries, in particular, lithium-ion batteries (LIBs). Battery waste is generally toxic and harmful to human health and the environment. However, waste LIBs are also seen as a valuable domestic mining resource which contains concentrated valuable critical elements. The predicted demands for critical metals required to build new LIBs combined with the current process of landfill disposal, raise environmental and financial concerns. It is widely recognized the hazards and value of the waste LIBs can be well managed through transition from the current linear economy (Make – Use – Dispose) to a circular economy (Make – Use – Reuse – Recycle) to reduce primary resource utilization through materials recovery from remanufacture technologies. This presentation will discuss the global battery demand, market trend, status of battery recycling, opportunities, and challenges of LIB recycling and second life reuse.

Audience Take Away:

The audience will learn the following:

- What the future battery waste stream matrix would look like?
- Why LIB battery waste management is a global focus among all the battery types.

- Challenges and opportunities of LIB battery recycling and second life reuse. This will help audience understand the status of LIB recycling, the change of technology and policy associated with the LIB value chain to achieve efficient battery waste management and circular economy.

Biography:

Yanyan is a material scientist and chemical engineer working as a research scientist at the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia. Her field of research is developing Australian solutions for battery recycling and materials recovery for on shore processing. Yanyan obtained her PhD from Queensland University of Technology in 2009 and worked with Rio Tinto on hydrometallurgy research prior to joining CSIRO in 2017. Since 2019 she has been developing battery recycling technology with a focus on recovering high value materials to change the economics of battery recycling and a focus on developing Australian on-shore processing technology.

This presentation will depict the results of a social impact assessment (SIA) of two cases of sustainable agricultural practices in Japan, including Chiasaki-city in Kanagawa prefecture and Iwata-city in Shizuoka prefecture. SIA is a method for analysing and managing social impacts resulting from planned interventions. Social impact in SIA is defined as the ultimate effect due to change on the individuals involved, that is, ‘the real and perceived impacts experienced by humans (at individual and higher aggregation levels) caused through biophysical and/or social change processes generated by planned interventions’.

The cases of house facilities investigated aim to produce vegetables and fruits in agricultural house hydroponic cultivation systems in an eco-friendly, economically viable, and socially desirable manner. They achieve little usage of chemical substances and nonrenewable resources, including pesticides, water, and electricity. This is realised via introduction of a water-saving cultivation method, ICT technology, and usage of solar panels set on the rooftops of agricultural houses (agrivoltaic system, commonly known as ‘solar-sharing’ in Japan).

The analysis will show how eco-friendly the cases are and also how successfully they demonstrate economic viability without relying on government subsidies. The results of the SIA conducted via surveys in the facility-sited prefectures will show how local residences evaluate benefits in terms of the local activities of agricultural houses, including environmental education and provision of electricity when disastrous events occur in nearby local areas.

These cases hold significant implications for viable, sustainable agricultural practices in Japan that will prove informative to all project designers, developers, policy makers, and researchers. The audience will gain knowledge on how realistically new sustainable agricultural practices can be implemented in places wherein high labour costs, aging societies, and a lack of new successors in agricultural production are prolonged serious problems.

Audience Take Away:

- The audience will learn how eco-friendly, economically viable, and socially desirable the house cultivation system cases in Japan are.
- The audience will understand the method of social impact assessment (SIA) used to evaluate the social desirability of sustainable agriculture.
- The audience will be able to use this knowledge to design sustainable and viable house cultivation systems in Japan and elsewhere, where aging agricultural owners and a limited number of successors are increasingly becoming an issue impeding the realization of sustainable agriculture. This information may also provide valuable insights to other developed countries regarding sustainability management for agricultural house cultivation systems.
- This is a hands-on and realistic solution for an actual sustainable project that can serve the interests of project designers, developers, policy makers, and researchers.

Biography:

Dr. Noriko Irie earned a Diploma and an MSc in Applied Environmental Economics at the Imperial College, an MPhil in Environmental Policy at the Land Economy Department of the University of Cambridge, and a PhD from the University of Tokyo. She is an associate professor at the Department of Environmental Design, Faculty of Collaborative Regional Innovation in the National University Corporation Ehime University, Japan. She also possesses work experience in environmental management and knowledge of environmental and energy facilities.

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- This is a hands-on and realistic solution for an actual sustainable project that can serve the interests of project designers, developers, policy makers, and researchers.

Biography:

Naoko Kawahara is the Department of Microbiology (formerly Department of Bacteriology), Kindai University Faculty of Medicine locates in Osakasayama, Osaka, Japan.

Ammonia is a potential hydrogen and energy carrier. It has a high capacity for hydrogen. As an energy carrier, ammonia is considered as energy-dense and zero-carbon green fuel. Industrially, ammonia is synthesized by the Haber-Bosch process using iron-based catalyst. The significant drawbacks of this process include the requirement of high temperature (425-600) and pressure (20-30 MPa) conditions as well emission of green-house gases. Green ammonia can be synthesized with hydrogen produced from electrolysis of water using renewable energy. To utilize renewable derived hydrogen, it is required to develop efficient and stable catalysts capable of operation under fluctuated supply of hydrogen and mild reaction conditions. Therefore, it is essential to evaluate the efficiency of a catalyst at various reaction conditions and stability for long term processing. Ru catalysts are known for their higher activity at mild reaction conditions. In this study, CeO2 supported Ru catalyst was synthesized by impregnation method. The activity of Ru/CeO2 catalyst for ammonia synthesis was determined using hydrogen and nitrogen as reactants. An effect of reaction conditions was studied. Below 400°C, higher rate for ammonia synthesis was obtained by a decrease in H2/N2 ratio. This detailed study is necessary for establishing ammonia as a hydrogen/

energy carrier.

Audience Take Away:

- This study will open a new horizon for practical application of ammonia as a hydrogen or energy carrier.

- It will help in assessment of optimized reaction conditions to attain higher catalytic activity for ammonia synthesis.

Biography:

Dr. Rahat Javaid studied Applied Chemistry at the University of Engineering & Technology, Lahore, Pakistan and graduated as MSc in 2003. She was awarded with Gold Medal for getting first class first position in MSc. She continued her studies and earned MPhil degree at the same institute. She was selected for Monbukagakusho MEXT Scholarship Japan and received her PhD degree in 2010 at Tohoku University, Japan. After postdoctoral research experience at Tokyo Institute of Technology, Japan, she obtained the position of Research Scientist at the Fukushima Renewable Energy Institute, AIST. She has participated in many national/International conferences and published research articles in peer reviewed journals.

The research aims to carry out the fixed-bed column study of phenol removal from wastewater by low-cost natural bio- adsorbent neem leaves. The neem leaves were characterized by SEM, XRD, FTIR and BET analyzers. The optimum pH

of the phenol solution was determined by batch experiments. The column experiments for determination of phenol removal efficiency by neem leaves were performed at optimum pH 3 at different bed height (8.5-13.5 cm), flow rate (10-30 ml/min) and initial phenol concentration (100-300 mg/L). The experiments showed that the breakthrough and exhaustion times increased with the rise of bed height, but decreased with the rise of flow rate and phenol concentration. The adsorption mechanism involved the interactions between the cellulose, hemicelluloses and lignin materials of the adsorbent and phenol molecules through n- π, π-π and H-bonding. The kinetic study with the experimental results showed that the Yen et al. model (r2 = 0.9911,

KY = 0.63711 ml/mg.min, qY = 6165 mg/gm) was fitted best. The scale-up design was performed using the best fitted kinetic model. Desorption of phenol from used adsorbent with ethanol solution (30% v/v) indicated 60.10% regeneration efficiency.

The safe disposal of used adsorbent was studied by incineration. The multiple linear regressions (MLR) and artificial neural networks (ANN) showed that the experimental results could be used with successful predictions. The research thus concludes that the neem leaves are the effective low-cost natural bio-adsorbent for phenol removal and therefore can be successfully applied to many small and medium scale industries, especially in the third world countries.

Audience Take Away:

- This research brings out a novel investigation on the removal of toxic phenol from industrial wastewater by low-cost natural bio-adsorbent neem leaves in a fixed bed column.
- The studies of scale-up design, regeneration and safe disposal make this research work practically implementable in the refineries and other allied chemical industries.
- The prediction established on the basis of experimental results using innovative MLR and ANN modelings can make it successfully applicable to any unknown process conditions.
- The low-cost and huge availability of neem leaves can bring out a practical solution to the third world countries since they cannot afford to set up costly wastewater treatment units in their chemical plants.
- This research highlights the environmental protection from the industrial pollutions as well as the contribution towards circular economy and therefore can be considered as a very important step in the present scenario all over the world.

Biography:

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

The bacterial community structure along with their role in predicted metabolism in the wastewater of Indian Paper Industries is poorly understood. In the present work, effort has been made to characterize the bacterial diversity using

16S (V3-V4 region) rRNA gene amplicon sequencing data with special reference to physicochemical parameters. Results obtained revealed the presence of bacterial taxa belonging to the genera like Cloacibacterium, Aerococcus, Chryseobacterium, Microbacterium, Acinetobacter, Sphingobium etc. that were involved in the predicted metabolic pathways like carbohydrate metabolism, fatty acid and aromatic compounds biosynthesis as well as degradation. Canonical correspondence analysis confirmed a significant correlation between the bacterial diversity loads and environmental preferences. Further, the chemical oxygen demand, biochemical oxygen demand, and total suspended solids exceeded the acceptable limits prescribed by Central Pollution Control Board New Delhi, Government of India, for discharge of wastewater. Moreover, the presence of these bacterial diversity in the wastewater treatment plant of paper industries may affect the maintenance as well as paper quality. In future, it will provide a benchmark for the better understanding and management of wastewater treatment plant in paper industries across the globe.

Audience Take Away:

- Baseline data about the Bacterial Diversity in the wastewater of Indian Paper Industries.
- It will let the audience to know about the metagenomics approach fused with Water Quality Analysis.
- The audience will learn about the environmental preferences of the bacterial genera.
- The audience will learn about the functional role of bacterial diversity in the wastewater treatment.

Biography:

Dr. Inderjeet Tyagi is currently working as Scientist B and have been working in the field of wastewater treatment from past ten (10) years. He had done his doctoral from IIT Roorkee (Institute of National Importance) with A+ grade thesis title in the field of wastewater treatment i.e. developing novel adsorbents for the removal of noxious pollutants from wastewater. Moreover, to his credit he has published more than 85 SCI articles in journal of international repute with cumulative impact factor (340), book chapter (01), One Indian Patent (Filed), and he also presented his work at different national as well as international platforms.

TiO_2-based photocatalysis has been considered as a promising technique to remove organic pollutants from water because of non-toxicity, strong chemical stability and low cost of TiO2. However, an important challenge associated with catalyst separation greatly limits its application. Both experimental results and theoretical calculations evidence that various

immobilization approaches could address this obstacle.

The aim of the present work was to prepare polymer-TiO2 microparticles and use them as photocatalysts for the degradation of caffeine in water under UV light irradiation of 365 nm wavelength. The physicochemical properties of the prepared materials with the size distribution from 100 to 200 μm were investigated by Field emission scanning electron microscopy (FESEM), Energy dispersive X-ray spectroscopy (EDS) and Thermogravimetric analysis (TGA) techniques. The effect of the particle size on the photocatalytic degradation of caffeine was evaluated. It should be noted that among synthesized materials, the 100- 150 μm ranged polymer microparticles coated with TiO2 achieved total caffeine degradation within 60 min. Supported TiO2 microparticles have a great advantage over pure nano-sized TiO2 such as the ease of catalyst removal from the liquid phase and possibility of being recycled. These results are valuable to design novel efficient strategies for the support modification of TiO2 to eliminate the organic pollutants from water.

Audience Take Away:

- Learn simple TiO2 immobilization method with polymer.
- The degradation of an emerging pollutant in water.
- Know the properties of the prepared materials.
- Application of polymer immobilized TiO2 in heterogeneous photocatalysis.

Biography:

Saule Mergenbayeva is a 2nd year PhD student in Nazarbayev University, Kazakhstan. She received her MS in 2015 from Kazakh-British Technical University in Kazakhstan. Then she obtained a scholarship to study for a PhD in Nazarbayev University and joined the research group of Prof. Stavros.

The two branches of chemistry, theory and experiment, are interdependent: theoretical calculations are required for the evaluation of experimental results (e. g. for the exploration of mechanisms), while experimental data are indispensable

for theoretical works (e. g. for method validation). Still, the cooperation between the areas is often cumbersome as the results of computations - typically reaction and activation energies - are difficult to interpret for experimentalists who observe macroscopic properties such as yield, reaction time and the time course of concentrations.

Our research group successfully applied microkinetic modeling as a bridge between computational and experimental data. In this approach, the computed activation Gibbs free energies ($\Delta G‡$) of elementary reaction steps are converted to rate constants (k) using the Eyring-Polányi equation. Then, the system of reaction rate equations is solved numerically to obtain the time course of concentration of all intermediates, which is exactly what one can measure experimentally. By comparing the simulated evolution of concentrations to available experimental data, the rate constants can be fine-tuned to eliminate the error of computation. In this way, an accurate theoretical model of the studied reaction mixture can be gained, which can be used to optimize reaction conditions or explore quantitative structure-reactivity relationships without the need of a large number of experiments.

In this presentation, two practical applications of microkinetic modeling is discussed:

1. Rational (mechanism-based) design of biomimetic ammonia synthesis catalysts: microkinetic modelling of the interdependence of the desired reaction (ammonia formation) and undesired side reactions (hydrogen evolution, catalyst deactivation).

2. Evaluation of carcinogenic potential of estrogen hormones: microkinetic modeling of the accumulation of carcinogenic species (e.g. superoxide radicals, quinones) in cells upon estrogen addition.

Audience Take Away:

- The concept of “microkinetic modeling”, which is potentially useful for both experimentalists and theorists and enables an effective cooperation between these two fields.
- How microkinetic modeling can be used for the confirmation or refutation of chemical hypotheses.
- How microkinetic modeling can be used to predict the results of future experiments.

Biography:

Zsolt Benedek gained his MSc degree in chemical engineering at Budapest University of Technology and Economics (BUTE) in 2017. As a part of the MSc program he spent an academic year at the Laboratory of Chemical Biology of Osaka University, Japan, as a special research student. From 2017 to 2021, he completed the PhD program of George Olah Doctoral School of BUTE under the supervision of Dr. Julianna Oláh. His current research topics include microkinetic modeling and quantum chemistry aided catalyst design and theoretical investigation of carcinogenic mechanisms.

Generation of wastewater is a major issue in today’s world, and it is produced from various activities such as agriculture, industries, commercial and domestic activities. They contain various physical, chemical and biological pollutants. One

such major pollutant present are the heavy metals in the form of dissolved ions, and they cannot be easily decomposed, and this immensely affects human health and the overall food-chain and ecological cycle. Adsorption is found to be very effective in removal of heavy metal contamination from wastewater. Adsorption using low-cost biomass derived biochar is promising and effective in the removal of mixed heavy metals from wastewater.

Present research work focuses on promising nano adsorbents using Date Palm for the removal of heavy metals as they are less harmful, bio-degradable, easily available, and are much more economical. The Aim is to find the possibilities of using low- cost date palm nano biochar adsorbent fibres by conducting batch experiments to remove heavy metals from wastewater. The results show that more than 96% removal of heavy metal takes place using date palm nano bio-

adsorbents. The maximum percentage removal is of Silver, Zinc and Lead metal ions while Nickel, Copper, Manganese, Cadmium and Chromium ions also exhibit good removal efficiencies. This proves that the date palm nano bio adsorbents are not only a suitable alternative to chemical adsorbent material but also economically viable. Adsorption equilibrium and adsorption isotherm studies reveals the equilibrium concentration and removal is rapid and linear. Adsorption kinetics studies shows constant adsorption of metal ions initially and rapidly increasing with time.

Keywords: Adsorption; Biochar; Date palm; Heavy metals; Wastewater.

Biography:

Dr. Vandana Sakhre studied doctorate degree in Chemical Engineering with graduate in chemical engineering. She has total 20 years of experience including 16 years as Assistant Professor in the chemical engineering. She is also active researcher in the field of chemical engineering and published quality research (total 21 research papers including 6 research papers in SCOPUS) in reputed national and international journals. She served various universities and institutes as Lecturer and Assistant Professor including Jiwaji University, Gwalior (2003 to 2006), India, Madhav Institute of Technology & Science, Gwalior, India (2008 to 2016). Presently she is serving in the Manipal Academy of Higher education, Dubai, as an Assistant professor-selection grade, in the chemical engineering department of School of Engg and IT (SOEIT) (2017 to till date).

Light olefins such as ethylene and propylene are essential for the various polymer production. Silicoaluminophosphates sieves (SAPO-5, SAPO-34) are generated using hydrothermal synthesis. Molecular sieves are known for industrial applications mainly as the effective adsorbent for the separation techniques in the liquid or gaseous phase. The silica, alumina, and phosphorous sources are the same except for the organic structure-directing agents (SDA). Diethylamine (DEA) and trimethylamine (TEA) are used as SDA for SAPO-34 and SAPO-5, respectively. The physicochemical properties of both catalysts are characterized by X-ray diffraction, Temperature programmed desorption, Scanning electron microscopy, and Nitrogen adsorption-desorption. The characteristic peaks for X-ray diffraction of both the catalysts were obtained for both the catalysts. By using the Scherrer calculator the size of the obtained crystal size are 38.5 nm and 34.7 nm for

SAPO-5, and SAPO-34 catalysts, respectively. The morphology of the SAPO-5 resembles the rough surfaced hexagonal structure, whereas SAPO-34 has cubical sheet morphology. Average particle size of SAPO-5 was about 15.5 µm and for SAPO-34 it was 4 µm. BET surface area of SAPO-5 is 386m2/g, whereas 533 m2/g for SAPO-34. The activity of the catalyst is checked for the methanol to olefins (MTO) process. The best catalytic activity of SAPO-34 is might be because of the presence of suitable acidic sites. The SAPO-34 selectivity for total olefins was 86.73 % initially, and for SAPO-5, it was 24.86 %. The results prove

that the shape and size of the framework are essential for olefins production.

Audience Take Away:

- Synthesis of SAPO-5 and SAPO-34 by hydrothermal treatment.
- Ethylene and propylene acts as raw materials for various polymers in chemical industry. Traditional routes (Naphtha cracking, fluidized catalytic cracking) for obtaining ethylene and propylene are energy intensive. MTO process is gaining momentum as it is the non-petrochemical route. In China alone, there are 18 MTO plants have been working till 2018.
- Present study concludes that SAPO-34 is better catalyst than SAPO-5 for MTO process as it is more selective to light olefins.

Biography:

Ms. Baljinder Kaur Riyar studied Chemical engineering at National Institute of Technology Jalandhar, India. After graduation, she did her post-graduation from Indian Institute of Technology Roorkee, India. She joined as a research scholar in the same institute working with Prof. Vijay Kumar Agarwal. Her research area involves the synthesis and characterization of SAPO-34. Catalytic performance of those catalysts were checked for methanol to olefins production.

The development of an economical, efficient and eco-friendly method for the synthesis of interesting compounds such as Ortho-dihydroxylated aromatic products is one of the principal's aims of chemistry. Hydroxytyrosol (HTY)

(3,4-dihydroxyphenylethanol) is one of the main phenolic components of olive oil characterized by its highly antioxidant property as well as its remarkably free radical scavenging capacity.Not only is it more active than antioxidant vitamins (E and C) and the synthetic antioxidants, but also it presents several interesting aspects for human health such as anti- inflammatory activity and a platelet aggregation inhibition.Moreover, HTY is likely to be applied in food as well as cosmetic and pharmaceutical industries.Recent research works have demonstrated that the bioavailability of HTY makes it a beneficial addition to the diet.

Diverse synthesis procedures to produce HTY have also been developed. However, the production methods proposed are highly expensive and/or produce low yields or use severe conditions. Acid-activated clays are among the most extensively studied solid acid catalysts for many organic transformations owing to their environmental compatibility, low cost, high selectivity and thermal stability. The most interesting features of this smectite are their intercalation, swelling and cation exchange capacity which improve the catalytic properties of smectite clay. This process was well described, and it is based on the production of powerful antioxidant -OH by the combination of the oxidant hydrogen peroxide with the presence of iron ions trough the redox process known as the Fenton reaction.

In this context, A successful procedure to demonstrate the ability to produce high-added value phenolic hydroxytyrosol by oxidation of tyrosol was developed, using KSFclay with peroxide hydrogen to afford excellent yields (more than 60%). Different derivative compounds in reaction mixture during reaction time were identified using mass spectrometry. Hydroxytyrosol 3,4-dihydroxystyrene; 3-hydroxyphenyl acetic acid and 2.5-dihydroxyphenylethanol were the major compounds. By means of 2,2-diphenyl-1-picrylhydrazyl DPPH method, the antioxidant activity was realized, indicating that the strongest antiradical activity (IC50 =21.57 mg/mL). An effective procedure was also developed to produce high-value added phenolic compounds through the conversion of 2-phenylethanol (2-PhEt) by using acid-activated clays KSF for the hydrogen peroxide. A variety of complex oxidations were catalyzed to convert 2-PhEt to hydroxytyrosol (HTY) and tyrosol (TY) derivatives. The analyses of catalytic solution revealed that the yield during the conversion reaction into HTY was around 25%. All compounds in the reaction mixture were identified by mass spectrophotometry using a LC-MS apparatus. HTY, TY, meta-tyrosol and Ortho- tyrosol were the major compounds. The antioxidant activity revealed that the strongest inhibition percentage (PI = 96%) was detected with the increase in the concentration of HTY. The developed synthesis, investigated for the first time, is operationally simple, an environment friendly method and could find application for industrial purposes.

Keywords: Catalytic conversion, Hydroxytyrosol, Tyrosol, Oxidation, 2-henylethanol, KSF clay.

Biography:

Prof. Mohamed Bouaziz was awarded PhD in Analytical chemistry and Bioactive compounds from natural substances (olive by products and medicinal plants) from Sfax University, Tunisia and Kew Gardens, London UK. He has been working on the Food chemistry and food bioactive ingredients for the past 21 years. Now, as a full Professor, he is Director of Studies and member of the Scientific Council at the Higher Institute of Biotechnology of Sfax-Tunisia. In addition he is a Scientific Evaluator Expert of the Euro-Mediterranean project, Scientific Evaluator Expert CNEAR assessments of research laboratories in Tunisia and Member of the National Commission:Instance of Evaluation, Quality Assurance and Accreditation INEAQA. He has published more than 200 papers in top-ranked International Food Chemistry journals (h-index=32 in Scopus). He has extended his valuable service for many years and has been a recipient of many award and grants. His international experience includes various programs, contributions and participation in different countries for diverse fields of study.

ZnO nanorods (NRs) are promising components in a wide range of nanoscale devices for future applications in photocatalysis, solar cells and optical devices. The nanorods in the form of arrays vertically oriented to the substrate can be obtained by electrochemical deposition; however, the morphology of the deposit is very sensitive to the synthesis conditions. In this study, ZnO nanorods are electrodeposited on a transparent conducting glass from nitrate baths. The influence of temperature and the deposition time on the electrochemical characteristics has been studied by cyclic voltammetry (CV) and chronoamperometry (CA). The potentiostatic current transients, based on the Scharifher–Hills model, reveals that nucleation mechanism is progressive and instantaneous with a typical three-dimensional (3D) nucleation and growth. However, the nucleation rate of ZnO changes with increasing deposition temperature. Mott–Schottky measurements reveal an n-type semiconductor character for samples with a carrier density of Nd = 6.65 × 1022cm-3. Scanning electron microscopy (SEM) observations show arrays of vertically aligned ZnO nanorods (NRs) with good homogeneity. The X-ray diffraction study confirms the

wurtzite phase of the ZnO nanostructures with high crystallinity. The high optical properties of the ZnO NRs was checked by UV–vis absorbance analysis, the band gap energy of films varies between 1.2 and 3.37 eV with transparency

around 95-100%.

Keywords: Electrochemical nucleation and growth, ZnO Nanorods , optical properties, semiconductor.

Biography:

In 2012, she obtained the degree of Bachelor in Chemistry at Mouloud Mammeri University, Tizi-Ouzou, in Algeria. Then, in 2014, she obtained the diploma of Master in chemistry option chemistry-physics under the title: elaboration of thin films of Cu_2O by electrochemical deposition under the direction of professor AZIZ KADRI at Mouloud Mammeri University, Tizi-Ouzou , Algeria. Thereafter, she integrated a research lab, laboratory of physics and chemistry of materials (LPCM) at the same University (Mouloud Mammeri of Tizi-Ouzou) in order to prepare my PhD thesis in chemistry. In 2020, she obtained Ph.D. degree in chemistry option physico-chemistry of materials under the title: Elaboration of thin films of Cu_2O, ZnO and heterojunction ZnO nanowires / Cu_2O dendrites by electrochemical and hydrothermal methods: application in photocatalysis under the direction of Professor AZIZ KADRI at Mouloud Mammeri University, Tizi-Ouzou, Algeria. From this work, they could participate to 10 national and international congresses with an international publication.

A variety of strategies are being implemented to reduce the emission of human induced greenhouse gases, particularly carbon dioxide in relation to climate change at a global, national and regional level for achieving a low-carbon and carbon-neutral society. The ultimate goal of climate change strategy is to achieve a carbon-free society which is the original state of atmosphere before industrialization has been advanced in the 18th century. Nonetheless, it is quite rare to establish

and implement strategies for achieving a carbon-free society.

In such context, this paper will present a framework for achieving carbon-free society through overcoming the limitations inherent in the existing strategies of low-carbon and carbon-neutral society. The presentation will be composed of four parts as below.

1. The difference in the concept and implication of low-carbon, carbon-neutral and carbon-free will be examined.

2. The limitation inherent in the existing low-carbon and carbon-neutral strategies will be critically examined in terms of their measures for achieving carbon-free society.

3. A framework for achieving a carbon-free society will be presented in a way to overcoming the limitations inherent in the existing low-carbon and carbon-neutral strategies, focusing on overall direction of nature-based and technology-based approach, major socio-economic sectors and strategies to be included, and methodologies for analyzing the efficiency and effectiveness of the strategies.

4. As a concluding remark, what capacity should be built will be discussed for achieving a carbon-free society.

Audience Take Away:

- The difference in the concept and implication of low-carbon, carbon-neutral and carbon-free.
- What sectors of nature and socio-economy should be covered for achieving a carbon-free society as a response to climate change.
- What capacity should be built for achieving successfully a carbon-free society.

Biography:

Dr. Dai-Yeun Jeong is presently the Director of Asia Climate Change Education Center and an Emeritus Professor of Environmental Sociology at Jeju National University (South Korea). He received BA and MA Degree in Sociology from Korea University, and PhD in Environmental Sociology from University of Queensland (Australia). He was a Professor of environmental sociology at Jeju National University (South Korea) from 1981 to 2012. His past major professional activities include a Teaching Professor at University of Sheffield in UK, the President of Asia-Pacific Sociological Association, a Delegate of South Korean Government to UNFCCC and OECD Environmental Meeting, etc. He has published 13 books including Environmental Sociology

Oxygen reduction reaction (ORR) is a key reaction in the number of electrochemical technologies directed towards energy storage and conversion such as alkaline fuel cells and metal-air batteries. Development of these technologies

is hampered by sluggish oxygen reduction. For this reason, various electrocatalysts are being developed for ORR in alkaline solutions. Pt-based electrocatalyst offer low overpotential but lack long-term durability. Thus, 3d transition-metals materials have been targeted due to their low cost and stability in alkaline media. Recently, their hydroxides have been indicated as a stable and active catalyst for electrochemical ORR.

In this presentation we will show that nickel hydroxides (Ni(OH)2/NiOOH) derived via an electrochemical oxidation of a nickel dithioxamide Ni(dto) chelate polymer in 1M KOH are promising candidates for ORR in alkaline solutions. In the experiment, synthesized Ni(dto) was mixed with acetylene black and deposited on a glassy carbon electrode after mixing with polyvinylidene fluoride used as a binder. The electrode was subject to potential cycling in the range of 0.5-1.55 V vs RHE. In the first potential sweep, Ni(dto) underwent oxidation to produce nickel hydroxides dispersed in a carbon matrix. The resultant nanocomposite was characterized by powder X-ray diffraction (XRD) and scanning electron microscopy (SEM). The electrocatalytic activity of the nanocomposite towards ORR was studied in O2-saturated 1 M KOH using cyclic voltammetry (CV) and rotating disk electrode (RDE) linear sweep voltammetry (LSV) methods. The nanocomposite showed an enhanced ORR activity with the onset potential of 0.78 V and E1/2 = 0.72 V vs RHE in O2-saturated 1 M KOH solutions. Investigation of the electrode after potential cycling reveals a presence of NiOOH. In this presentation we will discuss the reaction mechanism and compare the results to our previous report on Cu(dto)-derived nanocomposite.

Biography:

Ihsan Budi Rachman is a PhD student in Rzeznickas' group at Shibaura Institute of Technology (SIT). He received his Master degree from King Fahd University of Petroleum and Minerals, Saudi Arabia in 2017 in the field of chemical sciences. His current subject is 3d transition metals coordination polymers as oxygen reduction electrocatalyst. His supervisor, Prof. Izabela Rzeznicka, received her PhD degree from Hokkaido University in the field of surface reaction dynamics in 2004. Her current research subjects include investigation of surface reactions of electrified interfaces and biointerfaces.

Copper slag (CS) is an industrial by-product from the pyro-metallurgical process of copper. Even though CS is a non- hazardous material, the enormous yearly production (2.2 tons of CS for every ton of copper produced) makes it to be considered as a serious concern in environmental issues. From that purpose, the present research is to focus on the copper extraction from CS with different factors by high-power ultrasound (US). This US extraction process includied leaching time, temperature, leaching solution, acid leaching concentration on the process. In the process, the particle size of CS used during this experiment was 120-150μm containing about 1.5 % copper loading. For the copper extraction, the solid powder was mixed with several aqueous solutions such as HCl, H2SO4 and HNO3 in the combination of 5 % H2O2 and NaCl 5% with the 1:20 ratio (10g-200ml). Then, the obtained pastes were stirring from 30 to 240 minutes at 28 kHz – 600W of US. After the leaching experiment, the mixtures were centrifuged and the obtained liquid was filtered. ICP-OES was used to identify the quality and also quantity of the ion in the solution. As results, the leaching efficiency increased significantly in comparison with the conventional leaching. When the sample was stirred in 30 minutes using 1M HCl aqueous solution, the leaching efficiency was increased from 9.3 % to 25.8 % with the combination of US. Meanwhile, it was found that longer leaching time was required for the conventional leaching (28.4% at 4 hours). Moreover, with the addition H2O2 solution, the leaching was enhanced, showing to be 41% when 2M HCl was used. In the case of HNO3 (2M), however, with the presence of H2O2 the leaching was increased from 31% to 36% in 1 hour with US. Further research about the US effect on the leaching efficiency was carried on by using coumarine and umbelliferone to confirm the appearance of the OH- radical which was formed by

sono-chemical effect of the US exposure.

Audience Take Away:

- Audience will learn basic concept about ultrasound in general and effect of the extraction process, leaching mechanism and some information about the situation of copper slag in Japan and over the world.
- On the copper extraction process, the present research can provide for audience some alternative solution in generating OH- radical in US condition, how to identify the OH- radical generating effect using coumarine, umbelliferone and KI.
- On the process with and without the presence of US, the effect of the other factors like treatment temperature, leaching solution, and additive chemical to be effective of leaching the copper extraction.

Biography:

Mr. Phan Phuoc Tri studied Environmental Technology Engineering at University of Science of Ho Chi Minh city, Vietnam from 2013 to 2017. After graduation, He has been pursuing doctoral degree at Nagaoka University of Technology in the Department of Science of Technology Innovation supervised by Prof. Takaomi Kobayashi since 2018.

Antibiotics are widely used in aquaculture, stockbreeding, and human medicine. They are of great concern as many of them can induce bacterial resistance and resistant genes even at environmental concentrations. Recently, antibiotics have been detected worldwide in surface waters as well as wastewaters with their concentration levels as high as mg/L. Therefore, advanced treatment and remediation technology of antibiotic pollution are urgently needed. -OH-based heterogeneous Fenton-like oxidation process has been proved to be an effective approach for the removal of organic pollutants. However, the complex preparation processes and high cost of catalyst restrict the practical application for the removal of pollutants. In this study, Ferrocene (Fe) was introduced to establish a heterogeneous photo-Fenton system for the degradation of sulfonamide antibiotics, taking sulfamethoxazole as a representative. The results showed that the removal of sulfamethoxazole was effective in Fc-catalyzed photo-Fenton system as compared to other control system (Fe, H_2O_2 or Fc/H_2O_2 under irradiation). Electron spin resonance and radical scavenging experiments verified that there was a photoindued electron transfer process from Fc to H_2O_2 and dissolved oxygen resulting in the formation of hydroxyl radical (-OH) that was primarily responsible for the degradation of sulfamethoxazole in the Fc-catalyzed photo-Fenton system. The reactions of -OH with substructure model compounds of sulfamethoxazole unveiled that aniline moiety was the preferable reaction site of sulfamethoxazole with -OH, which was verified by the formation of hydroxylated product and the dimer of sulfamethoxazole in Fc-catalyzed photo-Fenton system. This heterogeneous photo-Fenton system displayed an effective degradation efficiency even in a complex water matrix, and Fc represented a long-term stability by using the catalyst for multiple cycles. The observation that dissolved organic matter, HCO −, and Cl−/Br− at environmentally relevant concentrations, -OH scavengers, did not dramatically retard the degradation, which is positive from an application viewpoint. These results demonstrate that Fe-catalyzed photo-Fenton oxidation may be an efficient approach for the remediation of wastewater containing antibiotics, and provides new remediation strategy for the organic wastewater.

Audience Take Away:

- The audience can identify radical species in photocatalyzed system using electron spin resonance and radical scavenging methods.
- A heterogeneous photo-Fenton system based on ferrocene (Fe) was developed for the elimination of organic pollutants in wastewater, which provides new remediation method for organic wastewater and is helpful for filling the knowledge gap of heterogeneous photo-Fenton theory.
- Even in a complex water matrix, this heterogeneous photo-Fenton system still manifests an effective degradation efficiency, which is indicative of well application prospect.

Biography:

Dr. Senlin Tian studied Environmental Science at the Kunming University of Science and Technology, China and graduated as MS in 2000, where he has been a professor in the Faculty of Environmental Science and Engineering since 2008. He received her PhD degree in 2004 at the Zhejiang University, China. His main research interests focus on the environmental catalytic materials and water pollution control. He has published more than 80 research articles in SCI(E) journals.

It is shown that the evolution of dissipative structures on the Earth, which include, amongst other things, living organisms and superorganismal systems, obeys a fundamental principle–Ziegler's principle of maximum entropy production. However, when a system approaches its stationary state due to the exhaustion of the free energy available to the dissipative structures of the planet, evolutionary changes are replaced by the relatively slow processes of the optimization of the homeostasis of the emergent structures. At this stage, Prigogine's principle of minimum entropy production becomes the main principle. It is shown that humanity found itself in this situation at the present stage of the Holocene, facing the inevitable need for rational use of the resources available to us. A similar rationalization was already implemented by Nature at the end of the previous stage of evolution (in the absence of man) based on the ability of biota (which developed over billions of years) to regulate and stabilize the biosphere of the planet. Therefore, at the present stage of evolution, B. Commoner's law of ecology is manifested: nature knows better. It has been demonstrated that humanity is already in the situation of the operation of this law. Over the past two decades, the so-called "green economy" has emerged—a direction in economics in which it is believed that the economy is a dependent component of its natural environment and is a part of it. In particular, it is shown that the use of "green farming" is expanding in the field of agriculture and the associated water sector (especially in the arid and semiarid regions of the planet). These agricultural technologies are characterized by more economical methods of tillage: a partial or complete rejection of dump plowing, a lack of vertical mixing of the arable layer, minimal soil disturbance by agricultural machines, and mandatory soil mulching (no-till or mulch tillage) in order to preserve soil moisture and reduce soil erosion. The system of zero tillage (no till—no interference with natural soil formation processes) is a modern farming system in which the soil is not cultivated and its surface is covered with specially shredded plant residues—mulch. It is illustrated that at present, no-till technology is being introduced in various regions of the planet. The use of green farming technologies leads not only to rationalizing the use of energy and soil resources, but also water resources, the situation with which is becoming

increasingly tense for human civilization.

Audience Take Away:

- The presented study can serve as a guideline for the creation of technologies for the rational use of natural resources.
- The results obtained can help the audience in substantiating the transition of mankind to a new and inevitable strategy for the use of natural resources by man in order to achieve sustainable co-evolution of human civilization and the biosphere.
- From a practical point of view, the results justify the need for the development of "green farming" based on the use of nature-based technologies in agriculture and water management.

Biography:

Dr. Gusev graduated the National Research Nuclear University, Moscow in 1972. He got a doctorate in Hydrology at the Agrophysical Institute (St. Petersburg) in 1980 and a doctorate in Biological sciences in Soil Science at Moscow State University in 1993. He currently works at the Institute of Water Problems, (RAS, Moscow) as head of the Laboratory of Soil Water Physics. He is the author of 3 monographs and more than 130 articles in SCI journals. For scientific activity, he received awards from the International Academic Publishing Company "Science / Interperiodica", the American Biographical Institute, the International Biographical Center, etc.

The photo electrochemical properties were investigated on hybrid CZTS films. The hybrid CZTS films were grown on FTO coated glass substrate using hybrid precursor containing inorganic chemicals and natural basil extraction. The basil extraction in bath was varied from 0 to 5 ml. Hybrid CZTS films grown using precursor with 5 ml basil extraction shows significant better photo electrochemical response than samples prepared with 0 and 1 ml. The results may lead to the

development of hybrid CZTS to fabricate hybrid photo electrochemical cells for solar power and solar fuel generation.

Audience Take Away:

- Audience will learn about alternative solar absorber CZTS and its growth using electro-deposition as well as its applications for photoelectrochemical solar conversion.

- Methods and Studies will be helpful to students to get job in energy conversion and storage related research area.
- The advanced experiments in proposed work may lead a new kind of low cost and eco-friendly solar cells that may compete existing silicon solar cells.

Biography:

T. Shiyani studied physics at Saurashtra University, Rajkot and graduated as MS in 2008. He then joined the School of Nanosciences at Central University of Gujarat for PhD in solar energy conversion devices. He also established Shiyani Research Institute at Rajkot, India to develop R&D facilities for advanced research in solar energy and nanotechnology. He has published reputed research articles, review articles and books in SCI(E) journals.