magnus Group

Joint Event

3rd Edition of International Conference on

Oil, Gas, and Petroleum Engineering &

19th Edition of Global Conference on

Catalysis, Chemical Engineering & Technology

19-21 September | Rome, Italy

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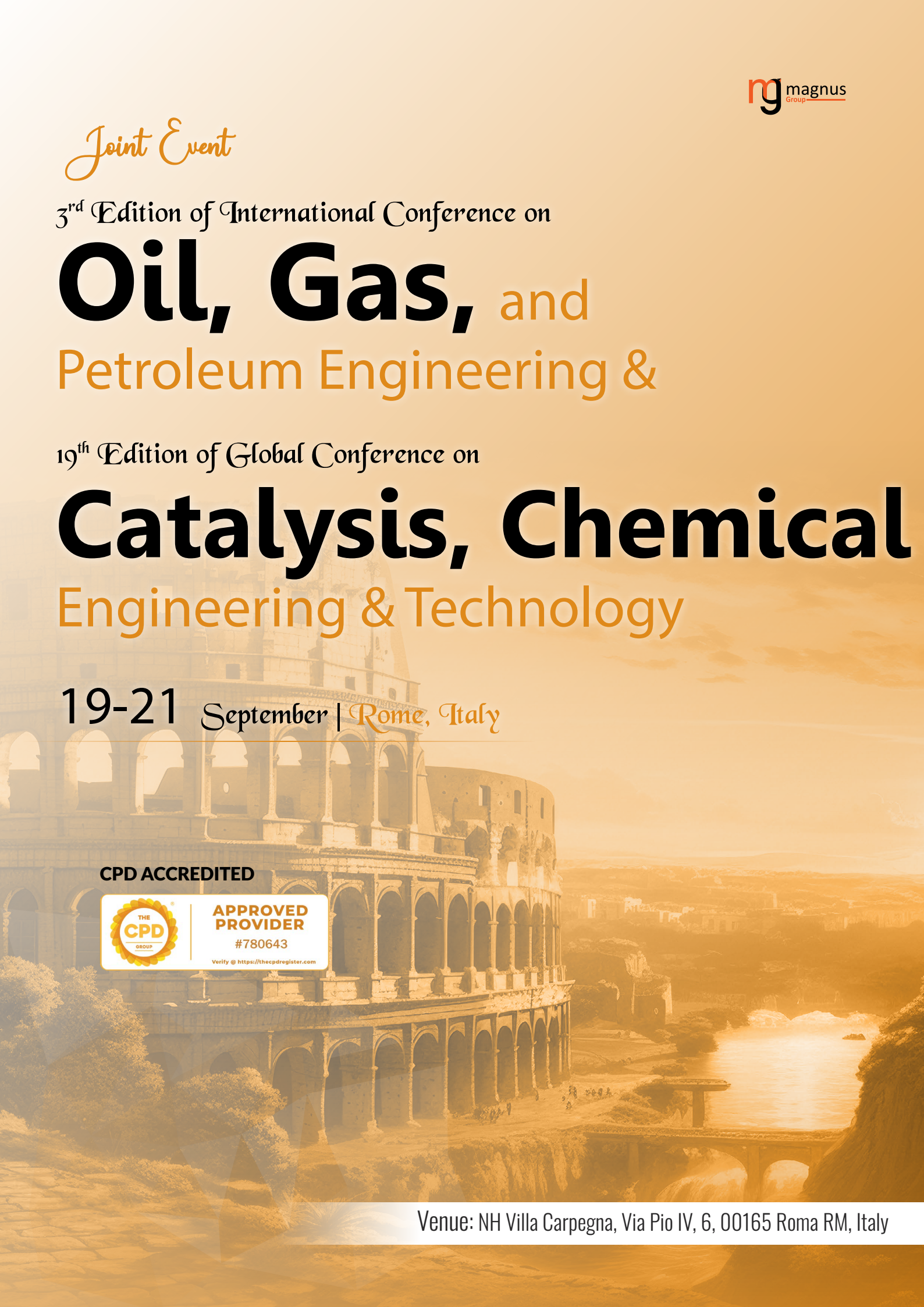

Venue: NH Villa Carpegna, Via Pio IV, 6, 00165 Roma RM, Italy

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SEPT

19-21

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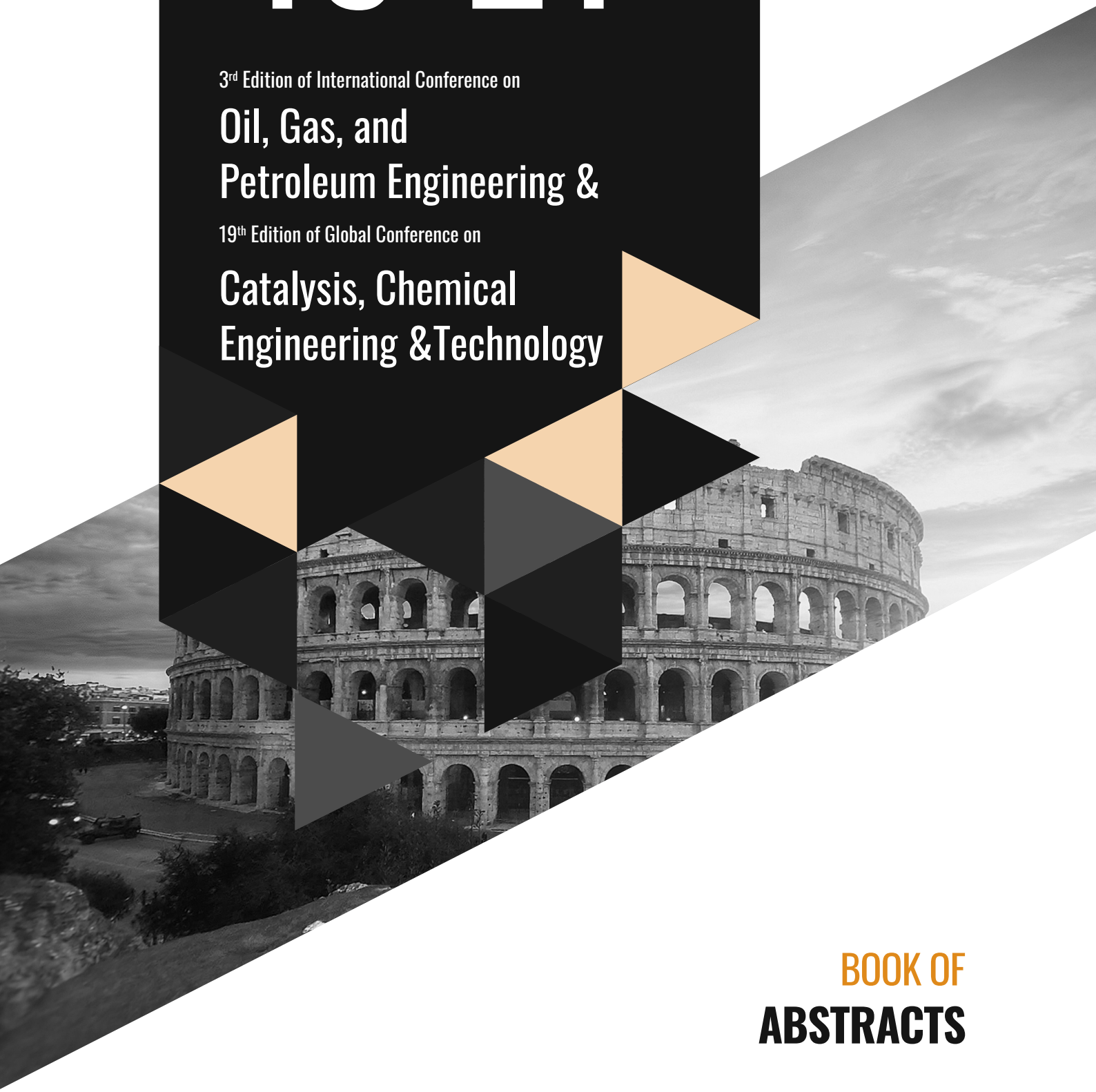

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Shunli Wang
Smart Energy Storage Institute, China

Stanislaw Dzwigaj
Sorbonne University, France

Yuanhua Lin
Southwest Petroleum University, China

Thank You All...

Speakers

Abhishek Prajapati
Indian Institute of Technology Madras, India

Abul Kasem Fazlur Rahman
University of Oklahoma, United States

Ahmed Mahgoub
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Anshuman Agrawal
Minimac Systems Pvt. Ltd., India

Bashar Al-Enezi
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Doowook Kim
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Emir Borovac
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China University of Petroleum (Beijing), China

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Beijing Institute of Technology, China

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Salim Almutairi
Kuwait Oil Cinpany, Kuwait

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Shashikumar K Paknikar
Nishant Aromas Pvt. Ltd, India

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Paher University, India

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Tokeer Ahmad
Jamia Millia Islamia India

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Amity University Uttar Pradesh, Nodia, India

Vikram Mahamiya
The Abdus Salam International Centre for Theoretical Physics, Italy

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Boreskov Institute of Catalysis SB RAS, Russia

Waewvalee Pramoon
PTT Exploration and Production, Thailand

Xia Li
Zhengzhou University, China

Xiao Zhang
Cracow University of Technology, Poland

Mohamed Ali Tarassi
Waha Oil Company, Libya

Thank You All...

Welcome Message

Stanislaw Dzwigaj

Sorbonne University, France

Dear congress visitors,

It is my honor and great pleasure to write a few welcome notes to you. Through centuries people were fascinated with the possibilities of synthesis of new materials with extraordinary properties. New materials are practically needed in all domains of life. Design and synthesis of new materials is one of the most important and interesting part of material sciences. Particularly a synthesis of new active and selective catalysts is a very important challenge. Our main aim concentrates on the new methods of the synthesis of single-site hierarchical porous zeolite catalysts with acid-base and redox properties. Such zeolite catalysts with active sites formed by incorporation of heteroelements in their framework are perspective as catalysts of protection of environment and biofeedstock conversion into valuable chemicals.

Welcome Message

PROF. DR. John W. Sheffield

Purdue University, United States

Dear conference participants,

It is a great honor to share with you my welcoming remarks. As we prepare for this conference on the future trends in the downstream sector of the oil and gas industry, we must join in the global discussions about energy transition pathways. We often hear that we need an all-energies approach, but we also need an all-technologies approach, including green hydrogen technology. Instead of using fossil fuels as the source of hydrogen, the production of green hydrogen, produced by electrolysis of water using excess renewable electricity, can be used to mitigate CO_2 emissions in oil refining, and has the least green-premium for the switch-over cost. Globally, this green hydrogen technology can make a significant contribution towards our goal for a sustainable future.

Welcome Message

Dai Yeun Jeong

Asia Climate Change Education Center, South Korea

Dear Congress Visitors

We are delighted to invite you to the upcoming the 19th Edition of Global Conference on Catalysis, Chemical Engineering & Technologies (CAT 2024) to be held in Rome, Italy during September 19-21, 2024.

The CAT 2024 aims to bring together scientists, researchers, experts, students, industries and companies from around the world. By fostering knowledge exchange and discussion, we aim to create a unique multidisciplinary environment for interaction and collaboration related to catalysis and chemical engineering and technology covering such as catalysis and porous materials, catalysis in nanotechnology, catalysis for renewable resources, catalysis for energy, environmental catalysis, and green and sustainable chemistry, etc.

These topics are all the current and future need by industry in a narrow sense. However, in a broad sense, they provide are an efficient and effective means for realizing sustainable development being promoted as the present and future ideology and practice of socio-economic development at a national and global level. This is because industry is the primary agent taking a role in promoting sustainable development through adopting sustainable technologies.

We are actively looking forward to welcoming you to the CAT 2024 and collectively exploring the frontiers for expediting the future endeavors in catalysis and chemical engineering.

Welcome Message

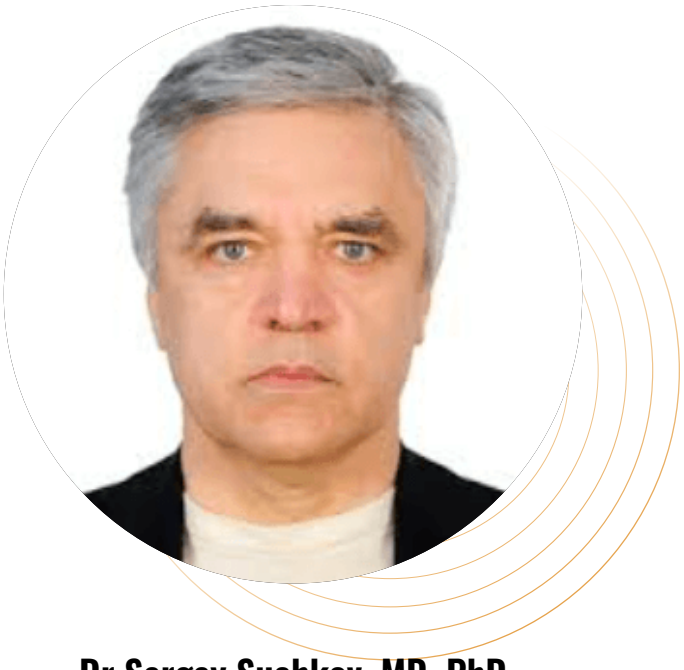
Professor Dr. Saim Memon

Sanyou London Pvt Ltd, United Kingdom

Dear Fellow Conference Attendees,

It is a great honour to welcome you to the session entitled “Renewable Energy.” As scientists and researchers, we are united by a shared commitment to the betterment of society. This Renewable Energy session, within the broader context of Oil, Gas, and Petroleum, plays a vital role in advancing critical areas such as carbon capture, energy generation, smart automation, and energy-saving technologies. These innovations are essential in our pursuit of net-zero energy infrastructure. In this session, we will explore a diverse range of renewable energy sources, including biomass, geothermal, solar, water, and wind. This is a valuable opportunity for scholars from around the world to share their scientific discoveries, discuss progress, offer critical insights, and gain knowledge from the latest research in renewable energy. Let us embrace this opportunity to learn from one another and work together toward a sustainable future.

Welcome Message



Dr Sergey Suchkov, MD, PhD

The Russian University of Medicine and The Russian Academy of Natural Sciences, Russia

Dear Partners, Researchers, Biodesigners & Bioengineers, Business leaders and Friends,

It gives us a great pleasure to welcome you to the19th Edition of Global Conference on Catalysis, Chemical Engineering & Technology to be hold in Rome as the Unique Beauty of the Eternal and Holy City, in September 19-21, 2024.

This Grand Event aims at creating a unique design-inspired multidisciplinary environment for interaction and collaboration related to catalysis, chemical engineering and technology for renewable natural and engineered resources, bioenergy, environment, sustainable chemistry and bioindustry as a whole. The other valuable type of interaction to be promote by this Event is setting up of productive discussion between basic researchers, biodesigners, bio- and chemical engineers, chemists & biologists, and bioindustry experts in order to drive the development of innovative solutions for life sciences, biochemical industry and healthcare applications.

The primary goal of the Conference is to promote research and developmental activities in Chemical Engineering and provide opportunities for the delegates to exchange new ideas and application experience face to face, to establish business or research relations and to find global partners for future collaboration. A special accent will be concentrated on catalysis by new materials and innovative chemical engineering to produce cost effective industrial products of the next-step generation (including renewable energy sources) and combinatorial (catalytically and immunologically armed antibodies of the future to come).

The Event would offer a dynamic blend of expert keynotes, interactive workshops, and unparalleled networking opportunities, fostering collaborations that will shape the upgraded principles and phylosophy of chemical technology, whilst operating across a multitude of sectors from Basic Chemistry through Biochemical Design to Bioindustry. We keenly understand that the new or upgraded solutions will come from the combination of fundamental knowledge, multidisciplinary development efforts, as well as advances in production communication tools. So the key and valuable speeches will be given by distinguished experts from academic institutions and industry, as well as by young junior participants. Those promising perspective aspects will provide us with new angles to look at the chemistry and chemical engineering in the coming decades and inspire the development of new methods, technologies and strategies to make our society sustainable.

WE do hope to see you all in the Grand Rome to enjoy the event along with the exceptional beauty of the ancient and unique Rome City. We extend a heartfelt welcome on this occasion and will have an appealing, exciting and unforgettable experience and thank you!

Welcome Message

Marta Litter

University of General San Martin, Argentina

Dear congress attendants,

It is an honor and pleasure to welcome you to the 19th Edition of Global Conference on Catalysis, Chemical Engineering & Technology Rome, Italy during September 19-21, 2024. Use of iron nanomaterials for the treatment of emergent contaminants in water represents an especially prominent issue from the point of view of fundamental and applied science, offering new opportunities to combine science and technology for environmental purposes. The technology is optimal to remove especially recalcitrant pollutants from water such as chlorinated compounds, heavy metals and metalloids, which cannot be treated by conventional methods. This low-cost technology is able to increase the knowledge of young generations and also to offer sustainable ways of controlling pollution in water, air, and soils. To achieve this goal, a multidisciplinary approach is necessary to develop innovative ideas and collaborations focused to open new scientific courses. From this point of view, CAT 2024 represent an exciting opportunity to meet different competences and establish contacts focused to develop new research collaborations, Thus, welcome and enjoy the Meeting! I hope you enjoy this relevant Conference.

Welcome Message

Dr. Raymond Li

University of Canberra, Australia

It is my pleasure to welcome you to the International Conference on Oil, Gas and Petroleum Engineering. You are what this conference is all about: exchanging ideas, sharing your cutting-edge research in oil and gas, and importantly, meeting other people with a common research interest. As energy transition gained traction and many countries strive to increase the share of renewables in their energy mix, the oil and gas industry faces unprecedented challenges. New or improved petroleum technologies will help maintain the competitiveness of the petroleum industry, and even create new demand for its products. Reliable supply of oil and gas at reasonable price will not only maintain consumer confidence, but also consolidate the role of oil and gas in energy transition. I hope this conference will open many fruitful and continuing dialogues among us.

Welcome Message

Lin Yuanhua

Southwest Petroleum University, China

It is my honor and great pleasure to write a few welcome notes for the conference of International Conference on Oil, Gas, and Petroleum Engineering - IOGP 2024. This hybrid event welcomes participants both in person and virtually. To those attending in person, we welcome you to Rome, Italy, and sincerely hope you enjoy your stay. To those attending virtulay, we wish you a pleasant experience and have a concrete exchanges. As an invited lecturer and a member of the Scientific Committee, I am honored to share with you my recent findings and contributions to Oil & Gas sciences and engineering, coveringing mechanism, prediction, and control of integrity failure of cement sheath during the entire lifecycle in my Keynote lecture. I am grateful to all participants for the opportunity to meet you and discuss new trends and advances in the Exploration & Production (E&P) field, moreover, many thanks to the conference organization team to establish a good exchange stage for all the scholars.

ABOUT
MAGNUS GROUP

Magnus Group, a distinguished scientific event organizer, has been at the forefront of fostering knowledge exchange and collaboration since its inception in 2015. With a steadfast commitment to the ethos of Share, receive, grow, Magnus Group has successfully organized over 200 conferences spanning diverse fields, including Healthcare, Medical, Pharmaceutics, Chemistry, Nursing, Agriculture, and Plant Sciences.

The core philosophy of Magnus Group revolves around creating dynamic platforms that facilitate the exchange of cutting-edge research, insights, and innovations within the global scientific community. By bringing together experts, scholars, and professionals from various disciplines, Magnus Group cultivates an environment conducive to intellectual discourse, networking, and interdisciplinary collaboration.

Magnus Group's unwavering dedication to organizing impactful scientific events has positioned it as a key player in the global scientific community. By adhering to the motto of Share, receive, grow, Magnus Group continues to contribute significantly to the advancement of knowledge and the development of innovative solutions in various scientific domains.

ABOUT
CPD Accreditation

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Continuing Professional Development (CPD) credits are valuable for CAT 2024 & IOGP 2024 attendees as they provide recognition and validation of their ongoing learning and professional development. The number of CPD credits that can be earned is typically based on the number of sessions attended. You have an opportunity to avail 1 CPD credit for each hour of Attendance. Some benefits of CPD credits include:

Career advancement: CPD credits demonstrate a commitment to ongoing learning and professional development, which can enhance one's reputation and increase chances of career advancement.

Maintenance of professional credentials: Many professions require a minimum number of CPD credits to maintain their certification or license.

Increased knowledge: Attending CAT 2024 & IOGP 2024 and earning CPD credits can help attendees stay current with the latest developments and advancements in their field.

Networking opportunities: CAT 2024 & IOGP 2024 Conference provide opportunities for attendees to network with peers and experts, expanding their professional network and building relationships with potential collaborators.

Note: Each conference attendee will receive 23 CPD credits.

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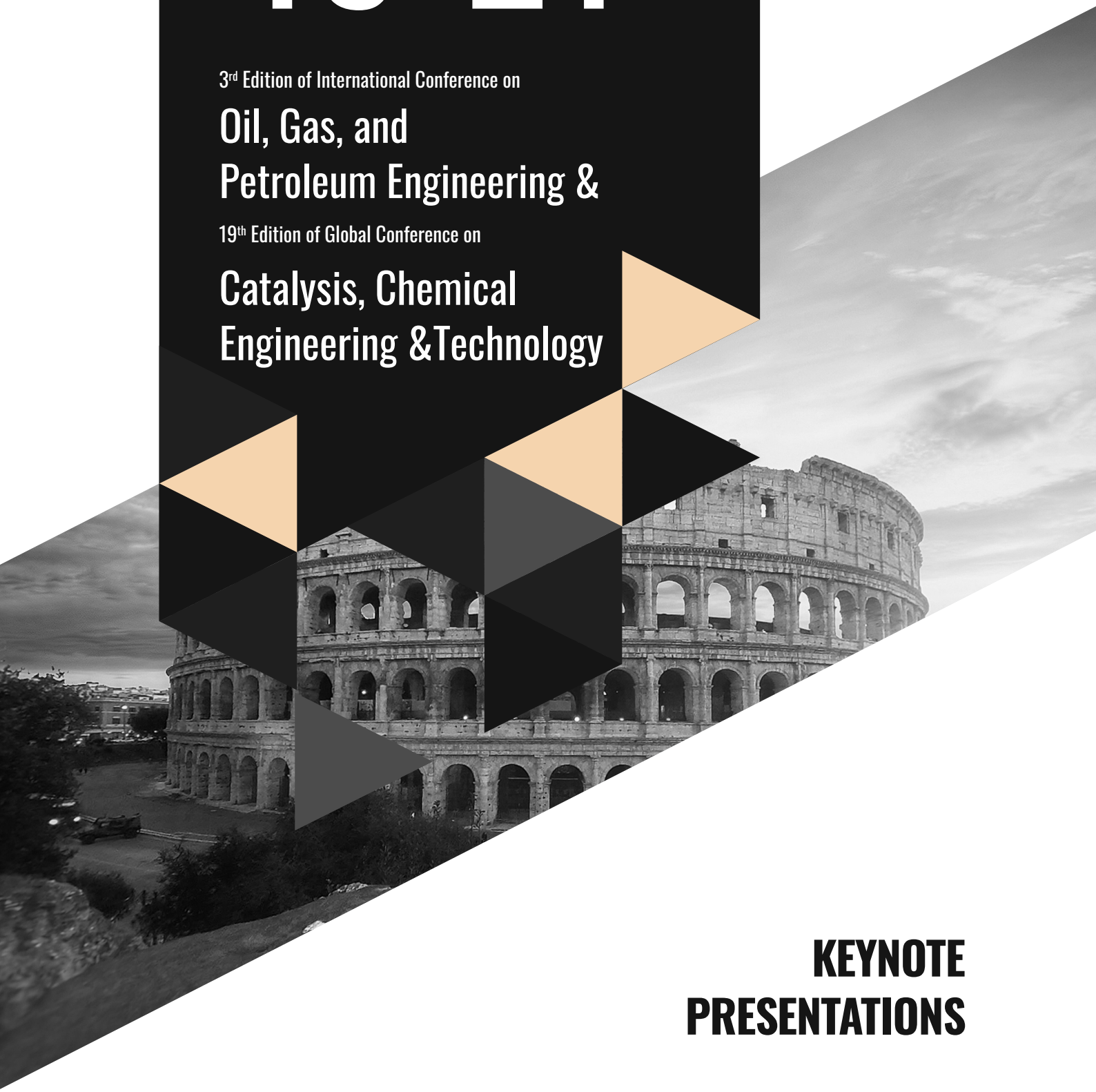

KEYNOTE PRESENTATIONS

Disruptive new CCUS technologies utilizing CO_2 as a commodity in carbon neutral gas production and reduced carbon footprint oil production

Providing sustainable energy for the future is a major global challenge that needs to reflect the growing societal awareness and concern for global warming. Due to climate concerns, new energy resources need to be cleaner, although the dependency on fossil fuels will continue; IEA estimates that 70% of energy consumption in 2035 will still be from fossil fuels.

Future energy production needs to reflect lower carbon footprint, exhibit reduced CO_2 emissions, and include carbon sequestration in the form of CO_2 storage. Successful global CO_2 storage in the amounts needed to mitigate global warming requires industry participation, reflecting improved economic and environmental sustainability. Opportunity for the industry to generate revenues is crucial, thus new disruptive Carbon Capture Utilization and Sequestration (CCUS) technologies are needed. Two technologies recently developed at University of Bergen as enablers of CCUS are CO_2 Foam EOR for low carbon oil production and CO_2 injection in hydrates for carbon neutral gas production from hydrates.

Utilizing CO_2 as a commodity in CO_2 Foam EOR with mobility control is currently emphasized in a large-scale field pilot demonstration project in Texas. Compared to conventional CO_2 EOR, CO_2 Foam EOR may produce twice as much oil at lower cost and in shorter time, and more CO_2 may be sequestered. The technology indicates it may represent a gamechanger with respect to sustainable economics in CO_2 EOR; the Rate of Return was at a factor of more than 20.

Our MRI laboratory results have shown that exposing CO_2 to hydrate accumulations spontaneously produces methane, with no need for additional energy. CO_2 injection in hydrates is a win-win situation for CO_2 storage with simultaneous natural gas production. Each molecule of methane produced needs a CO_2 molecule to be released, establishing a carbon neutral gas production technology. There is more than twice as much energy in hydrates than all reserves of oil, gas and coal combined worldwide. This carbon neutral gas production technology may generate clean energy for the future, creating an associated huge market for CO_2 globally. USDOE, ConocoPhillips and JOGMEC performed a successful US$ 30mill CCUS field test in Alaska in 2012, demonstrating the technology at large scale.

Arne Graue

Dept. of Physics and Technology, University of Bergen, Norway

Biography

Arne Graue is Professor of Physics at the Department of Physics and Technology, University of Bergen (UoB), Norway. He is Head of "Reservoir Physics – Energy Technology and CO_2 Storage (CCUS)". His scientific interest is within Reservoir Physics emphasizing heterogeneous and fractured reservoirs, multiphase flow in porous media, in-situ fluid saturation imaging, laboratory investigation of Integrated EOR-techniques, Carbon Capture Utilization and Storage (CCUS), CO_2 sequestration and gas hydrates. He has published more than 300 scientific publications and supervised 218 PhD and MS students. He has MS-degree in Experimental Nuclear Physics and PhD degree in Reservoir Physics, all from UoB. Graue has been Invited Visiting Scientist/Professor at Massachusetts Institute of Technology (MIT), U. of Wyoming, U. of Kansas, at ConocoPhillips Research Center, OK, and at Rice University in Houston, TX, USA. He Chairs the Executive Boards of: Petroleum Research School of Norway, where all universities in Norway are members, Colorado Norway Clean Energy Transition Research and Educational Collaboration (ColNor), and NorTex Petroleum Cluster.

Audience Take Away Notes

- Learn about disruptive new CCUS technologies not widely known.
- Be inspired and learn how to utilize CO_2 in their own research.
- Info to be used to Inform students and co-workers on more sustainable use of fossil fuels.
- Learn about industry participation in CCUS projects.
- New research that other faculty could use to expand their research or teaching.
- New information to assist in CO_2 utilization in energy production.
- Interact with industry, academicians, and politicians in their own country to utilize new CCUS technologies.

How to analyze the effectiveness of climate change policy

Environmental problems are as much as serious to threaten the existence of humans on the earth. Climate change is one of the environmental problems, but is placed at the top in terms of its seriousness impacting on nature and humans. Wide range of climate change policies are being launched by local and national government. In addition, UNFCCC (United Nations Framework Convention on Climate Change) also proposes lots of climate change policies applicable to global level.

It is no doubt that the existing climate change policies being launched at a local, national and global level are all very suitable and right ones responding to climate change. However, it is necessary to analyze how effective the policies are on climate change. Nonetheless, it is quite rare to analyze the effectiveness of policy including climate change policy.

In this context, this paper aims at explaining how to analyze the effectiveness of climate change policy. This paper will be composed of four parts as below.

Part 1: First of all, we have to understand what policy is. Some concepts that are related to policy will be examined for improving the understanding of what policy is. The concepts to be examined are the definition of vision, objective, goal and strategy.

Part 2: Based on the concept of policy examined in Part 1, what climate change policy is will be explained. The concept of climate change policy will be explained first, and followed by the process of establishing climate change policy.

Part 3: Part 3 is the key sector of this paper, and will explain how to analyze the effectiveness of climate change policy. The analytic method of the effectiveness of mitigation policy will be explained first, and followed by the analytical method of adaptation policy. The former includes <Efficiency Analysis of Financial Investment by Policy> and <Effectiveness Analysis of All Policies as a Whole>. The latter includes <Cost-Effectiveness Analysis> and <Market and Non-Market Valuation Method> that can be used when estimating the effectiveness of adaptation policy.

Part 4: Most policies require a lot of conditions in their process being launched such as the availability of finance and advanced technologies, etc. In this context, this paper will examine what capacities should be built as the pre-requisites for implementing successfully the climate change policy by government.

Dai-Yeun Jeong

Asia Climate Change Education Center, Jeju City, Jeju Special Self-Governing Province, South Korea

Emeritus Prof. at Jeju National University, Jeju City, Jeju Special Self-Governing Province, South Korea

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, and has conducted 95 environment-related research projects funded by domestic and international organizations.

Audience Take Away Notes

- The audiences can utilize the analytic methods to analyzing the effectiveness of climate change policies that they establish.
- The analytic methods will help the audiences enhance their professional job performance.
- If other researchers include the analytic methods in their research on climate change, their research will be more comprehensive in that the existing previous researches do not cover the analytic methods analyzing the effectiveness of climate change policy.
- Yes, the analytic methods provide the designers with more efficient and effective job performance through identifying the strategies to achieve maximum effectiveness at the lowest cost.
- The most effective climate change policies identified through the effectiveness analysis would serve as providing the information on the right and best accuracy and solution in terms of deciding policy priority.
- Enhancing the understanding on the conceptual difference and relationship between strategy and policy, concept of climate change policy, and the process of climate change policy being established.

Innovative chemical additives as pour point depressants

The issue of controlling and preventing wax/paraffin deposition during various stages of crude production is a situation that is unavoidable and certainly more prevalent in specific geographical regions.

While diverse methodologies exist for mitigating this issue, the use of chemical additives to lower the pour point and improve the flow characteristics is often the most cost-efficient option. The tendency and potential for wax deposition and subsequent requirement for paraffin inhibitors and PPDs can often be established through various analytical methods. The type of paraffin inhibitor or PPD used in the field can depend heavily on the region and crude type. Challenging crude types demand unique tailored solutions beyond standard market offering. This research focuses on improved paraffin inhibition and pour point depression performance of novel paraffin additives exploring their structural differences in comparison to common benchmark inhibitors used in various crude oil conditions. Through different chemical synthesis routes, it can be possible to obtain highly efficient inhibitors for different oils especially for heavy oils.

Audience Take Away Notes

- This presentation will focus on how innovative paraffin additives can help to address the challenges that are found in heavier crudes by reducing the pour point and paraffin deposition with lower dosages and higher efficiency.

Dr. Irina Giebelhaus[1]*, Crystal Jacobs[2], Lilian Padula[2], Jörg Bömer[1]

[1]BYK-Chemie GmbH, Wesel, Germany

[2]Oilfield Chemicals, BYK USA, Gonzales- USA

Biography

Dr. Irina Giebelhaus studied Chemistry at the University of Cologne, Germany and received a diploma in 2010. Then she joined the research group of Prof. Mathur at the Institute of Inorganic and Material Chemistry in Cologne, Germany and received her PhD degree in Chemistry in 2013. She has worked at BYK-Chemie GmbH since 2014 and has held the position of Manager in Research and Development at BYK-Chemie GmbH since 2017.

Role of green hydrogen in CO_2 emission mitigation in oil refining

Green hydrogen can play a key role in the race to zero emissions for many industries. Specifically, it is important to define that green hydrogen is produced from electrolysis of water using excess renewable electricity from solar PV, on-shore, and off-shore wind sources. It is important to note that the updated EU Renewable Energy Directive (RED III) provides green energy targets, including mandates for industry and transport to use an increasing share of green hydrogen. The new directive includes a requirement for industries such as ammonia and chemicals production, oil refining and green steel for at least 42% of their hydrogen use to be renewable by 2030, rising to 60% by 2035. A recent study evaluated the role of green hydrogen for use in the oil refining industry in Finland as a replacement for grey hydrogen, hydrogen produced by reforming natural gas, concluded that green hydrogen could truly make a significant contribution to CO_2 emission mitigation in the oil refining industry. This Finnish study evaluated alternative scenarios for wind power procurement and evaluated the price sensitivity of green hydrogen.

Audience Take Away Notes

- Definition of Green Hydrogen - produced from excess renewable electricity.
- Impact of the updated EU Renewable Energy Directive (RED III).
- Role of Green Hydrogen in CO_2 Emission Mitigation in Oil Refining.

Prof. Dr. John W. Sheffield

School of Engineering Technology, Purdue University, West Lafayette, IN, USA

Biography

Dr. Sheffield is a Professor of Engineering Technology at Purdue University. He is the President of the International Association for Hydrogen Energy and has served for more than 40-years as an editor of the International Journal of Hydrogen Energy published by Elsevier. He previously served as a Founding Associate Director at the United Nations Industrial Development Organization - International Centre for Hydrogen Energy Technologies in Istanbul. He was selected for the 2022 Outstanding Leadership in Globalization Award from Purdue University and appointed as a 2023 Energy Scholar at the Institute for Resilient Environmental and Energy Systems at Oklahoma University.

Use of iron nanomaterials for the treatment of emergent contaminants in water

Iron-based nanomaterials are increasingly used in environmental applications. Different types of iron-based nanomaterials, namely, zerovalent iron nanoparticles, nanoparticles of iron oxides, and nanoparticles prepared from iron salts and natural extracts by green procedures, are briefly indicated in this presentation, together with their preparation, characterization, and applications in the treatment of pollutants in water, with emphasis on the works performed in the last 10 years. In terms of preparation, top-down procedures such as mechanical milling, nanolithography, laser ablation, sputtering, and thermal decomposition, and bottom-up methods such as chemical synthesis, sol-gel, spinning, Chemical Vapor Deposition (CVD), pyrolysis, and biosynthesis are indicated for nanoparticle production. The most commonly used nanomaterials are inorganic nanoparticles based on metal and metal oxides and, among them, iron-based materials have been widely used in the removal of pollutants in water. Among pollutants, halogenated organics, nitroaromatics, pesticides, dyes, antibiotics, halogenated aromatics, phenolic compounds, PCBs, inorganic anions such as nitrate and heavy metals and metalloids (e.g., Hg, Pb, Cr, Cu, As, Ni, Zn, Cd, and Ag); radioisotopes of Ba, TcO_4, and U, and antibacterial activity against Gram-positive and negative bacteria have been successfully treated. In some cases, iron-based nanoparticles have been combined with H_2O_2 in Fenton processes. In this presentation, examples of emergent contaminants are specially discussed. The advantages of using these materials and the need for their improvement to extend their deployment are remarked.

Keywords: Iron-based nanomaterials, Removal of pollutants, Emergent pollutants, Water

Marta I. Litter

Habitat and Sustainability School, National University of General San Martín-CONICET, San Martín, Buenos Aires province, Argentina

Biography

Prof. Litter is Dr. in Chemistry (Buenos Aires University, Argentina), with postdoctoral studies at the University of Arizona, USA. She is a Senior Researcher at the National Research Council and a Full Professor and Consultant at the National University of San Martín (Argentina). She has more than 250 publications in journals, books, and book chapters. She received the Mercosur Prize (2006 and 2011), the Charreau Prize for Regional Scientific-Technological Cooperation, the Prize for Latin American Women in Chemistry (2021), and the Houssay Prize (2022). She was designated pioneer in photocatalysis in Argentina and is a Member of TWAS, ACAL, and the Argentine Academy of Environmental Sciences. She received the Konex Diploma and the Platinum Prize in 2023.

World oil prices: Has china played a role?

World oil prices have experienced a period of sustained strong growth between year 2000 and 2008 before starting its rollercoaster ride in the last decade. Unlike the two oil price shocks in the 1970s, the long oil price hike to the peak in mid-2008 did not come hand-in-hand with major oil production disruptions. Commentaries often associated this oil price growth with various demand-side factors, including the "China factor", which is echoed by evidence from the academic literature. Being an economic superpower with an economy that is primarily powered by fossil fuels, China is expected to be influential on fossil fuel demand and prices. This presentation reviews China's activities and involvement in the world oil market in recent decades. It also presents new empirical results on the influence of China on the oil price.

Audience Take Away Notes

- Understand China's activities in oil markets.
- Model results help inform oil price modeling.
- Effects of global economic activities on oil prices.

Raymond Li

Faculty of Business, Government and Law, University of Canberra, Australia

Biography

Raymond Li is Associate Professor of Economics at the Faculty of Business, Government and Law. Ray's research interests include applied econometrics and energy economics. He is particularly interested in energy demand, energy pricing and market integration studies. His research outputs appear in a range of high impact factor international journals like the Energy Journal, Energy Economics, Energy Policy, Energy and Applied Energy, among many others. Ray is an editorial board member of three international academic journals and he has reviewed numerous research articles for academic journals.

Vacuum insulation energy technologies for realistically reducing heating or cooling energy requirements in buildings

Vacuum insulated energy materials for energy savings such as Vacuum Insulated Wallpaper (VIW), vacuum insulation panel (VIP and decorative integrated VIP are pivotal industrial R&D developments that help in reducing heating (in cold-arid regions) or cooling (in hot-arid regions) energy requirements in buildings due to their superior thermal efficiency and space-saving attributes. These vacuum insulated materials significantly reduce heat transfer, thereby lowering the energy needed for heating and cooling, aligning with sustainability goals by reducing buildings' carbon footprints. VIW and VIP are particularly effective in extreme climates, offering superior insulation with minimal thickness compared to traditional materials like XPS, EPS, mineral wool, or polyurethane. This results in less space required and lower overall energy consumption. In both cold-arid regions where heating is essential, and hot-arid areas where cooling demands are high, VIPs effectively prevent unwanted heat transfer, enhancing interior comfort while reducing energy use and associated carbon emissions. Overall, the application of VIPs in buildings not only supports stringent building regulations but also contributes to a sustainable, energy-efficient future. This keynote speech focus on addressing global challenges to pave the way for a sustainable, net-zero energy future using vacuum insulation energy technologies.

Audience Take Away Notes

- The audience will gain a comprehensive understanding of vacuum insulated materials like Vacuum Insulated Wallpaper (VIW) and Vacuum Insulation Panels (VIP), including their construction, thermal efficiency, and application in buildings.
- Attendees will learn how VIW and VIP can dramatically reduce heating and cooling energy requirements in buildings, particularly in extreme climates, by minimizing heat transfer with minimal material thickness.
- The presentation will illustrate how these vacuum insulated materials contribute to reducing a building's carbon footprint, aligning with global sustainability goals and building regulations.
- The audience will be able to compare the effectiveness of vacuum insulated materials with traditional insulation options like XPS, EPS, mineral wool, and polyurethane, understanding the advantages and limitations of each.

Saim Memon[1]*, Zhang Liangliang[2], Huang Shengyun[3]

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[3]China Academy of Building Research, No. 30 North Third Ring Road, Beijing, 100013, China

Biography

Prof. Dr. Saim Memon, CEO and Industrial Professor of Renewable Energy Engineering, unifies academic research, industrial manufacturing, and global product distribution. A Chartered Engineer and Fellow of the Higher Education Academy, he holds Qualified Teacher Status from the General Teaching Council for Scotland. Prof. Memon boasts multidisciplinary expertise in Electrical, Mechanical, and Renewable Energy Engineering, with over 120 research publications and 50+ speakerships, engaged in research with 40+ countries worldwide. He taught 41 modules, supervised numerous PhD and MSc/MEng projects, and collaborated with researchers in 40+ countries. His work has acquired 1600+ citations, a 23+ h-index, and a 52+ i10-index.

Personalized and Precision Medicine (PPM) as a unique healthcare model to be set up through biodesign-inspired biotech-driven translational applications and upgraded business marketing to secure the human healthcare, wellness and biosafety

Traditionally a disease has been defined by its clinical presentation and observable characteristics, not by the underlying molecular mechanisms, pathways and systems biology-related processes specific to a particular patient (ignoring persons-at-risk). A new systems approach to subclinical and/or diseased states and wellness resulted in a new trend in the healthcare services, namely, Personalized and Precision Medicine (PPM).

To achieve the implementation of PPM concept, it is necessary to create a fundamentally new strategy based upon the biomarkers and targets to have a unique impact for the implementation of PPM model into the daily clinical practice and pharma. In this sense, despite breakthroughs in research that have led to an increased understanding of PPM-based human disease, the translation of discoveries into therapies for patients has not kept pace with medical need. It would be extremely useful to integrate data harvesting from different databanks for applications such as prediction and personalization of further treatment to thus provide more tailored measures for the patients and persons-at-risk resulting in improved outcomes and more cost effective use of the latest health care resources including diagnostic (companion ones), preventive and therapeutic (targeted molecular and cellular) etc.

Translational researchers, bio-designers and manufacturers are beginning to realize the promise of PPM, translating to direct benefit to patients or persons-at-risk. For instance, companion diagnostics tools and targeted therapies and biomarkers represent important stakes for the pharma, in terms of market access, of return on investment and of image among the prescribers. At the same time, they probably represent only the generation of products resulting translational research and applications. So, developing medicines and predictive diagnostic tools requires changes to traditional clinical trial designs, as well as the use of innovative (adaptive) testing procedures that result in new types of data. Making the best use of those innovations and being ready to demonstrate results for regulatory bodies requires specialized knowledge that many clinical development teams don't have. The areas where companies are most likely to encounter challenges, are data analysis and workforce expertise, biomarker and diagnostic test development, and cultural awareness. Navigating those complexities and ever-evolving technologies will pass regulatory muster and provide sufficient data for a successful launch of PPM, is a huge task. So, partnering and forming strategic alliances between researchers, bio-designers, clinicians,

Sergey Suchkov[1,2]*, Noel Rose[3,5], Daniel Scherman[6,8], Shawn Murphy[4,6], David Smith[9], Hiroyuki Abe[11,12], Holland Cheng[10], Trevor Marshall[6]

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[2]Dept for Clinical Immunology of the Russian University of Medicine, Moscow, Russia

[3]Johns Hopkins Center for Autoimmune Disease Research and PAHO/WHO Collaborating Center for Autoimmune Disorders, Johns Hopkins Medical Institutions, Baltimore, MD, USA

[4]Harvard Medical School, Boston, MA, USA

[5]Boston Children's Hospital, Boston, MA, USA

[6]Centre de Recherche Pharmaceutique de Paris (CRP2), France

[7]Faculté de Pharmacie, Université Paris Descarte, Paris, France

[8]Centre National de la Recherche Scientifique, Unité de Technologies Chimiques et Biologiques pour la Santé (UTCBS) Inserm, Paris, France

[9]Mayo Clinic, Rochester, MN, USA

[10]T College of Biological Sciences, UC Davis, CA, USA

[11]ISPM, Tokyo, Japan

[12]Tokyo OncoClinic, Tokyo, Japan

business, regulatory bodies and government can help ensure an optimal development program that leverages the Academia and industry experience and FDA's new and evolving toolkit to speed our way to getting new tools into the innovative markets.

Healthcare is undergoing a transformation, and it is imperative to leverage new technologies to support the advent of PPM. This is the reason for developing global scientific, clinical, social, and educational projects in the area of PPM and TraMed to elicit the content of the new trend. The latter would provide a unique platform for dialogue and collaboration among thought leaders and stakeholders in government, academia, industry, foundations, and disease and patient advocacy with an interest in improving the system of healthcare delivery on one hand and drug discovery, development, and translation, on the other one, whilst educating the policy community about issues where biomedical science and policy intersect.

Audience Take Away Notes

- To implement special technologies into the lab and clinical practice and to be used the latter for monitoring the chronic disorders personally
- To get the clinical hospitals re-armed with precision OMICS-technologies of the next step generation
- Highly positive steps forward!
- To understand the aims, objectives and philosophy of Personalized and Precision Medicine (PPM) and Biodesign-driven Biotech to get the latter re-armed?
- To Adapt PPM towards the experience and knowledge in the daily practice?

Biography

Sergey Suchkov graduated from Astrakhan State Medical University and awarded with MD, then in 1985 maintained his PhD at the Sechenov University and in 2001, maintained his Doctorship Degree at the Nat Inst of Immunology, Russia. From 1987 through 1989, he was at Koltzov Inst of Developmental Biology. From 1989 through 1995, he was a Head of the Lab of Clin Immunology, Helm-holtz Eye Res Institute in Moscow. From 1995 through 2004, a Chair of the Dept for Clin Immunology, MONIKI. Dr. Suchkov has been trained at: NIH; Wills Eye Hospital, PA, USA; Univ of Florida in Gainesville; UCSF, S-F, CA, USA; Johns Hopkins University, Baltimore, MD, USA. He was an Exe Secretary-in-Chief of the Edit Board, Biomedical Science, an Int Journal published jointly by the USSR Academy of Sciences and the Royal Society of Chemistry, UK. At present, Dr. Sergey Suchkov is a Chair, Dept for Personalized Medicine, Preci-sion Nutriciology and Biodesign at the Institute for Biotech & Global Health of RosBioTech and Professor of the Dept for Clinical Immu-nology of A.I. Evdokimov MGMSU, Russia. He is a member of the: New York Academy of Sciences, American Chemical Society (ACS), American Heart Association (AHA), EPMA (European Association for Predictive, Preventive and Personalized Medicine), Brussels, EU; ARVO (American Association for Research in Vision and Ophthalmology); ISER (International Society for Eye Research); PMC (Personal-ized Medicine Coalition), Washington, USA.

Core state parameter monitoring of high-reliability smart energy storage systems

As an important component of the smart grid energy storage system, high-precision state of health estimation of lithium-ion batteries is crucial for ensuring the power quality and supply capacity of the smart grid. To achieve this goal, an improved integrated algorithm based on multiple layer kernel extreme learning machine and genetic particle swarm optimization algorithm is proposed to estimate the SOH of Lithium-ion batteries. Kernel function parameters are used to simulate the update of particle position and speed, and genetic algorithm is introduced to select, cross and mutate particles. The improved particle swarm optimization is used to optimize the extreme value to improve prediction accuracy and model stability. The cycle data of different specifications of LIB units are processed to construct the traditional high-dimensional health feature dataset and the low-dimensional fusion feature dataset, and each version of ML-ELM network is trained and tested separately. The numerical analysis of the prediction results shows that the root mean square error of the comprehensive algorithm for SOH estimation is controlled within 0.66%. The results of the multi-indicator comparison show that the proposed algorithm can track the true value stably and accurately with satisfactory high accuracy and strong robustness, providing guarantees for the efficient and stable operation of the smart grid.

Prof. Shunli Wang

Academic leader of the National Electrical Safety and Quality Testing Center, Smart Energy Storage Institute, China

Biography

Prof. Shunli Wang is a Doctoral Supervisor, Academic Dean, Academic Leader of the National Electrical Safety and Quality Testing Center, Academician of the Russian Academy of Natural Sciences, Provincial Senior Overseas Talent, Provincial level scientific and technological talents, Academic and Technical Leader of China Science and Technology City, and top 2% of top scientists in the world, who is an authoritative expert in renewable energy research. His research interests include modeling, state estimation, and safety management for energy storage systems. 56 projects have been undertaken, including the projects from the National Natural Science Foundation of China and the Provincial Science and Technology Department. 258 research papers have been published (Research Interest Score: 11547; Citations: 3167; h-index: 29). 53 intellectual property rights have been applied, of which 23 authorizations have been approved. 9 books have been published by famous publishers such as Elsevier and IET. 23 honorary titles or awards have been achieved, such as young scholars and leading experts of innovative talent teams. Also, the team has been continuously supported by the "University & Enterprise Innovative Talent Team Support Plan" and unanimously praised by employers and peer experts.

CO_2-assisted dehydrogenation of propane to propene over Zn-BEA zeolites: Impact of acid–base characteristics on catalytic performance

Research results about the influence of BEA zeolite preliminary dealumination on the acid–base characteristics and catalytic performance of 1% Zn-BEA compositions in propane dehydrogenation with CO_2 are presented. The catalyst samples, prepared through a two-step post-synthesis procedure involving partial or complete dealumination of the BEA specimen followed by the introduction of Zn^{2+} cations into the T-positions of the zeolite framework, were characterized using XRD, XPS, MAS NMR, SEM/EDS, low-temperature N_2 ad/desorption, C_3H_8/C_3H_6 (CO_2, NH_3)-TPD, TPO-O_2, and FTIR-Py techniques. Full dealumination resulted in the development of a mesoporous structure and specific surface area (BET) with a twofold decrease in the total acidity and basicity of Zn-BEA, and the formation of Lewis acid sites and basic sites of predominantly medium strength, as well as the removal of Brønsted acid sites from the surface. In the presence of the ZnSiBEA catalyst, which had the lowest total acidity and basicity, the obtained selectivity of 86–94% and yield of 30–33% for propene (at 923 K) exceeded the values for ZnAlSiBEA and ZnAlBEA. The results of propane dehydrogenation with/without carbon dioxide showed the advantages of producing the target olefin in the presence of CO_2 using Zn-BEA catalysts.

Audience Take Away Notes

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

Stanislaw Dzwigaj

Sorbonne Université, UMR 7197, Laboratoire de Réactivité de Surface

Biography

Professor Stanislaw Dzwigaj received his PhD degree in 1982 in Jerzy Haber Institute of Catalysis and Surface Chemistry, Krakow (Poland). After two years of postdoctoral stay at the Laboratoire de Réactivité de Surface Université P. et M. Curie (Paris) he obtained in 1990 a position of contracted researcher in the same Laboratory devoted to surface reactivity in relation to catalysis phenomena. Then, in 2008 he obtained permanent position in CNRS as a researcher. On February 19, 2014 for outstanding scientific achievements, he received the title of professor. His published work includes more than 180 papers published in reputable international journals.

Mechanical damage behavior and constitutive model of cement sheath under ultra-high temperature thermal cycling

The cement sheath faces extreme service conditions in ultra-high temperature and ultra-high pressure wells, which easily leads to the failure of the cement sheath and safety accidents such as annulus pressure and wellhead movement. Based on the wellbore structure design and conditions in the LD-10 gas field, the evaluation and testing method for the damage behavior of cement sheath under Ultra-High Temperature Thermal Cycling (UTTC) is proposed. The mechanical properties test of cement sheath under thermal cycling (25℃150℃25℃, 25℃200℃25℃, 25℃250℃25℃) is conducted by combining the full-scale experiment device of "9-5/8" production casing-cement sheath-13-3/8"technical casing". The evolution law of mechanical properties of cement sheath after thermal cycling is obtained and the damage behavior and mechanism of cement sheath is clarified. The results show that the temperature and thermal cycling significantly negatively affect the mechanical properties of cement sheath and the degree increases with increasing number of cycles and temperature. The damage to the cement sheath is caused by five factors, which could be summarized as the changes in mechanical properties of the cement sheath caused by temperature itself and fatigue damage caused by thermal cycling on the cement sheath. Based on the test results, a uniaxial compression damage constitutive model under thermal cycling with consideration of the pore compaction stage and elastic deformation stage and a triaxial compression damage constitutive model with consideration of the elastic deformation stage and plastic deformation stage are established, by which experimental results validate these models. The research results could provide a reference and basis for optimizing and controlling cement sheath integrity in deep wells.

Audience Take Away Notes

- A method for evaluating the mechanical damage behavior of full-scale cement sheath under thermal cycling was proposed.
- This could benefit to clarify the damage mechanism of cement sheath under severe alternating temperatures.
- This could contribute to broadening the cognition of the boundary for cement sheath damage theory and enrich the wellbore integrity theory, and more beneficial to investigate the control and prediction method of wellbore integrity.
- This could contribute to establishing the indicator system for the evaluation of cement sheath integrity under severe alternating temperatures and propose the recommended practices for maintaining the long-term integrity of cement sheath in ultra-deep wells.
- The research results can provide a new method and concept for the optimization design of wellbore integrity and cement sheath integrity in deep wells and ultra-deep wells.

Yuanhua Lin[1,2]*, Niaotao Zhou1, Kuanhai Deng[1], Kai Yan[1], Changlin Li[1]

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[2]School of New Energy and Materials, Southwest Petroleum University, Chengdu, 610500, Sichuan, P.R. China

Biography

Yuanhua Lin, the professor and doctoral supervisor, is the deputy director of CNPC Key Laboratory of Petroleum Pipe Engineering, the researcher of the State Key Laboratory of "Oil and Gas Reservoir Geology and Development Engineering", and the head of the Team leader of young scientific and technological innovation research in Sichuan Province. He mainly engages in research on oil and gas well construction engineering, oil well tubing mechanics and corrosion prevention, wellbore integrity management, and other related fields. He has published more than 120 research articles in SCI journals and obtained more than 60 national patents.

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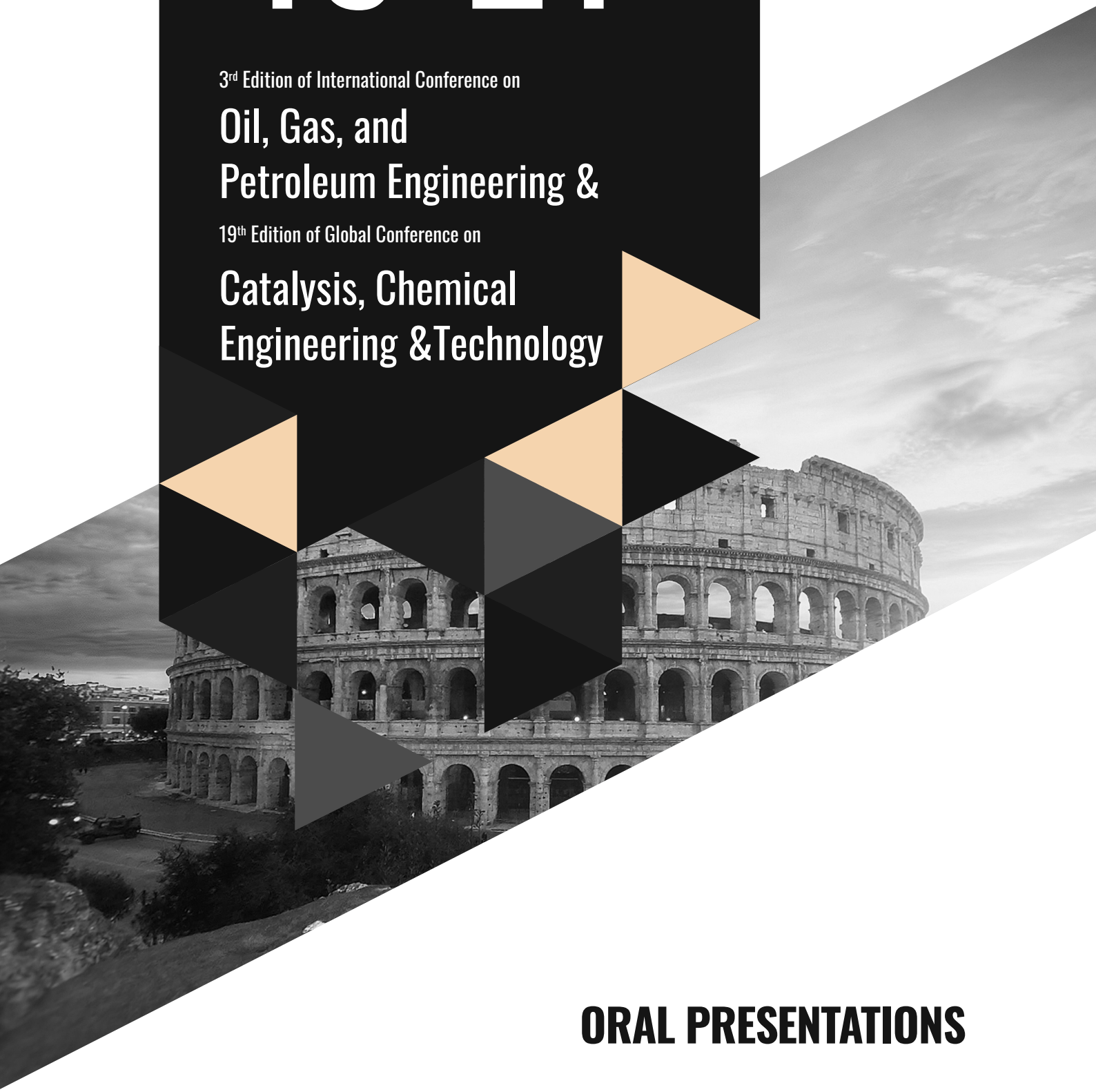

ORAL PRESENTATIONS

Abhishek Prajapati*; Rajesh R. Nair
Department of Ocean Engineering, Indian Institute of Technology Madras, Chennai, Tamil Nadu, India

Underground coal gasification: Unlocking the potential of India's coal resources

Underground coal gasification (UCG) represents a promising technology for addressing the world's growing energy needs while mitigating environmental impacts. This paper provides a comprehensive overview of UCG, emphasizing its potential and relevance in the Indian context. As India holds the fifth-largest coal reserves globally, integrating UCG into its energy infrastructure could significantly enhance energy security and sustainability. The UCG process involves the in-situ conversion of coal into syngas through controlled combustion, eliminating the need for traditional mining. This method offers several advantages, including reduced surface disturbance, lower greenhouse gas emissions, and access to deep or un-mineable coal seams. However, successfully implementing UCG requires overcoming technical, environmental, and regulatory challenges. This paper reviews the current state of UCG technology, detailing recent advancements and innovations that have improved efficiency and safety. We explore various gasification techniques with a focus on the types of coal seams prevalent in India. The potential environmental impacts of UCG, such as groundwater contamination and land subsidence, are assessed alongside mitigation strategies and best practices.

Case studies from pilot projects are presented to illustrate successful applications and lessons learned. Safety and risk management play a vital role in UCG operations. This paper examines the risks associated with UCG, including gas leakage and explosions, and provides recommendations for enhancing safety protocols and regulatory frameworks. Finally, the paper discusses the potential applications of syngas produced through UCG in India, including power generation, industrial use, and chemical production. The integration of UCG with India's existing energy infrastructure and the role of carbon capture and storage (CCS) technologies in reducing the carbon footprint is also explored. In conclusion, UCG offers significant opportunities for India's energy sector, providing a pathway to cleaner and more efficient utilization of its vast coal reserves. This paper underscores the need forcontinued research, technological development, and international collaboration to realize the full potential of UCG in India.

Audience Take Away Notes

- Attendees of this presentation on Underground Coal Gasification (UCG) will gain several vital insights that can be applied in their professional and academic work:
- Raising awareness about the potential of UCG to contribute to sustainable energy solutions, particularly in coal-rich regions like India.
- Faculty and researchers can incorporate the case studies and technologies into theirresearch and teaching, fostering further exploration and development in the field.
- Engineers and project managers can apply the knowledge from UCG pilot projects aboutUCG techniques to their projects, ensuring safer and more efficient operations.
- Encouraging innovation and technological development in underground gasification and related areas.

- This highlights the potential for UCG to reduce environmental impact compared totraditional coal mining and combustion, which contributes to cleaner energy production
- Overall, this presentation aims to provide valuable knowledge and tools to improve UCG practices, makeoperations safer and more efficient, and encourage further research and innovation.

Biography

Abhishek Prajapati is pursuing his PhD in Petroleum Engineering under the guidance of Professor Rajesh Nair at the Indian Institute of Technology Madras, India. He transitioned to the PhD program after upgrading his MTech at IIT Madras. Abhishek completed his BTech in Petroleum Engineering from the Rajiv Gandhi Institute of Petroleum Technology in 2018. Throughout his academic career, he has been a meritorious student, earning various scholarships for his outstanding achievements. He has also held several positions of responsibility, including serving as the Vice President of the RGIPT SPE Student Chapter.

A.K. Fazlur Rahman[1,2*], Howard Zhong, William Wang and Kenneth M Nicholas[1]

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[2]Department of Chemistry, Oklahoma School of Science and Mathematics, Oklahoma, OK 3104

Transition metal mediated activation of carbon dioxide

The activation of Carbon Dioxide by transition metals forms the basis of numerous commercially and synthetically important catalytic processes. To understand the mechanistic aspects of these catalytic reactions we have reported earlier the formation of Metallo formates M-OC(O)H] [at the metal centers using CpTaH (CO) and CpNb (H) (CO) via stoichiometric oxidation reactions. In connection with our study of the activation of CO_2 molecules and to explore a route to mitigate Greenhouse Gases (GHG) we reacted CO_2 with hydrocarbons such as Tetralin, dihydroanthracene, cyclohexadiene and dihydroanthracene in the presence of various catalysts ($MeReO_4$, NH_4ReO_4, V_2O_3, Ru (acac)3 to produce corresponding dehydrogenated products and Formic Acids. We also have conducted studies with various vanadium, Cobalt, and ruthenium oxo complexes to explore the oxidation of alcohols and ethers in the presence of sodium hypochlorite. Catalytic Oxidation of benzyl alcohol demonstrated to produce benzaldehyde. Similar reaction with tetrahydrofuran produced y-butyrolactone.

Biography

Dr. Fazlur Rahman did his MA in Chemistry from Brande is University and a Ph.D. from the Australian National University in Canberra, Australia. He did his post-doctoral works at the University of Tasmania, Australia, at the Ames National Laboratory, USA and at the University of Oklahoma, USA. Dr. Rahman received the Southwest ACS regional Award in 2009 and the Oklahoma Chemist award in 2015. Dr. Rahman held visiting faculty positions at Texas A&M, University of Rochester, Cal-Tech, UC Berkeley, Free University of Berlin and Fried Schiller University, Rutgers University and at the Columbia University in NYC. He currently holds an endowed professorship and Sharkey's Energy Foundation Chair in Chemistry at the Oklahoma School of Science and Mathematics. Rahman also worked as an affiliated Professor of Chemistry and Chemical Engineering at the University of Oklahoma where he teaches Organic chemistry as an adjunct Professor.

Ahmed Mahgoub
CSD/Saudi Aramco, Dhahran, Saudi Arabia

Electrical power sources impact on oil & gas buried pipeline integrity

Pipeline leaks are one of the most critical issues that companies in the oil and gas industry must address. The primary cause of pipeline leaks is corrosion in either the interior or external parts of the pipeline. Companies have made significant efforts to combat equipment failure due to rust. Corrosion cannot be eliminated, however it can be mitigated. Cathodic protection has been widely used to protect the pipeline's externally parts.

In cathodic protection, the term "interference" is understood in the pipeline industry as electrical interference and is defined as "any detectable electrical disturbance on a structure caused by a stray current where a 'stray current' is defined as a current in an unintended path". Furthermore, although the interfering current is often a Direct Current (DC) from a Cathodic Protection (CP) impressed current source, the current can also originate from any electrical system that uses the earth either intentionally or inadvertently as a current path. Thus Alternating Current (AC), solar Photovoltaic (PV) system and High Voltage Direct Current (HVDC) can be included in the definition.

The location of steel buried pipelines in the vicinity of AC power transmission facilities has resulted in mutual electrical interference problems that can produce damaging effects on both utilities and an electrical hazard to pipeline personnel. However, the vast majority of interference problems is created by three-phase power transmission systems, since these involve both high currents (steady-state and fault conditions) and high voltages and are more likely to parallel pipelines for long distances than are low voltage distribution systems, for instance. Electrical energy from an overhead power line can be transferred to a pipeline by three possible mechanisms—conductive coupling (during fault conditions), electrostatic or capacitive coupling, and electromagnetic or inductive coupling.

Moreover, Due to the continuous growth of energy consumption and the installation of solar photovoltaic arrays at facilities and along the pipeline right-of-way (ROW) are being considered to reduce the carbon footprint, this close proximity has become more and more frequent. Therefore, there is a growing concern about the possible hazards resulting from the influence of DC leakage of grounded solar photovoltaic on metallic buried pipelines. The effects of DC stray current on metallic structures can be harmful, beneficial, or innocuous depending on the magnitude of the current density, type of structure, and location of current pick-up and discharge areas.

The prime objective of the presented work is to study the electrical interference taking place between power line and buried pipeline by focused on calculations of the induced voltage on pipeline and the mitigation design techniques using a developed MATLAB M-file program designed by the author, to examine the interference at both steady state and during fault conditions and compare results with applicable standards and to evaluate the performance of the earthing/grounding method when used for mitigation of induced voltages on pipelines.

Furthermore, impact of DC stray current corrosion from PV systems will be illustrated by estimating the local pipeline's potential shift at the coating / electrolyte interface based on the coating defect size and soil resistivity along the pipeline allows for the quantification of the corrosion risk on coating defects and will be compared against the allowable threshold limit based on international standards. The results and conclusions presented here can be used as a reference to analyse the severity of DC interference on pipelines due to proximate PV systems.

Finally, conducting these simulations and study will provide increased confidence when undertaking mitigation design by highlighting interference hot spots, therefore assisting with the design of more efficient mitigation systems to address both personnel safety and pipeline integrity concerns.

Audience Take Away Notes

- Will illustrate the impaction of DC &AC interference on buried pipeline integrity.
- Will improve the interference mitigation methodologies.

Biography

Dr. Ahmed Mahgoub, Currently working as SME in Saudi Aramco. Experienced engineer with a demonstrated history of working in CP Consulting, Contractor and Client environment with relevant experience of around 17 years. Ahmed has a Ph.D., is a AMPP CP Specialist, an Icorr CP Specialist, and a NACE Senior Corrosion Technologist.

Arun Kumar Shandilya
Dr. H.S.G.University Sagar, India

Helium in rocks of vindhyan super group around Sagar, South Ganga Basin, Bundelkhand Begion M.P. India

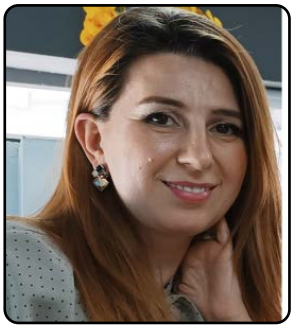
Studies on the exploration of the Helium gas in the rocks of the Vindhyan Super Group around Sagar, South Ganga Basin, Bundel khand region, M.P. is carried out in the detail with joint collaboration of Deptt. of Applied Geology and ONGC Energy Centre, Ahmadabad. As Author has already reported the Discovery og Helium has leakages through more than 50 tube wells/e wells excavated in agriculture fields various Villages in Sagar Distt. The geochemical analysis of the soil, gas and water indicates remarkable amount of Helium gas in these tube wells, containing about 0.45 to 0.735 and methane varying from 72 % to 99%. These investigations were done in the long research work (more then 25 years)dedication carried out in this area and research finding published in the Journal of National and International repute, which has attracted the officers/ Scientists of ONGC, Dehradun, CGWB, Faridbad, Atomic Mineral Directorate Hyderabad and Bhabha Atomic Research Centre Mumbai.

The Result of the stable isotopic analysis of Ethane gas in these samples □ C_{13} value are ranging from -24.9 per mill w.r.t. PDB and -26.9 per mill w.r.t. PDB and the Methane gas are ranging from Isotopic Values -54.0-per mill w.r.t. PDB to -61.5 per mill w.r.t. PDB are indicative that this gas is of thermogenic origin, which must have been formed at very high temperature & pressure condition in the deeper horizon of the great Vindhyan sedimentary basin of late Proterozoic (>500m.y.) period. A reporting of leakages of above mentioned gas from 50 tubewells in the inliers of Vindhyan rocks and even in the Deccan trap rocks ensures that this area must be having a big gas reservoir within Vindhayn rocks around Sagar-Distt. in M.P.

The ONGC energy Centre Ahmadabad has started the detail collaborative geophysical work on the drilling exploration upto the depth of 600 m has been carried out and to be carried out in various location from where the leakages of has been earlier reported earlier. In these 600 m deep drill holes detail geophysical logging including the gama ray logging and Neutron logging, lithological an d structural logging will be carried out to know the probable gas reserve and at what depth the, we can get the gas for the exploration and utilization of these ases for industrial purpose and other uses etc. The detail geophysical studies will be very much helpful in the gas reserve calculation and the depth of the gas pockets in the South Ganga Basin in Bundelkhand region in M.P.

Biography

Prof. Arun Kumar Shandilya, worked as Professor in Dr, H.S.G University SAGAR, having 44 years of Experience in Teaching and Research and Administration. he did his Doctoral research on Himalayan Tectonics. He had published more then 85 Research papers in the Journal of National and International repute. Supervised 8 students for Ph.D and more then 500 students for M.Tech/M.Sc Dessertaions on Himalayan Geology, Central India and Rajasthan Geology and Geology of Bundelkhand Tectonics, Satpura Tectonics and on Coal Geology and impact of mining on the Environment of Manganeese and coal, Iron, Marble mines, Phosphorire Mines etc. He has published a Book On-GEOLOGICAL AND ENVIRONMENTAL PROCESSES BY SPRINGER NATURE AND another book is on PENINSULA GEOLOGY AND ENVIRONMENT.



Jalilova A.A*, Alimardanov Kh.M, Suleymanova E.T.
Academician Y.H.Mammadaliyev Institute of Petrochemical Processes of the Ministry of Science and Education, Baku, Azerbaijan

Oxidative dehydrogenation of 4-Vinylcyclohexene to styrene in a two section reactor on metal-containing zeolites

This abstract presents the results of the oxidative dehydrogenation of 4-vinylcyclohexene in a two-section reactor in the presence of γ-Al_2O_3 (1st section) and Fe-Zr-Gd-La/HNa-ZSM-5 (2^{nd} section).

For the study, we used Fe-Zr-M-O/HNa- ZSM-5 (M-alkali or rare earth elements) catalytic systems prepared according to the method.

We previously established that in the temperature range of 250-320°C the main reaction products are conjugated dienes formed as a result of the migration of double bonds. The migration of double bonds in the substrate molecule in this temperature range is thermodynamically more favorable which leads to a sharp increase in the content of 3-ethylidenecyclohexene and ethylcyclohexadiene-1,3 isomers (52-57%).

Table:

Results of the studies on the oxidative dehydrogenation of 4-VCH in the two-section reactor (cat: I sec γ-Al_2O_3, II sec Fe-Zr-Gd-La/HNa- ZSM-5 –3 cm^2/3cm^2, V= 1.0 hour-1, 4-VCH:O_2 in each section 1:0.2)

T, °C/°C I section II section	Yield of liquid products, %	Composition of liquid products, wt %						Yield, %		Selectivity to EB+St,%
		C6-C8 cyclans, cyclenes	C8-cyclo-dienes	4-VCH	BTX	EB	St	EB	St	
350/400	97,2	2,2	23,2	28,0	1,9	33,2	11,5	32,9	11,6	61,2
375/400	97,0	2,4	24,8	29,2	1,9	31,5	10,2	31,1	10,2	57,6
400/400	96,7	1,6	23,0	24,0	3,3	35,6	12,5	35,1	12,5	62,0
350/420	97,0	2,7	21,3	23,0	3,0	34,6	25,4	34,1	25,6	76,8
375/420	96,2	1,8	22,9	22,5	3,7	34,9	14,2	34,2	14,3	61,8
400/420	93,0	1,3	18,8	17,4	5,0	38,5	19,0	36.5	18,3	65,3
350/450	95,4	1,5	15,8	9,2	4,7	46,2	22,6	44.9	22,3	73,7
375/450	95,3	1,5	12,0	9,2	4,9	48,2	24,2	46.7	24,1	77,6
400/450	95,0	1,3	9,8	7,0	5,9	50,2	25,8	48.7	25,4	79,3

In order to find experimental confirmation of these assumptions about possible reaction routes and obtain comparative results, the experiments on the dehydrogenation of 4-VCH were carried out in the two-section reactor with a section-by-section supply of oxygen. In the first section, 4-VCH was isomerized over γ-Al_2O_3 or Ga_2O_3/HNa-ZSM-5 at a temperature of 350-375°C; and in the second section, dehydrogenation of the forming isomerate over Fe-Zr-Gd-La/HNa-ZSM-5 in the temperature range of 400-450°C.

The obtained results are presented in a table and it is seen that at a temperature of 350/420-375°C/450°C and a molar ratio of 4-VCH:CO_2:O_2=1:4-5:0.05-0.1 the yield of ethylbenzene and styrene increases to 69.0-72.0%. The selectivity of the reaction as a result of reducing the degree of destructive oxidation, cracking and other side reactions of 4-VCH increases from 75.0-77.0 to 86.8-87.2%.

Thus, the use of the two-section reactor helps to increase the yield of target products in the temperature range of 350-450°C.

Biography

Dr. Arzu Akif Jalilova studied Chemical Technology at Azerbaijan State Oil Academy and graduated from academy as a technologist. She is a senior scientific researcher at the Laboratory of "Chemistry of alicyclic compounds" of the Institute of Petrochemical Processes of MSE of Azerbaijan Republic. She received her PhD degree on Petrochemistry in 2013 at the same institute. She conducted researches on the process of producing alkyl aromatic hydrocarbons, especially, ethylbenzene and styrene from 4-vinylcyclohexsene by oxidative dehydrogenation, preparation of catalysts in order to carry out the process, studied the impact of several factors on the process and achieved high results. The results were published in prestigious journals such as "Azerbaijan Chemical Journal", "Petrochemistry", "Applied Chemistry", "Processes of Petrochemistry and oil Refining", "Theoretical and experimental chemistry". She will be responsible for the development of catalysts and conducting oxidative dehydrogenation.

Dr. Ashanendu Mandal
University of Calcutta, India

Phenol removal from wastewater using innovative biological and industrial wastes as adsorbents

This research aims for adsorptive removal of phenol from wastewater by solid waste materials generated from biological wastes viz. guava tree bark, rice husk, neem leaves, activated carbon from coconut coir and industrial wastes viz. rice husk ash, red mud, clarified sludge from basic oxygen furnace, activated alumina. The adsorbents are characterized by SEM, XRD, FTIR and BET analyzers. The experiments of phenol removal are carried out with the variation of initial phenol concentration (5-500 mg/L), initial pH (2-12), adsorbent dose (0.10-20 gm/L), temperature (25-50°C) and contact time (30-600 min). The maximum phenol removal percentage through batch absorptions has been found to be as high as 97.50%. The kinetics analysis with the experimental results shows that the pseudo-second order model is best fitted for all adsorbents except red mud. The kinetic modelings show that the adsorption mechanism is supportive of film diffusion, intra-particle diffusion and chemisorption for all adsorbents. The isotherm analysis suggests that Freundlich isotherm model is best supportive for guava tree bark, rice husk, neem leaves, activated carbon, red mud and activated alumina, whereas Langmuir and D-R isotherm are best supportive for rice husk ash and clarified sludge respectively. The thermodynamics shows the spontaneity, randomness and endothermic/exothermic nature of the adsorption processes. The ANN modelling using two popular algorithms viz., Levenberg-Marquardt and Scaled Conjugate Gradient establishes that the experimental and predictive data are within allowable range. The scale-up designs are performed for their commercial applications. The regeneration and the safe disposal of used adsorbents are also studied for checking their wider industrial applicability. Further, the column study is also extensively carried out using the most efficient batch adsorbent neem leaves. The study concludes that these adsorbents can be used commercially for removal of toxic phenol from wastewater.

Biography

Ashanendu Mandal has graduated as B. Sc in Chemistry and B. Tech in Chemical Engineering from University of Calcutta. He has got his M. Tech Degree in Chemical Engineering from IIT, Kharagpur. He has acquired MBA degree in Finance from IGNOU, New Delhi and has undertaken an Advanced Management Program from IIM Calcutta. He has also acquired the Degree of Ph. D. (Tech) in Chemical Engineering from University of Calcutta. Dr. Mandal has worked in ONGC for more than 34 years and his experience includes commissioning, modifications, safety, operations, artificial lifts, pressure maintenance, EOR and planning in offshore and onshore oilfields. He has also vast experience in marketing of upstream and downstream petroleum products. Dr. Mandal has published technical papers in Chemical Weekly and research papers in many international journals. He has visited more than 25 countries for attending training programs and for participating in international conferences as invited speaker or panelist. Dr. Mandal is a lifetime member of Indian Chemical Society and Indian Science Congress.

Ayman Al Abbad*, Mustafa AlJubran
Saudi Aramco, Saudi Arabia

Sulfate removal facility yield enhancement

Objective: Treating seawater is an essential preliminary procedure before injecting it into reservoirs for pressure support. This process is vital for preventing the formation of hard calcium sulfate scales, which occur due to the reaction between sulfates present in seawater and calcium in rich reservoirs. This paper outlines a study focusing on planning and execution strategies for enhancing a Sulfate Removal Facility (SRF) production to meet the specification of Total Suspended Solids (TSS) and other geochemistry specifications of treated seawater. The study aims to identify the essential scope elements required to meet field injection requirements, encompassing associated infrastructure and the associated supporting systems/utilities to facilitate the implementation of a fulfilling water treatment process.

Methodology: The process of selecting the design for upgrading surface facilities follows a structured methodology comprising four stages of Front-End Loading (FEL), with comprehensive risk and safety evaluations conducted at each phase. This method begins with initiation, moves through the business case, study, design basis scoping paper, project proposal, and concludes with detailed design. Each phase undergoes evaluation and optimization using a value engineering approach.

Result: The four stages of Front-End Loading (FEL) are planned to be launched, with a focus on adhering to specific process design parameters to ensure the safety of both people and the environment. Through the value engineering process, various enhancement technologies will be identified, including the implementation of an Ultra Filtration System, the introduction of a waste water system as well as upgrading of utilities, electrical and process automation systems as appropriate. The design enhancement is expected to lead to an increase in permeate production, prolong the membranes lifecycle and improve the overall facility yield percentages.

Conclusion: The structured methodology that will be utilized as detailed in the paper is projected to result in a substantial production enhancement by sustaining the facility's maximum capability and improving the performance of the water treatment process, leading to the production of water at a quality that is complying with reservoir requirements. Moreover, sustaining continuous operation of the new pre-treatment filtration system will improve the overall performance of the facility.

Novelty: The development of surface facilities in a populated area poses significant challenges. The workflow proposed in this study effectively unlocks the field's potential despite the complex location.

Biography
Ayman Al Abbad is a seasoned Petroleum Engineer with over 14 years of experience in Upstream oil and gas industry, specializing in Petroleum Engineering, Facilities Engineering, Facilities Planning and Field Development. He holds a bachelor and Master degrees, both in Petroleum Engineering from Montana Tech and University of New South Wales, respectively. Ayman successfully led several oil development project within Saudi Aramco, showcasing exceptional leadership, technical expertise and successful track record in the oil and gas industry.

Ayman Al Abbad*, Ardian Nengkoda
Saudi Aramco, Saudi Arabia

Innovation on drilling pad and surface facilities selection to unlock potential for oilfield development in populated area

Objective: The strategies and requirements of surface facilities development for sour oilfield development in populated area varies based on their reservoir fluid properties, well potentials and HSE policies. This paper presents a study of planning and execution strategies for developing field surface facilities for sour oil production in proximity to populated areas. Additionally, the paper aims to address various HSE-related aspects, with a specific focus on safety as a critical factor influencing development strategy, investment size, and operational excellence.

Methodology: A Quantitative Risk Assessment (QRA) was conducted to quantify the risks associated with field development, particularly those stemming from H2S, throughout the asset's lifecycle. The surface facilities design selection process follows four stages of Front-End Loading (FEL) with rigorous risk and safety evaluations at each phase, starting from initiation, business case, study, design basis scoping paper, project proposal, and detailed design. Each phase will be evaluated and optimized accordingly with the approach of value engineering.

Result: The Quantitative Risk Assessment (QRA) was successfully completed under specific Rupture Exposure Radii (RER). The QRA findings led to several recommendations for the design of facilities and production philosophy to ensure the wells are produced safely. Through the value engineering process, various enhancement technologies were identified, including the implementation of drilling pads, introduction of appropriate multiphase pumps, utilization of unmanned and control operations, and the adoption of an Enclosed Ground Flare (EGF) System to mitigate development-associated risks.

Novelty: The development of surface facilities in a populated area poses significant challenges. The workflow proposed in this study effectively unlocks the field's potential despite the complex location.

Biography
Ayman Al Abbad is a seasoned Petroleum Engineer with over 14 years of experience in Upstream oil and gas industry, specializing in Petroleum Engineering, Facilities Engineering, Facilities Planning and Field Development. He holds a bachelor and Master degrees, both in Petroleum Engineering from Montana Tech and University of New South Wales, respectively. Ayman successfully led several oil development project within Saudi Aramco, showcasing exceptional leadership, technical expertise and successful track record in the oil and gas industry.

Beatrice Vincenti[1,2*], Orlando Palone[3], Alessandro Amadei[4], Martina Damizia[4], Luca Cedola[3], Benedetta De Caprariis[4], Domenico Borello[3]

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Syngas cleaning by chemical looping conversion of tars from hazelnut shells pyrolysis and gasification

The depletion of fossil fuel reserves, exacerbated by the climate crisis, is driving scientific research towards innovative and more sustainable methods to supply feedstocks for the energy and chemical industries. Chemical looping biomass gasification (CLBG) emerges as a promising alternative to conventional gasification processes, offering several advantages: a) no nitrogen dilution of the syngas, b) no external heat required to drive endothermic gasification reactions, and c) reduced tar generation. This technique involves the circulation of a solid material between two reactors: the fuel reactor and the air reactor. In the fuel reactor, biomass undergoes sequential pyrolysis and gasification, while the oxygen carrier interacts with char through solid-solid and gas-solid reactions, facilitating the reduction of volatiles. In the air reactor, an exothermic reaction restores the oxygen carrier to its original phase. Iron oxide (Fe2O3) is the most developed material for this purpose, being environmentally benign, readily available, and resistant to attrition.

This study employs an iron-based oxygen carrier to chemically loop gasify biomass waste, such as hazelnut shells. The investigation focuses on the impact of adding alkaline earth metals and/or transition metals to iron oxides on the composition of the resultant syngas. The synergistic effects of combining two or more metal oxides for chemical looping applications, including the use of waste materials as oxygen carriers, are also examined. A parametric analysis is conducted in a lab-scale fixed bed reactor, considering variables such as steam-to-biomass ratio, biomass-to-oxygen carrier ratio, reaction temperature, tar release, and gas space hourly velocity. Optimizing these parameters aims to enhance syngas output, lower heating value, improve biomass conversion, and increase carbon capture efficiency.

The performance comparison with an inert bed is discussed. Finally, material characterization before and after the reaction is carried out to assess: a) changes in material morphology (Scanning Electron Microscopy), surface area (Brunauer, Emmett, Teller analysis), and crystalline phase (X-Ray Diffraction) at each reaction step; b) the reaction pathway at different temperatures (Temperature Programmed Reduction); and c) the presence of deposits on the particle surface. This comprehensive characterization contributes to defining the proposed material's suitability for high energy density syngas production through chemical looping gasification.

Audience Take Away Notes

- Understanding the basic principles and advantages of CLBG compared to traditional gasification methods.
- The role of the oxygen carrier in the gasification process and its circulation between the fuel reactor and air reactor.
- Key parameters affecting CLBG performance: steam to biomass ratio, biomass to oxygen carrier ratio, reaction temperature, tar release, and gas space hourly velocity.

- How optimizing these parameters can enhance syngas output, reduce heating value, improve biomass conversion, and increase carbon capture efficiency?

Biography

Dr. Beatrice Vincenti is currently a Technologist at the Council for Agricultural Research and Economics, Center of Engineering and Agro-Food Processing (CREA-IT), where she carries out her research activity on the reuse of biomass from agroforestals as an energy source in a circular economy perspective. At the same time, she is a PhD student at Sapienza University in Rome, where she works on the optimization of biomass gasification processes. Graduated in Analytical Chemistry from the Sapienza University, she is now a member of the National Order of Chemists and Physicists and participates as a Member of Scientific Committees and Reviewer in several national and international conferences.

Ceren Sevimli*, Sedat İnan
Istanbul Technical University, Faculty of mines, Geological Engineering Department, Istanbul,Türkiye

An assessment of unconventional hydrocarbon potential of the Silurian Dadaş Shales in Diyarbakır Basin, Türkiye

The Silurian Dadaş Formation within the Diyarbakir Basin in SE Türkiye, like other Silurian shales in North Africa and Middle East, represents a significant prospect for conventional and unconventional hydrocarbon exploration. The Diyarbakır Basin remains relatively underexplored, presenting untapped potential that warrants further investigation. This studyfocuses on the thermal maturity and hydrocarbon generation histories of the Silurian Dadaş shales, utilizing basin modeling approach. The Dadaş shales are organic-rich and contain mainly Type II kerogen, especially the basal layer contains up to 10 wt. %TOC and thus it is named as “hot shale”. The research integrates geological, geochemical, and basin modeling data to elucidate the unconventional hydrocarbon potential of this formation, which is crucial given the global demand for energy and the need for new resources. The data obtained fromprevious studies were used to calibrate basin model that has been established by using PetroMod software (Schlumberger). The calibrated model results suggest that Dadaş shales are in oil generation window and that the major episode for thermal maturation and hydrocarbon generation took place prior rot Alpine orogeny (uplift and erosion) The modelingresults elucidate the burial history, maturity history, and hydrocarbon production history of the Silurian-aged Dadaş shales, as well as its hydrocarbon content in the area.

Audience Take Away Notes

- The Silurian Dadaş Shale Formation is regional hydrocarbon source rock has generated.
- By use of basin modeling, the burial, temperature, maturation, and hydrocarbon generation history for the Dadaş Shale is predicted.
- Diyarbakır Basin is evaluated in terms of its unconventional hydrocarbon potential.
- The audience will be informed about a case study where burial history and temperature history of source rock directly play important roles on the unconventional hydrocarbon potential.
- Yes, this research will guide to implement basin modeling in similar geological fields. This studyalso will give an opportunity to expand and improve production of unconventional hydrocarbons.

Biography
Ceren Sevimli is a master student currently pursuing in Geological Engineering at Istanbul Technical University, Türkiye. Prof. Dr. Sedat İnan is advisor on her master thesis project. She has bachelor's degree in Geophysical Engineering at Istanbul Technical University, with a thesis subject as "Gas hydrate potential in South Shetland Islands". The current research involves model prediction of the maturity and hydrocarbon generation histories of unconventional reservoirs in the Diyarbakır Basin of southeastern Türkiye.

Mansour Al-Azmi*, Danah Al-Humoud*
HSE–Safety Refinery, KIPIC (Kuwait Integrated Petroleum Industries), Zour, Kuwait

Ensuring safe transition: A comprehensive KIPIC HSE plan for commissioning new or modified plants

The successful commissioning of new or modified plants hinges on meticulous planning and coordination. This paper elucidates the pivotal role of a robust Health, Safety, and Environment (HSE) Transition Plan in ensuring the safe handover of systems from Engineering, Procurement, and Construction (EPC) contractors to Operations. The transition plan outlined by Kuwait Integrated Petroleum Industries Company (KIPIC) serves as a blueprint for safeguarding the well-being of personnel and the environment during the critical phase of transitioning from field activities to commissioning and start-up.

The HSE Transition Plan outlines specific accountabilities and practices to be followed during the turnover of systems from the EPC Contractor(s) to Operations, with a primary goal of protecting the health and safety of personnel and the environment. Key components of the plan include area demarcation, a robust work permit system, fire prevention and response measures, emergency response planning, and environmental compliance.

Furthermore, the plan underscores the significance of training and communication, facilitating smooth stakeholder interfaces, maintaining operational schedules, and robust incident management protocols. With meticulous attention to detail, the plan aims to mitigate execution risks, ensure compliance with regulatory requirements, and foster a culture of safety throughout the commissioning process.

Through adherence to the delineated guidelines, stakeholders can navigate the complexities of transitioning with confidence, safeguarding against potential hazards, and facilitating the seamless integration of new systems into operational environments. This paper serves as a comprehensive guide for organizations embarking on the commissioning journey, offering insights into KIPIC best practices for ensuring a safe and successful transition.

Audience Take Away Notes

- From the presentation, the audience will learn about the importance of a robust Health, Safety, and Environment (HSE) Transition Plan in ensuring the safe handover of systems from Engineering, Procurement, and Construction (EPC) contractors to Operations.
- They will learn the key components and practices outlined in the HSE Transition Plan, including area demarcation, work permit systems, fire prevention measures, emergency response planning, and environmental compliance.
- It will help the audience in their job to facilitate smoother transitions from construction to operational phases, minimizing disruptions and hazards.
- For job benefits the presentation upskills streamlined communication and coordination among stakeholders, leading to more efficient project execution.

- The presentation will demonstrate how to improve the accuracy of design by incorporating safety and environmental considerations from the early stages of project planning.

Biography

Mansour has a diverse experience in Oil & Gas industry. He started his career as a Maintenance Engineer at KNPC-Mina Abdullah Refinery. He also worked as a Projects/commissioning Engineer in Mega projects such as Clean Fuel Project and Al-Zour Refinery Project. In addition, he has worked as a lead design engineer in Petrochemical - Refinery Integration Al-Zour Project (PRIZe) during the FEED development. Currently, Mansour is working as a Senior Safety Engineer in Al-Zour refinery handling the start-up activities.

Danah Al-Humoud is an electrical engineering graduate with three years of experience as a Safety Engineer at KIPIC, She has merged her technical expertise with a dedication to ensuring workplace safety. Her role involved implementing and monitoring safety protocols to protect personnel and the environment during critical phases of project execution. Through meticulous planning and attention to detail, She has mitigated risks and fostered a culture of safety within the organization. Leveraging his engineering background, She has effectively communicated complex safety measures and procedures to stakeholders, contributing to successful project outcomes.

Mr. Dhiraj Gondaliya[1], Mr Kinjal Patel[2]
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The novel process for separation of water and sediments from ETP slop oil

The objective of this innovative research work was to develop reliable slop oil treatment techniques to address desalting and distillation process related issues faced by petroleum refinery. A huge quantity of slop oil is being collected at effluent treatment plant from de-salter brine water and reprocessed at petroleum refinery. The slop oil is in a very tight emulsion form having 60 to 75 percent water, 0.5 to 1.0 percent sediments and high amount of water-soluble salts. The reprocessing of tight emulsion with crude oil is quite challenging and petroleum refiner facing many problems even reprocessing at lower rate viz a) The huge quantity of slop oil is reducing refining capacity and increasing processing cost hence it has very big financial impact on GRM, it also consumes extra energy at different stages and require multiple storage, treatment & handling facilities (tanks, chemicals, mechanical and heating resources). It has adverse impact on environment as well as it increase hazardous risk, b) The worst quality of slop oil (high level of water, sediment and water soluble salts in tight emulsion form) is destabilizing de-salter & CDU operation, generating more slop oil during de-salting process and creating vicious cycle of emulsion, c) Some time, slop oil generation is very high and it is difficult to manage inventory, hence it become compulsion to reprocess within time frame even at the cost of more CDU throughput loss, d) It increase fouling, corrosion and frequent breakdown of critical equipment, and e) It is also impacting on colour of ATF product.

Nayara R&D team has invented a simple and quick process to separate water and sediments from ETP slop oil. The process performance is verified at laboratory scale and 1000 MTPM capacity semi-commercial demo unit at Nayara refinery. The process is capable to separate water up to 99 percent hence it is reducing the quantity of slop oil and it also separates sediments & reduce water soluble salts hence it is improving the quality of slop oil. From the experimental output, it is concluded that the invented process will resolve above mentioned problems of petroleum refinery. The process is under implementation stage at Nayara Refinery. The invented process is novel hence granted for Indian patent, PCT application published and EU patent under examination. Since the invented process is applicable to petroleum industries globally it is envisaged that invented process will be highly useful for petroleum fraternity.

Keywords: Crude oil, Slop oil, Oil-in-water emulsion

Audience Take Away Notes

- Slop oil generation from de-salter brine water and reprocessing is common practice at most of the petroleum refinery globally. The problems are facing due to reprocessing of slop oil by petroleum refineries is also similar in nature hence this research work will provide knowledge sharing of problems as well as available solution to these common problems. The presentation will have quite useful experimental research data with output results which highly useful for refinery operation, technical service, research people hence they can understand and utilize knowledge to resolve their problems.

Biography

Dhiraj Gondaliya is a General Manager and Head of R&D Laboratory, Nayara Energy Limited, India. He is a General Manager of R&D Laboratory with Nayara Energy Ltd (formerly known as Essar Oil Ltd), Vadinar, Dist. - Devbhumi Dwarka, Gujarat, India since 2006. He has more than 31 years of professional experience in petroleum and petrochemical R&D and QC/QC Laboratory. Prior to Nayara Energy Ltd, he worked with M/s Reliance Industries Ltd and M/s Lupin Laboratory. He earned his Master of Science degree with Organic Chemistry from Saurashtra University, Rajkot, Gujarat, India. He has carried out assignments in laboratory commissioning, project management, Lab operation and technical support for analytical and research activities of laboratory department. He is internal certified trainer & certified ISI 9001 auditor. He was nominated member of national committees viz Oil Industries Safety Directives (OISD) GDN-211 & Bureau of Indian Standard (BIS), PCD-3. He has expertise in Crude oil assay, petroleum products testing (LPG, Gasoline, Diesel, LDO, ATF, SKO, MTO, Petcoke, Bitumen, Sulphur pallets etc.) and analytical techniques viz. Gas Chromatography, Spectroscopy, CFR engine and water chemistry. He is inventor in one of granted Indian patent and four patent applications as well as one of PCT application. He has published three research papers in international journals, one book chapter and, has orally presented research papers in fourteen international conferences. He honored by fifteen Appreciation Awards for Innovation, Improvements, suggestion, and Special works from Nayara Energy and Reliance Industries.

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Parametric study on steam reforming of methane to syngas with Ru/Al_2O_3 catalyst in an annular reactor

It was reported that CO_2 emissions (2.6 Gt/y) of the steel industry account for approximately 7% of the global value in 2020 by IEA. It is necessary to reduce CO_2 emissions in the steel industry to achieve net-zero by 2050. In 2022, the Korea LCP research center was launched to develop low-carbon chemical process, which makes olefins by using steel off-gas (BFG: blast furnace gas). The total process is as follows: BFG + syngas → methanol → olefins.

Steam reforming of methane is the most economical way to produce hydrogen-rich syngas for methanol. The key design issue for maximizing reforming efficiency is to promote the balance between heat input through the reformer tube surface (heat transfer rate) and the heat consumption by the endothermic reaction of steam reforming (kinetics). Therefore, it is very important to optimize internal heat exchange between heat sources (flue gas, syngas) and sinks (water, NG, air).

The reformer module consists of desulphurization bed, steam reforming reactor, plate heat exchangers, and vapor/liquid separator. The annular reactor for steam reforming includes SG (steam generator), SH (super heater), and internal heat exchanger to decrease heat loss. The parametric study was carried out to determine the optimal syngas composition ($H_2/CO/CO_2$ = 10.8/2.2/1.0) for the methanol synthesis using the steel off-gas. The experiments were conducted at a constant pressure (4.0 barg). The effect of temperatures (830, 840, 850 °C) and S/C ratios (2.4, 2.6, 2.8, 3.0) were investigated to find the optimum conditions. This system has syngas production capacities of 12 Nm3/hr with 77.1 LHV% reforming efficiency.

Audience Take Away Notes

- Design of annular reactor for steam methane reforming with a heterogeneous catalyst.
- Process intensification to improve the reforming efficiency and compactness.
- Operating issues of reforming module (high temperature resistance, burner stability et al.).
- Parametric study to determine the optimal syngas composition for methanol synthesis.

Biography
Dr. Doo-Wook studied Chemical Engineering at Yonsei University (Seoul, Republic of Korea) and graduated as MS in 2012. He received the Ph.D degree in 2018 at the same institution. He worked at the R&D center in the petrochemical company (LG Chem.) for 2 years and then has joined hydrogen research department in KIER. His current interest focuses on SMR (steam methane reforming) and DRI (direct reduced iron).

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Studying the dynamics of the structure of a mollusk shell using the example of a bivalent ellipsoidal vortex

The study of the structure during the growth of mollusk shells allowed us to assume the existence of a divalent structure of an ellipsoidal vortex, in which the circulation distribution of the substance obeys the inversion law, the mechanism of which allows one to preserve its own angular momentum during chemical interactions during the construction of a crystalline structure – a cone-shaped mollusk shell in sea water of a certain salinity and density at a certain temperature. Here, in the presence of organic matter, calcium reacts with carbon dioxide, forming a mineral phase. The latter, depending on the composition and structure of the organic matrix (on which crystallization of calcium carbonates occurs with the formation of the mineral part of a mollusk clam) takes the form of one of the calcium carbonates (calcite or aragonite).

The study of the crystal structure of mollusk shells suggests that the formation of the hard shell follows the law of vortex growth of fibers along the kernel. That is, thanks to the unique chemical construction data of the physical fields of a divalent ellipsoidal vortex, it creates peculiar tubular lines that grow along the surface of the "expanding" kern with a helical shear. A new geometric-topological closed vortex model has been proposed to explain the growth and formation of mollusks in sea water.

Biography

Milyute Elena professional scientist-researcher in the field of Natural Science and Mathematics.

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Experimental investigatıon of emission and performance values of methanol and gasoline mixtures in an RCCI diesel engine

With the increase in population in the world and the development of technology, the need for energy is increasing more than ever. Today, we still meet the majority of our energy needs from oil. NOX, CO and HC emissions released from internal combustion engines have been largely reduced by the use of catalytic convector-style exhaust gas purification systems, but these systems have not yet been able to reduce harmful emissions to the desired levels. One of the applications that increases engine efficiency while reducing emissions is the RCCI method. In this study, the RCCI method was applied by adding methanol and gasoline to a Lombardini LDW 1003 brand 3-cylinder, 4-stroke diesel engine. Gasoline and methanol applied as Low Reactivity Fuel (LRF), the timing and injection amount were adjusted with the information received from the crankshaft with the help of a PLC program. The studies were carried out with the engine at full load, at 1500, 2000, 2500 and 3000 rpm, with LFR fuel (gasoline-methanol) and 3 different injection timings (10, 20, 30 CA). In the experiments, in-cylinder pressure, power, torque, exhaust temperature, fuel consumption and NOx, HC, O_2, CO and CO_2 exhaust emission values were taken. According to the test results, fuel consumption and exhaust temperatures decreased in parallel with the increase in the amount of LRF fuel in both gasoline and methanol. While the highest torque and power values were obtained at methanol 30 CA and, decreased in NOX values.

Keywords: RCCI, Methanol, Gasoline, Emission, Injection timing.

Biography

Emin Borlu graduated from Erciyes University, Department of Mechanical Engineering in 2013. Then, he started his master's degree at Erciyes University, Institute of Science and graduated in 2015. Emin Borlu continues his doctoral education in the field of energy.

Emir Borovac*, Sedat İnan
Istanbul Technical University, Istanbul, Türkiye

Thermal maturity and hydrocarbon generation histories of the Silurian Tannezuft Shale formation, Ghadames Basin, Northwestern Libya

The Silurian Tannezuft Formation within the Ghadames Basin of Northwestern Libya, like other Silurian shales in North Africa and the Middle East, represents a significant prospect for unconventional hydrocarbon exploration. Unlike the more popular and extensively studied Sirt Basin, the Ghadames Basin remains underexplored, presenting untapped potential that warrants further investigation. This study focuses on the thermal maturity and hydrocarbon generation histories of the Tannezuft shales, utilizing calibrated basin modeling approaches. The Tannezuft shales are organic-rich and primarily contain Type II kerogen, especially in the basal layer, which contains up to 10 wt. % TOC, leading to its designation as "hot shale". The research integrates geological, geochemical, and basin modeling data to elucidate the unconventional hydrocarbon potential of this formation, which is crucial given the global demand for energy and the need for new resources.

By employing PetroMod software from Schlumberger, calibrated modeling results simulate hydrocarbon generation and migration within the Tannezuft shales. The findings suggest dual-phase hydrocarbon generation from the Lower Silurian Tannezuft source rock, related to deep burial prior to Hercynian orogeny and subsequent Alpine orogeny events. The Ghadames Basin's tectonic history, including major Hercynian and Alpine orogenies, has significantly influenced the generation, migration, and preservation of hydrocarbons, making the Ghadames Basin a promising area for further exploration.

Audience Take Away Notes

- The geological and geochemical characteristics of the Silurian Shale Tannezuft Formation and its significance in hydrocarbon generation.
- The application of basin modelling tools to predict hydrocarbon generation and migration within a complex geological setting.
- Insights into the tectonic and depositional history of the Ghadames Basin and its impact on hydrocarbon accumulation.
- The audience will gain a deeper understanding of the factors influencing hydrocarbon generation in unconventional reservoirs, which can be directly applied to exploration and development strategies in similar basins worldwide.
- Yes, the methodology and findings can serve as a foundation for further research in basin modelling and unconventional hydrocarbon systems, providing valuable case studies for academic and industry applications.

Biography

Emir Borovac is a Bosnian student currently pursuing his master's degree in Geological Engineering at Istanbul Technical University, Turkey, under the supervision of Prof. Sedat İnan. He holds a bachelor's degree in petroleum engineering from Tripoli, Libya, where his thesis focused on the "Pressure Gradient in Horizontal Wells." His current research focuses on the thermal maturity and hydrocarbon generation histories of unconventional reservoirs, particularly in the Ghadames Basin of Northwestern Libya. Emir has a strong interest in basin modelling and the application of geochemical techniques in petroleum geology. He aims to contribute to the field by developing innovative methods for assessing and exploring hydrocarbon resources.

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Production of light hydrocarbons (C_2-C_4) by hydrogenation of CO_2 using Co-K/ɣ-Al_2O_3 catalysts with additional metal promoters (Ba, La, Ce) and combined supports (Y_2O_3, TiO_2)

In this research work, we obtained C_2-C_4 hydrocarbons as a product of the Fischer-Tropsch synthesis (FT-CO_2) by converting CO_2 using Co-K/ɣ-Al_2O_3 catalysts. The catalysts were enhanced with 1% Ba, La, Ce or 0.5-3% Ce promoters, respectively. Moreover, 10% Y_2O_3 or 10%TiO_2 was added to the ɣ-Al_2O_3 support, respectively. Effect of the promoter and the support doping on CO_2 conversion and C_2-C_4 selectivity was inverstigated in FT-CO_2 synthesis.

The catalysts were prepared using the incipient wetness impregnation method, and characterized by X-ray diffraction analysis, Temperature-programmed hydrogen reduction, and CO_2 desorption measurements. Catalytic activity of the catalysts was evaluated in a fixed-bed reactor at 350°C, 3 atm, and H_2:CO_2=3:1 molar ratio with a total volume rate of 3000 h-1.

At 350°C, the addition of promoter metals to the catalysts increased catalyst activity. The Ce promoted Co-K/ɣ-Al_2O_3 catalyst increased the C_2-C_4 yield by 10.67%. However, the catalyst activity decreased when the Y_2O_3, TiO_2 was added into the ɣ-Al_2O_3 support. At 350°C, the Co-K-1Ce/ɣ-Al_2O_3 catalyst showed the highest activity in the FT-CO_2 synthesis. With this catalyst, CO_2 conversion, C_2-C_4 yield and C_2-C4 hydrocarbon selectivity were reached 44.90%, 14.91%, and 37.17%, respectively. TPR results of the Co-K-1Ce/ɣ-Al_2O_3 catalyst showed the creation of much active sites due to the interaction between metal and support, leading to an increase in selectivity towards light hydrocarbons. Also it was known by CO_2-TPD analysis that the interaction between metal catalysts and support enhanced the CO_2 activation over the Co-K-1Ce/ɣ-Al_2O_3 by increasing the medium strength basic sites. Futhermore, additional supports such as Y_2O_3 and TiO_2 increased the CO yield by the reverse-water gas shift reaction in FT-CO_2 synthesis.

The addition of Ce as the promoter to the Co catalyst was found to be the most effective way for enhancing the catalytic activity, while the addition of Y_2O_3 and TiO_2 to the ɣ-Al_2O_3 support did not show significant improvement in catalyst performance for the FT-CO_2 synthesis.

Biography

Dr. Enkhsaruul Byambajav studied at the Tohoku University, Japan and graduated her PhD course in 2004. Since then, she is teaching at the National University of Mongolia. She was promoted as a full professor the National University of Mongolia in 2020. Now she is supervising a laboratory of Clean energy technology development in the University. She has published more than 20 research articles in WoS-JCR journals.

Dr. Enrico Paris[1*], Beatrice Vincenti[1,2], Francesco Gallucci[1], Carmine Cava[2], Domenico Borello[2]

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Enhancing syngas quality from biomass gasification using an iron-based splitting reactor

The proposed work is the result of several studies in which the phenomenon of gasification of biomass from Plant Assisted Bioremediation (PABR).

In the proposed study, the process of splitting H_2Ov and CO_2 through oxidation of metal catalyst was studied and the aim was to optimize the operating parameters to obtain the ideal conditions for the entrance into the oxidizing reactor of the syngas produced by gasification of biomass PABR. For the tests conducted it was chosen to use Fe because it adequately meets all the criteria of an appropriate catalyst for splitting CO_2 and H_2Ov, such as: high capacity of oxygen transport; a great thermodynamic and kinetic affinity with CO_2 and H_2Ov; high melting temperature; excellent fluidization characteristics; high mechanical resistance to wear and tear; low cost; safe and low environmental impact. The following are the overall oxidation reactions of Fe to $Fe_2O_3$with steam and CO_2: $xCO_2+(1-x)\ H_2O+2Fe \leftrightarrow Fe_2O_3+xCO+(1-x)\ H_2$

The work was carried out in two phases: the first was to optimize the process and conditions by using a mixture of technical gases entering the reactor (modifying parameters such as temperature, mixture composition in input, amount of reducing catalyst material). The second phase was a numerical simulation of the yields obtained by using as input the syngas data obtained by prototypical scale gasification of biomass PABR in the process of splitting and oxidation of the catalyst Fe, according to optimized parameters.

Audience Take Away Notes

- The proposed work shows the efficiency of a decarbonisation system based on the use of a catalyst (recoverable from waste materials) in order to obtain a syngas produced from higher quality biomass.
- It is then shown how a biomass gasifier can be interfaced with syngas upgrading system in order to obtain a biofuel rich in hydrogen.
- The proposed H2 optimization and production work is particularly useful for those involved in:
    - Disposal of biomass
    - Altrenative energy
    - Circular Economy
    - Biohydrogen

Biography

Dr. Enrico Paris studied Analytical Chemistry at La Sapienza University of Rome (Italy) and graduated as MS in 2017. In 2018 he obtains a scholarship to CREA-IT of Monterotondo and is a member since 2020 of the Italian Association of Chemists and Physicists. In 2022 he received his PhD degree cum laude in "Energy and Environment Engineering" at La Sapienza University of Rome. From 2022 he is Technologist at the CREA-IT in the LASER-B (Laboratory for Experimental Activities on Renewable Energy from Biomass). He is a reviwer and editor of numerous international scientific journals and has been a member of the scientific committee of several international conferences.

Fatemehsadat Mirmohammadmakki[1*], Seyed Fathollah Mir Mohammadmakki[2], Ali Zarrabi[3], Nargessadat Mirmohammadmakki[2]

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[3]Shahid Beheshti University of Medical Sciences

Comparative assessment of biosorption efficiency of two agricultural waste for heavy metal removal

Environmental issues, primarily driven by human activities, have significantly impacted water quality. Natural processes like rainfall can introduce particles and dissolved substances into water, but human activities such as industrial discharges and agricultural runoff introduce more harmful pollutants, further degrading water quality. The necessary water quality depends on its intended use, ranging from drinking to industrial applications. As water moves through both natural and human-influenced cycles, its characteristics often change, requiring treatment to meet specific standards. Sustainable water management practices and advanced wastewater treatment technologies are essential to address these challenges. These innovations protect water quality and recover valuable resources, supporting a circular economy.

Additionally, the use of agricultural waste as a bio-absorbent for heavy metals offers a sustainable and cost-effective solution for water treatment. By repurposing agricultural by-products like nut shells, this approach reduces waste and enhances water quality, aligning with environmentally friendly resource management practices. This study, which compares the biosorption capacities of two agricultural wastes that are abundantly produced in Iran, provides crucial insights. Specifically, it focuses on the examination and comparison of peanut and walnut shells in terms of their ability to adsorb certain water pollutants, particularly heavy metals. The biosorbent samples were prepared by obtaining the biosorbents with a specific particle size and storing them until they were added to the contaminated water. These prepared biosorbents were then introduced into contaminated water in specific proportions. The concentration of the heavy metals, as well as the pH, were monitored at specified time intervals. Throughout the experiment, the temperature was maintained at a constant 25 degrees Celsius. The results, which revealed that walnut shells demonstrated a higher biosorption capacity for the pollutants studied compared to peanut shells, are of significant importance. Among the heavy metals analyzed, cadmium and lead showed the highest levels of absorption by both biosorbents. Further research is recommended to investigate the performance of biosorbents with varying particle sizes, wastewater with different pH levels, and the absorption of heavy metals by these biosorbents at different wastewater temperatures.

Audience Take Away Notes

- The audience will learn about the biosorption capabilities of agricultural residues, specifically peanut and walnut shells, for removing heavy metals from contaminated water. This knowledge can be applied to environmental management and waste treatment practices.
- Environmental scientists, engineers, and waste management professionals can use these findings to develop more effective, sustainable, and cost-efficient water purification and pollutant removal methods. This can be particularly useful in areas with high agricultural waste and water pollution levels.
- Yes, it provides a basis for further investigation into the use of agricultural by-products in

environmental applications. Faculty members in environmental science, chemistry, and engineering could use this study to expand their research on sustainable materials or incorporate it into their teaching on water treatment technologies.

- Yes, using readily available agricultural waste as biosorbents offers a practical and low-cost solution for water purification, which could simplify the design and implementation of environmental remediation systems.
- This research provides new information on the comparative effectiveness of different biosorbents, which can improve the accuracy of designs for water treatment systems. Designers can use this data to select the most efficient materials for specific contaminants, optimizing the performance of their systems.
- Sustainability: Promotes waste materials, reduces waste, and promotes sustainable practices.
- Cost-effectiveness: Utilizes low-cost materials, which can make environmental cleanup efforts more affordable.
- Environmental impact: Potentially reduces the reliance on synthetic or chemical adsorbents, decreasing the environmental footprint of water treatment processes.
- Flexibility: The study's findings on the impact of particle size and pH can be tailored to different environmental conditions, enhancing the solution's versatility.
- Foundation for further research: This provides a strong basis for further studies on optimizing biosorbents and exploring their application in different contexts or with different pollutants.

Biography

Dr. Fatemehsadat Mirmohammadmakki received her PhD in "Food industrial engineering and science - Food Chemistry" in 2021 from Islamic Azad University, Sciences and Research Branch. She then joined the research group at the same institution. Her research focuses on agricultural products, edible oils, and extracts, with a specialization in biosorbents for reducing heavy metals in food, soil, and wastewater. Also, she is researcher of Medical Ethics and Law Research Center, Shahid Beheshti University of Medical Sciences. A lecturer and researcher, she has contributed to sustainable pollution control and has published over 10 research articles and participated in more than 50 national and international conferences.

Hamad Alomran*, Naser Alshebeeb*
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Selective Laser Sintering (SLS) and its applications in the oil industry

Selective laser Sintering (SLS) is a fast and reliable fabrication method that uses a computer aided design "CAD" to control the process; to continue, this makes it a very efficient technique that reduces waste material and maximizes precision especially when operating on complex parts. Moreover, selective laser sintering is a layer by layer process that create objects and parts by melting powder by the usage of laser. The layer has to wet the layer beneath it to create what is known as the interlayer bonding.. Moreover, high temperature sintering creates a strong bond between the particles in the powder that have surface contact.

The types of lasers that are used for selective laser sintering and discussed in this paper are CO_2 and Nd:YAG. These lasers are used to scan and heat the powders. A comparison between the scanning speed of both lasers is essential to know the results of the powder. Also, in selective laser sintering there are many factors that one should watch out for when using this technique. First, oxidation and balling. Secondly, Evaporation and finally the residual stresses. These factors can cause problems to the final product; therefore, proper planning that were discussed in this paper such as pressure and temperature control are required.

Moreover, Important SLS parameters were investigated in this paper to find their effects on the materials properties. SLS parameters such as laser power, scan spacing, layer thickness, scan speed, and hatch length have major effects on various properties. The most highlighted properties that were discussed in this paper are density of powder, surface roughness, and sharpness of edges.

Throughout this paper, several applications were discussed where selective laser sintering was applicable. To be more specific, this presentation will be aimed to explain the selective laser sintering manufacturing process and its application in the oil industry to 3D print complicated parts.

Audience Take Away Notes

- Applications of the new manufacturing technique known as Selective Laser Sintering (SLS).
- How 3D printing of solid metallic parts is made possible through SLS?
- Material Waste Reduction and maximization of precision allowing the production of complex parts.
- Utilization of CAD software to create a full part using one manufacturing technique.
- Understanding the different variables that effect the properties and dimension accuracy of the final product that is produced through SLS.

Biography

Hamad Alomran and Naser Alshebeeb were born in Kuwait. Both were awarded a scholarship funded by the Ministry of Education in Kuwait. This enabled them to attend an intensive one-year academic English program in California State Polytechnic University, Pomona. The following year, they pursued their Bachelor of Science degree in Mechanical Engineering in both San Diego State University and Embry-Riddle Aeronautical University. In 2019, Hamad Alomran became a Heavy Equipment Engineer and Naser Alshebeeb became a Valve Shop Engineer both working for Kuwait Integrated Petroleum Company (KIPIC). Hamad Alomran also pursued a Master of Science degree in Mechanical Engineering in Kuwait University as a part-time student and Graduated in 2023. Both have experience in the downstream oil industry and have earned many certifications related to their line of work such as being a certified Maintenance and Reliability Professional, Six Sigma, Welding Inspector and a certified Lifting Equipment Engineer.

Ibrahim Al Siyabi*, Antonin Chapoy
University of Technology and Applied Sciences- Nizwa, Oman

The effect of common impurities on the ift, swelling factor and mmp of CO_2/n-decane systems for CO_2-eor applications

The effects of impurities (N_2, CH_4, CO, O_2, H_2 and Ar) of CO_2/n-decane system on the IFT (Interfacial Tension), the swelling factor and the MMP (Minimum Miscibility Pressure) have been investigated at 310.95 K. The impurities studied in this work were analysed using as injection gases four binary mixtures: CO_2- CH_4, CO_2- N2, CO_2- O_2, CO_2- H_2 and two multicomponent mixtures. A capillary rise apparatus was used to measure the IFTs and the swelling factors at the same pressure and temperature conditions and the VIT (Vanishing Interfacial Tension) approach was used to estimate the MMPs of the systems containing impurities. The above properties are compared between systems and the main findings of the study are that the impurities increase both the IFT and MMP of CO_2/n-decane systems and reduce the swelling factor.

Biography

Ibrahim Al Siyabi is a highly organized senior lecturer with over 20 years of teaching experience to various levels of students at leading University of Technology and Applied Science (UTAS). He finished his degree in Mechanical Engineering from Sultant Qaboos Univesity (SQU) and MSc in Thermal and Fluid Engineering from The University of Manchester and PHD in petroleum engineering from Heriot Watt University. He works in UTAS and took responsibilities as Head of Mechanical Engineering, Assistant Dean of Academic Affairs and Deputy of Assistant Vice Chancellor for postgraduate and Research in more than one branches in the University.

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Upcycling of plastic to carbon black and H_2-rich gas

This research investigates an approach for the sustainable conversion of plastic into valuable products, with a specific emphasis on the production of hydrogen-rich gas for prospective use as a clean fuel and carbon black as a promising catalyst support material. The study encompassed three distinct stages: plastic material characterisation, experimental bench preparation – the upcycling of plastic material into both solid and gaseous products, and analysis of the generated products. The initial stage involved a comprehensive characterisation of the plastic samples, providing crucial information about their composition and thermal properties. Subsequently, to separate two primary elements in plastics (C and H) and generate valuable products, samples were devolatilized and these intermediate volatile products were cracked afterwards to obtain solid carbon and H_2 gas within controlled and optimised conditions. The produced carbon was characterised using techniques generally applied for carbonaceous materials to be used as catalyst support, namely, Thermogravimetric Analysis (TGA-DTG), Scanning Electron Microscopy (SEM), Brunauer-Emmett-Teller (BET) analysis, Inductively Coupled Plasma (ICP) and Raman spectroscopy. In conclusion, the results obtained in this study contribute to the advancement of sustainable technologies for plastic waste management by upcycling it into high-value materials and thus have a prospect for contributing to the development of the circular economy.

Audience Take Away Notes

- The audience will learn about the thermal properties of plastic and what are the main constraints of a such C-rich material conversion to solid carbon as a multifunctional product.
- In this presentation an up-to-date technology will be introduced, by which avoiding the use of very harsh process conditions or a catalyst, plastic was upcycled into solid carbon and H_2 gas.
- The technology which was used for plastic conversion can be applied to different kinds of organic waste conversion, thus it is qualified as universal and simple.

Biography
Ms. Ieva Kiminaitė is currently in the second year of her PhD studies in the program of Energetics and Power Engineering at the Kaunas University of Technology and Lithuanian Energy Institute. Concurrently, she holds a position as a Junior Researcher in the Laboratory of Combustion Processes at the Lithuanian Energy Institute.

Mohamad Shahrustami Mohd Nadzeri[1], Dr. Igor Kolesnikov[2*], Mohd Izuwan Ilmi[3], Dr. Kang Kim Ang[4], Hamizah Syamimi Supian[5]

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Advanced comparative studies between MTM-G technology and inline pipeline inspection technology

This paper discusses the comparative system and method for inspecting a carbon steel pipeline utilizing the Magnetic Gradient Tomography Method (MTM-G) and Intelligent Pig (IP). The data and results from both technologies complementarily identify stress-related defects, their dimensional characterization and precise orientation location effectively. The comparative studies analyze the data and results given by both systems post-inspection and are valuable in the further optimization of inspection and maintenance processes. While MTM-G measures the mechanical stress directly through magnetic field gradient of the pipeline under in situ conditions, IP, on the other hand provides the geometry and orientation location of the anomalies. In order to compare and complement the outputs, we first established a baseline from the known defects with verified dimensions on the intended pipeline for inspection. Post-inspection, the reported results from both technologies are assessed and compared accordingly by the defect matching process. Subsequently, we use a standard statistical analysis method to analyse the Probability of Identification (POI) and their dimensions for the comparative studies. The MTM-G technology notably determines the comparative degree of danger of anomalies by a direct quantitative assessment of the mechanical stresses reflected from the distribution of magnetic field gradient along the pipeline. Therefore, with the additional data on the geometrical parameters of the defects, subsequent calculation or correlation can be established to assess the impact of anomalies on the overall pipelines' safe operation and their constituted imminent risks. Based on these comparative studies, the Probability of Identification (POI) of MTM-G inspection can be confirmed, complemented and enhanced from the sizing information of the defects and their orientation location on the pipeline provided by the IP inspection technology. On the other hand, the defects' severity in terms of remaining wall thickness can be enhanced and complemented with MTM-G findings that evaluate defect stress directly from the measured magnetic field gradient of the pipeline. As a result, the aforementioned integrative and comparative studies may provide comprehensive findings that become the basis for pipeline integrity and maintenance programme enhancements. The comparative analytical studies will be a reference for pipeline asset owners to extensively explore their pipeline's behaviour, examining its actual state and evaluating risk with increased confidence, thus improving Pipeline Integrity Management.

Biography

Mr Igor is the inventor and developer of Magnetic Tomography Method (MTM), Magnetic Gradient Tomography Method (MTM-G) inspection for onshore and offshore pipeline. More than 25 years working skills, 23 years in pipeline integrity industry, Development and research of the technologies of pipeline integrity. The author and inventor of more than 20 international working patents and innovations, implementing of new technologies for the pipeline integrity industry, specially focused on "non-piggable" or "difficult to inspect" cases of pipelines

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Influence of the sun on the day and night sides of the earth. Explanation of the 'Storm glass' and 'Water memory' phenomena

Even 0.02% water in acetonitrile can form clusters, the size and chemical reactivity of which can change under the influence of the Sun in a very wide range. Bulk water added to such acetonitrile can copy and reproduce these original clusters and acquire different hydrolytic activities depending on the size of the copied clusters. As a result, the rate of hydrolytic reactions with the added water can vary greatly depending on where the acetonitrile was located before the reaction - outdoors, inside buildings or underground.

The influence of the Sun is accounted for by the decomposition of water clusters by muons, which are generated in the upper atmosphere by the solar wind. Due to the anisotropy of the muon flux the rate of hydrolysis depends on the geometry of the reaction solution, its position in space and constantly changes during the day depending on the position of the Sun in the sky.

For example, at noon, when the Sun is at its zenith, the rates of this reaction in three 5-mm NMR-tubes directed North-South, East-West and Vertically are considerably higher in the horizontal tubes, and at sunrise and sunset when the Sun shines along the East-West line the rate is higher in the vertical tube.

It was logical to assume that at night when the Sun irradiates the opposite side of the Earth, it cannot have the same influence as during the day, and the rates of this reaction in multidirectional NMR-tubes should become equal. However, experiments carried out at midnight did not confirm this. At night the rate of hydrolysis decreases substantially, but the distribution of rates remains the same as at noon - in the vertical tube the rate is significantly less than in the horizontal tubes. The same distribution of triethyl phosphite hydrolysis rates in multidirectional tubes day and night allows us to conclude that on the night side of the Earth the influence of the Sun is inducing the appearance of some radiation vertically from underground. The mechanism of the solar influence at night requires a detailed comprehensive study. Measuring the rate of hydrolysis of triethyl phosphite in acetonitrile in multidirectional 5-mm NMR-tubes at different locations on Earth at different latitudes may help to explain this fundamental phenomenon, which is important for biological, chemical, physical and environmental research.

The discovered influence of the Sun on structuring of water clusters explains the 'Storm Glass' mystery and experimental instability of the 'Water Memory' phenomenon.

Biography

Dr. Shevchenko studied Chemistry at the Kiev University, Ukraine and graduated as MS in 1979. He then worked at the Institute of Organic Chemistry in Kiev and received there his PhD degree in 1985. In 1990 he won Alexander von Humboldt scholarship and until 1996 was invited scientist at the Braunschweig University in Germany and at the Southern Methodist University in Dallas, Texas, USA. Then he worked in Kiev at the Institute of Bioorganic Chemistry and Petrochemistry and the Institute of Geochemistry Mineralogy and Ore Formation, Ukrainian Academy of Sciences. He has published more than 60 research articles.

Dr. Intisar Al Busaidi
University of technology and applied sciences, Oman

Rheological and geochemical interactions of low salinity polymer on rock-brine interactions

Recently, there has been growing interest in the synergistic combination of low salinity water with polymer flooding as a technique for enhanced oil recovery. Numerous studies have been conducted to investigate the efficiency of low salinity polymer (LSP) flooding in sandstone oil reservoirs; however, a clear conclusion on the driving mechanism has not yet been reached. Detailed explanations regarding the relative contribution of rock/fluid and fluid/fluid interactions to enhance oil recovery through LSP flooding are lacking. This study aims to investigate the impact of LSP on the rheological and geochemical interactions between equilibrated formation brine samples and Boise rock. Rheological and ionic analyses were performed to characterize the properties of equilibrated formation brine samples with Boise rock in the absence and presence of polymer under different brine chemistries. The results suggest that salinity has a stronger effect on the viscoelasticity of the HPAM polymer compared to composition. This can be attributed to the fact that changes in brine composition have a lesser impact on the screening of electrostatic interactions between polymer chains compared to changes in salinity. Consequently, the association between the chains weakens, leading to an overall reduction in the viscoelasticity of the polymer.

Additionally, the results reveal that the presence of the polymer decreases ion concentration in the equilibrated brine, which may be attributed to polymer adsorption on the rock surface. This finding aligns with previous results and substantiates the role of the polymer in reducing brine content by forming a protective barrier, limiting ion diffusion through exclusion mechanisms, and forming complexes with divalent cations. Furthermore, a notable increase in calcium concentration in the equilibrated brine is observed when the calcium and magnesium ions are absent in the polymer solution. This observation supports the concept of ions migrating from rock to brine until concentration equilibrium is achieved, driven by the concentration gradient. The significance of this finding underscores the importance of considering the impact of divalent ions on rock-brine geochemical interactions in the presence of the polymer.

Biography

Intisar Al Busaidi is an experienced research engineer and lecturer specializing in enhanced oil recovery (EOR). She holds a Ph.D. in Petroleum Engineering and a Master's in Petroleum and Natural Gas Engineering from Sultan Qaboos University, along with a Bachelor's in Applied Chemistry. Her research focuses on polymer-enhanced oil recovery, with significant experience in conducting and analyzing advanced laboratory experiments. Intisar has presented her research at international conferences and has been recognized for her contributions to the field. Notably, she won first place in the student paper contest at the SPE Middle East, North Africa, and South Asia Ph.D. division and has been involved in several high-profile hydrogen energy projects and symposiums

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1,3,5-Triethynylbenzene-based conjugated microporous polymers: Green mechanochemical synthesis and energy storage applications

Research is increasingly focusing on novel technologies for energy production and storage, recognizing the significant economic and societal impacts. Among these, Conjugated Microporous Materials (CMPs) are gaining attention for their potential in energy storage applications. CMPs are synthesized from fused and non-fused aromatic building blocks, offering large surface areas, structural tunability, fixed building blocks, photophysical stability, and extended π-conjugation. These properties make CMPs suitable for a variety of applications, including gas adsorption and separation, catalysis, fluorescence sensing, solar fuel production, and biological uses.

Currently, there is a significant interest in utilizing CMPs for energy storage due to their extended π-conjugation, large surface areas, appropriate microporous characteristics, and conductivity. These features make them ideal candidates for supercapacitors and batteries. However, optimizing structure-property relationships and developing green synthetic methods are crucial challenges that need to be addressed.

This research presents the design and green catalytic mechanochemical synthesis of novel CMP materials based on triethynylbenzene as a central core, using the Sonogashira-Hagihara coupling under air. Mechanochemistry is highlighted by IUPAC as a top emerging technology for sustainability. The synthesized polymers are conjugated with scaffolds having different electronic nature like benzene, thiadiazole, and Benzo [d] [1, 3] Dioxole (J-BDOX) to study structure-property relationships of CMPs for energy storage. The J-BDOX material demonstrated significant energy storage properties, with a specific capacitance of 147 F g^{-1} at a current density of 1 A g^{-1} and a redox window of 1.8 V. It also showed excellent cyclic stability over 100 cycles at various current densities (0.5 A g^{-1} to 7 A g^{-1}). These findings indicate that the newly designed CMP materials are highly promising for energy storage applications.

Audience Take Away Notes

- Audience can apply knowledge of important class of materials (CMPs) to develop advanced materials for energy storage applications.
- They can utilize the new green synthetic approaches outlined to create sustainable materials.
- The information on optimizing structure-property relationships can guide the design of more efficient and effective materials for various applications.
- Provides insights into creating high-performance energy storage devices like supercapacitors and batteries.
- Helps in developing sustainable materials, aligning with green chemistry goals.
- Enhances their understanding of CMPs, allowing for innovative applications in energy, catalysis, and sensor development.
- Yes, faculty can integrate these findings into courses on materials science, chemistry, and renewable energy.

- Provides a basis for further research on CMPs and their applications in various fields.
- Offers a practical example of applying green chemistry principles in advanced material synthesis.
- Yes, it offers a method for synthesizing CMPs efficiently and sustainably.
- The green synthesis approach can reduce the complexity and environmental impact of creating advanced materials.
- Provides a clear pathway to developing high-performance materials for energy storage, simplifying the design process.
- Yes, understanding the structure-property relationships helps in designing more accurate and effective energy storage materials.
- Offers empirical data on the performance of CMPs, guiding design decisions for energy applications.
- Promotes sustainability in material synthesis through green chemistry approaches.
- Encourages interdisciplinary collaboration by bridging chemistry, materials science, and energy engineering.
- Provides a framework for future innovations in energy storage technologies.

Biography

Dr. Shaya received his MSc in Synthesis, Catalysis, and Sustainability from University of Lyon and his Ph.D. in Chemistry from University of Nice in 2016 with honor distinction. He completed postdoctoral fellowships at Ecole Normale Supérieure de Lyon, Strasbourg, and Kyushu Universities until 2019. Appointed as a senior lecturer at Khalifa University in 2019, he also completed a postdoctoral degree in AI and Machine Learning from University of Texas at Austin. Dr. Shaya was promoted to assistant professor in 2023 and has published in high-impact journals. His research focuses on organometallic chemistry, catalysis, and materials for sensing and energy storage.

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Photocatalytic oxidation of elemental mercury by hydrophobic reduced graphene oxide modified CeO_2/TiO_2

Since the signing of the Minamata Convention in 2013, the control of mercury emissions has become a pressing concern, considering its impact on human health through bioaccumulation and biomagnification. Various sources include mining, waste incineration, and coal-fired power plants. According to the Convention, coal-fired power plants are recognized as primarily controlled targets. Mercury could be emitted in three forms: elementary, oxidized, and particulate. Among them, elemental mercury (Hg0) is the most difficult species to remove because of its volatility and insolubility. A cost-effective solution involves oxidizing it into mercury oxide and dissolving it in wet flue gas desulfurization. This study synthesized TiO_2/CeO_2 by modifying reduced graphene oxide (GCT) to photocatalytic oxidize Hg0 to Hg^{2+}. The modification of reduced Graphene Oxide (rGO) provides several advantages. Its high specific surface area allows for the uniform dispersion of TiO_2/CeO_2 nanoparticles, thereby increasing the active sites exposed to pollutants. Furthermore, rGO can serve as a sacrificial adsorbent, capturing SO_2 to mitigate its detrimental effects on metal oxides. In addition, rGO is hydrophobic, and the water molecules in the flue gas are hard to adsorb on the surface of GCT. From the advantages mentioned above, GCT could perform excellent photocatalytic oxidation efficiency of Hg0 under the complex gas components at a high temperature compared to TiO_2/CeO_2. This presentation also provides some basic DFT calculations to identify the active sites of GCT (Hg0 adsorption). The adsorption energy of various gas components (SO_2, NO, and H_2O) in the flue gas as well.

Audience Take Away Notes

- The audience can know the advantages of graphene in photocatalytic oxidation of elemental mercury.
- The audience can learn about the application of photocatalysis in the industry.
- The audience can build their laboratory-scale flue gas system to experiment.

Biography
Mr. Zheng is studying for a PhD degree in environmental engineering at Sun Yat-Sen University in Taiwan under the guidance of Professor Yuan. His primary focus was researching the oxidation efficiency of elemental mercury emitted from coal-fired power plants using TiO_2 photocatalysts. He published seven articles in SCI journals, three of which were authored by him as the first author.

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Efficient catalytic conversion of small molecules for synthetic fuels and chemicals

Efficient utilization of green hydrogen has become the focal point for achieving the net zero target. Hydrogenation has consistently posed a significant challenge in many domains, including renewable energy, bulk chemical production, and petrochemical engineering. The specific technical difficulties mainly include targeted bond cleavage, efficient oxygen removal, enhancing low-temperature activity, and the optimization of catalyst stability. We employed various probe reactions of carbon molecules to elucidate our comprehension and strategies concerning controllable hydrogenation and catalyst stability promotion.

In the context of enhancing catalytic activity, we showcased Mo_2C-carbon with nonstoichiometric metal defects dramatically improved the selective hydrogenation efficiency for the Reverse Water-Gas-Shift (RWGS) reaction of CO_2 ($CO_2+H_2=CO+H_2O$) at low-temperatures, surpassing noble metals and other Mo based catalysts. For the RWGS reaction, Mo_2C supported on modified graphene (Mo_2C@NGn) demonstrated outstanding catalytic performance at temperatures as low as 300°C with good stability, surpassing many noble metal catalysts. Modeling reveals defects were essential for balancing the negative charge of H atoms, facilitating their surface migration and accelerating products desorption with reduced magnetization of the active site[1,2]. In terms of curbing excessive hydrogenation of C_2H_2 ($C_2H_2+H_2=C_2H_4$), we harnessed the oxygen vacancies within the Pd-$SrTiO_3$ (STO) system to induce Pd-Ti alloy formation. With the Pd-STO solid-solution induced by O vacancy, the C_2H_4 desorption became an exothermic process, facilitating the semi-hydrogenation of acetylene, and greatly benefiting the highly selective production of C_2H_4[3]. As for optimizing catalyst stability, we overcame the stability challenge inherent in nickel-based catalysts in dry reforming reactions ($CH_4+CO_2=2CO+2H_2$) with two distinct strategies for achieving long-term catalyst stability. The deactivation regions of the Ni-based catalyst were discovered to display distinct colors during the CH_4-CO_2 dry reforming. Operando TEM revealed the deactivation mechanism in both oxidizing and reducing atmospheres. From the perspective of in-situ regeneration and surface modification, we proposed a gas-switching strategy that effectively ensured catalyst long-term stability, which could also be attained by another steady-state strategy of oxidation state regulation[4].

The research we are sharing encompasses comprehensive results, obtained from operando experiments and multi-scale modeling. Our study elaborates on several strategies for regulating the local electronic structure of catalytic active centers, which include defect engineering, dynamic coordination, alloy modification, and elemental doping. By realizing these strategies, we have successfully achieved precise hydrogenation of different carbon molecules and a remarkable promotion of the catalyst life.

Audience Take Away Notes

- The advancement of controllable hydrogenation in hydrocarbon resource utilization.
- The state-of-the-art fundamental knowledge on local electron regulation, enabling highly efficient catalysis.
- The practicable strategy to deal with the deactivation of catalysts with detailed mechanisms elaboration.

Biography

Professor Luo is a Fellow of the Royal Academy of Engineering and a Member of Academia Europaea. He has a PhD from Cambridge University and has been a full professor of the University of London since 2002. He has held various positions at Imperial College London; Queen Mary, University of London; Southampton University; Tsinghua University; and University College London. He is specialized in modelling and simulation across scales, with application in energy, power and interdisciplinary fields. He founded and has led the "UK Consortium On Mesoscale Engineering Sciences" since 2013 to advance mesoscopic, atomistic and multiscale modelling and simulation.

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Accurate prediction of bottom-hole pressure in vertical wells of Algerian fields using a new hybrid intelligent system based on neural network-fuzzy logic and PSO algorithm

The evaluation of the pressure drop due to multiphase flow in vertical pipes is an old problem in oil and gas industry. Correct prediction of pressure drop between the edges of production wells is a crucial task as it needed for the viable and low-cost design of tubing, also for the optimization of production strategy, which is a key target for oil production maximization and operational price discount. But the prediction of this parameter is complicated due to the variation in fluid flow rate through the two phase flow stream; otherwise it's not feasible economically to deploy a pressure gauge in each well to measure the Bottom-Hole Pressure (BHP) directly. To overcome these difficulties numerous correlations and mechanistic models were advanced on the grounds since 1950. Notwithstanding, the relevance of every single existing correlation is extremely constrained and likewise with mechanistic models, they all require longer computations and have significant error. The error in predicting Bottom-hole Pressure engender a big error in predicting the well potential during its life-cycle which leads to making bad decisions on fateful operational tasks such as tubing design, artificial-lift system design and well production monitoring. Accordingly, precise and quick computation/estimation of the Bottom-hole Pressure is of incredible significance and is one of the fundamental difficulties in petroleum engineering. Therefore, introducing a more powerful, fast and accurate method than the traditional ones to determine (BHP) it becomes a necessity. The main focus of this study is to establish an appropriate novel hybrid intelligent system to predict the bottom-hole flowing pressure in a multiphase vertical flow with higher accuracy than the existing methods using a sum of 150 field data sets amassed from Algerian fields. This method which combines two approaches, artificial neural networks (ANN) and Fuzzy-Logic (FL) is called "Adaptive Neuro-Fuzzy Inference System" (ANFIS). The goal of their combination is to amplify their strengths and compliments their weaknesses. After filtering the data and building the ANFIS model using a hybrid (Last Square and Back Propagation) algorithm for learning, a comparison has been made between this technique and the most generally utilized correlations and mechanistic models, using graphical and statistical error analysis. The comparison indicates that the proposed method is more accurate, reliable and efficient than all the other correlations used in this work. For more improving the performance of this model, a Particle Swarm Optimization (PSO), Algorithm as well-known a famous method to solve complex optimization problems is employed for the surest layout of both vector of linear coefficients of consequents and the Gaussian membership functions of antecedents in such network. Finally the results of (PSO), Algorithm are compared with the primary hybrid algorithm and showed pretty pleasant outcomes.

Audience Take Away Notes

- The public can apply the Adaptive Neuro-Fuzzy Inference System (ANFIS) to predict bottom-hole pressure (BHP) in their own projects, improving the accuracy of their pressure-drop estimates in multiphase vertical flows.

- By understanding the advantages of ANFIS over traditional methods, they can adopt this hybrid approach to improve the reliability and efficiency of their BHP predictions, leading to better decision-making and better operational results.
- Participants will be able to use particle swarm optimization (PSO) to refine their ANFIS models, to achieve better performance and greater accuracy in their predictive analyses.
- By using ANFIS and PSO, the public will get more accurate predictions of bottom-hole pressure (BHP), which will reduce errors in estimating well potential and lead to better-informed operational decisions.
- Yes, faculty can use this study as a basis for exploring other advances in hybrid intelligent systems, such as combining ANFIS with other optimization algorithms or applying the model to different types of flows and multiphase conditions.
- Yes, implementing ANFIS and PSO to predict bottom-hole pressure (BHP) offers several practical benefits such as increased accuracy and reliability that can greatly simplify and improve a designer's work.
- Indeed, ANFIS integrates the strengths of artificial neural networks and fuzzy logic, enabling it to capture complex relationships in multiphase flow dynamics more accurately than traditional empirical correlations or mechanistic models. The result is more accurate predictions of bottom-hole pressure (BHP) under varying conditions.
- PSO optimization fine-tunes the ANFIS model parameters, such as membership functions and coefficients, to minimize prediction errors. This optimization ensures that the model adapts to specific field conditions, thereby improving its accuracy in real-world applications.

Biography

Redouane Kheireddine (PhD in oil and gas engineering) is a Postdoctoral researcher in oil and gas engineering at Norwegian University of Science and Technology (NTNU). His working projects deal with the adaptation and development of proxy models for the simulation and optimization of petroleum reservoirs. The main focus of his research is to develop automatic optimization routines that use artificial intelligence techniques, evolutionary algorithms in conjunction with simulators to reliably identify the development plans for both conventional and unconventional petroleum fields

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Simulation of fluid flow in the enhanced geothermal system and coupled thermal hydro-mechanical modeling

Emphasizing their integration to maximize energy output, we will explore the complex interaction between Enhanced Geothermal Systems (EGS) and heavy oil reserves during the presentation. The conversation will start with an overview of EGS, a rather recent but rapidly rising energy source's importance within the framework of renewable energy. Although geothermal energy is becoming more and more popular, crude oil is still the main fuel used hence innovative technologies are needed to harmonize these energy systems for effective generation of steam, oil, and electricity.

The fundamental focus of the talk will be on a three-dimensional, three-phase numerical model meant to replicate steam injection in heavy oil reservoirs. This model incorporates a new control equation catered to the thermal fluid characteristics of heavy oil reservoirs, therefore addressing the difficulties of heat and mass transport post-EGS fracturing. This equation uses a nonlinear mechanics model of elasticity and plasticity in sand fractures and matrices to consider the dynamic conditions during heavy oil steam flooding.

Using both rectangular and circular fracture models, we will investigate the application of the finite volume approach to replicate EGS water-flood recovery. This section of the work generates a coupled mathematical model for EGS heat removal and steam injection flooding in heavy oil, therefore producing an effective numerical simulation framework. We will emphasize how well this model designs and maximizes the co-development of heavy oil reserves and EGS.

The sensitivity and optimization study of EGS under several conditions—such as well spacing, injection volume, temperature, and reservoir permeability—will occupy a good share of the presentation. These studies seek to meet thermal energy needs and improve heat extraction efficiency. Real-world EGS field examples will be used to apply the outcomes of these research, therefore illustrating how sensitivity analysis enhances conventional field optimization results.

We will also go over how best to identify ideal well spacings using simulations, stressing the part horizontal wells play in secondary recovery for both systems. First running turbines to generate energy, the procedure entails injecting surface water to create steam. With another well drawing the oil, the leftover steam is subsequently used to improve heavy oil flow in a horizontal well.

Additionally, discussed will be the application of reservoir modelling tools from Computer-Modelling Group, Inc.'s (CMG) for operations planning and forecasting. These instruments enable the prediction of technical and engineering results, therefore guaranteeing consistent output of steam, oil, and energy. Developed

mathematical models in this work will be presented to show characteristics like initial concentration, fracture length, surface water injection rate, steam generation, reservoir energy, and oil production.

Finally, under stressing the need of integrated modelling and simulation to maximize energy production and improve the viability of renewable energy sources in combination with conventional fuels, the presentation will offer a thorough review of the synergistic potential between EGS and heavy oil recovery systems.

Audience Take Away Notes:

- The audience will discover how Enhanced Geothermal Systems (EGS) may be coupled with heavy oil reservoirs to maximize energy production and improve oil recovery.
- The creation and use of a three-dimensional, three-phase numerical model for simulating steam injection in heavy oil reservoirs, hence addressing heat and mass transport post-EGS fracturing, will be discussed in two points of view.
- Development of coupled mathematical models for effective simulation helps one to understand how to apply the finite volume method for simulating EGS water-flood recovery and steam injection floods.
- The relevance and technique of doing sensitivity and optimization analysis under different reservoir conditions to improve heat extraction efficiency and satisfy thermal energy needs are discussed here.
- Using the reservoir simulation tools of Computer-Modeling Group, Inc.'s (CMG) will help one forecast and plan energy, steam, and oil production operations.
- Audience members can employ the integrated EGS and heavy oil recovery approaches to construct more efficient energy producing systems, therefore optimizing resource utilization and improving project outcomes. By simulating complicated reservoir interactions using the explored numerical models and finite volume methodologies, they can improve forecasting accuracy and decision-making. Applying sensitivity and optimization analysis techniques can help reservoirs to be managed more efficiently, thereby optimizing heat extraction and satisfying energy needs sustainably. By using CMG simulation tools, one will be able to better forecast and plan operations, hence lowering uncertainty and strengthening project planning
- Effective resource management and well-considered designs can result in notable cost savings during the development as well as the operational stages. Combining conventional and renewable energy sources helps the shift to more sustainable energy systems, therefore lowering the carbon footprint. The audience will become more competent in their domains by acquiring thorough technical knowledge in nonlinear mechanics, heat transfer, and mass transfer in reservoir systems. Enhanced simulation and forecasting powers contribute to early identification of possible problems, so enabling proactive risk management and guaranteeing project success.
- Indeed, this study offers a strong structure for other faculty members to increase their output of research or instruction. Rich material for academic investigation and curriculum creation comes from the combination of EGS with heavy oil recovery, the advanced numerical modeling approaches, and sensitivity and optimization analysis application. Using these approaches, faculty members can investigate fresh directions of engineering design, sustainability, and energy resource management.
- The presentation provides doable fixes that might simplify and improve the effectiveness of engineers' and designers' efforts:The approaches covered clearly offer a foundation for planning and optimizing energy systems, hence lowering complexity and raising efficiency. Better planning and execution follow from designers' accurate prediction of system behaviors made possible by the use of advanced simulation tools and techniques. Understanding how to combine EGS with heavy

oil recovery will help designers create more complete and sustainable energy generating systems that fit with contemporary energy targets.

- How Enhanced Geothermal Systems (EGS) affect heavy oil reservoirs helps designers and engineers optimize energy output. The proposed numerical models and simulation methods enable their projects develop more accurate and efficient designs. The three-dimensional, three-phase numerical model and finite volume approach will allow audiences mimic complex reservoir interactions. More accurate system behavior projections can reduce project planning uncertainty and direct behavior, improving decision-making. The audience can better manage resources by understanding sensitivity and optimization analysis under diverse reservoir conditions. These methods can meet thermal energy needs and optimize heat extraction efficiency for more sustainable and cost-effective operations. Creative energy generation is possible by combining EGS and heavy oil recovery systems. These suggestions help the audience maximize fossil fuel use and boost renewable energy technology. This technique boosts profits and the environment. Energy project construction and operation can be cheaper with optimized designs and resource management. Combining renewable and traditional energy sources helps create more sustainable energy systems and reduce energy generation's carbon impact. Deep technical insights into nonlinear mechanics, heat transfer, and mass transport in reservoir systems will increase the audience's technical expertise in respective fields. Businesses may lead the energy sector by adopting the latest EGS and oil recovery technology, fostering innovation and competitiveness. Enhanced simulation and forecasting technologies help identify potential issues early, enabling proactive risk reduction and project success. Your presentation gives designers and engineers actual ideas to simplify and improve their job, from cost savings and sustainability to technical competence and competitive advantage.

Biography

Dr. Khosraw Ubaidy completed his bachelor's degree in geology and mining resources exploration at Balkh University, Afghanistan, and obtained his degree in 2010. Subsequently, he collaborated with the China National Petroleum Corporation on the Amudarya project in Afghanistan. Due to his notable accomplishments and diligent efforts, he was awarded a scholarship by the aforementioned firm to pursue a master's degree at China University of Petroleum (Beijing). He successfully completed his studies and obtained a Master of Science degree in 2016. He began working as a capacity building and trainer in China oil while also completing his PhD degree at the same institution in 2022. In addition, he is collaborating with the aforementioned company as a trainer and capacity developer for both international and domestic employees of the organization.

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Enhanced oil recovery using rectangular silica nanoparticles: An efficiency comparison over commercial spherical nanoparticles

Enhanced Oil Recovery (EOR) methods have traditionally relied on chemical flooding techniques to increase the extraction efficiency of oil reservoirs. Recently, the integration of Nanoparticles (NPs) with conventional EOR methods, such as water flooding, has demonstrated significant potential in enhancing oil recovery rates. The effectiveness of these nanoparticle assisted EOR methods, however, is highly dependent on the stability of the nanofluids. Ensuring the stable dispersion of nanoparticles within the flooding medium is crucial for maximizing their effectiveness in altering reservoir properties, reducing interfacial tension, and improving the overall displacement efficiency of the oil recovery process. More research is needed to optimise NPs' performance for EOR applications. This study focuses on silica NPs due to their low production cost and environmental friendliness. A primary challenge with silica NPs is their tendency to aggregate in solution due to their ultra-small size and large surface area, which hinders their effectiveness in EOR applications. To address this, silica NPs with a unique rectangular (peanut-like) shape were synthesised. The physico- chemical and morphological properties of these NPs were characterised using Scanning Electron Microscopy (SEM), Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA), Brunauer-Emmett-Teller (BET) surface area analysis, Zeta Potential (ZP), and Dynamic Light Scattering (DLS). The performance of the synthesised rectangular silica NPs was evaluated for EOR applications through contact angle measurements and Interfacial Tension (IFT) assessments. A microfluidic setup was constructed to assess the efficacy of enhanced oil recovery at the pore scale, comparing commercial spherical silica NPs with the as-synthesised rectangular silica NPs. This setup allowed for direct visualisation of oil recovery mechanisms after nanofluid injection. Results indicated that the rectangular silica NPs exhibited significantly greater stability compared to commercial spherical NPs, with less size distribution variance. The IFT measurements revealed a substantial reduction in the presence of rectangular silica NPs, with a 75% IFT reduction compared to only 12% for spherical commercial NPs. Moreover, the rectangular silica NPs improved oil recovery in micro-model tests post-water flooding, showing an approximate 15% increase in recovery compared to a 6% increase with spherical NPs. This enhancement is attributed to better adsorption of rectangular NPs on microchip-pore surfaces, inducing greater structural disjoining forces, detaching oil droplets from surfaces, and altering wettability. In contrast, spherical silica NPs showed notable microchip-plugging due to higher aggregation, which blocked pores and reduced oil recovery. Future research will focus on functionalising the rectangular silica NPs with different agents to further enhance their stability and improve oil recovery efficacy.

Keywords: Enhanced oil recovery, Silica nanoparticles, Nanofluid stability, Interfacial tension, Microfluidic setup, Wettability alteration

Audience Take Away Notes

- Innovative Application of Rectangular Silica Nanoparticles (NPs) in EOR: Understanding the advantages of using uniquely shaped silica NPs over traditional spherical NPs in enhancing oil recovery.
- Enhanced Stability and Efficiency: Insights into the stability and performance benefits of rectangular silica NPs, including reduced aggregation and improved interfacial tension reduction.
- Microfluidic Setup for EOR Evaluation: A demonstration of how microfluidic setups can be used to directly visualise and assess the efficiency of nanofluids in EOR at the pore scale.
- Wettability Alteration and Structural Forces: An explanation of the mechanisms by which rectangular silica NPs enhance oil recovery through better adsorption, wettability alteration, and the induction of structural forces.
- Future Directions in Nanoparticle Functionalisation: Exploration of potential future research directions, including the functionalisation of rectangular silica NPs to further enhance their stability and efficacy in EOR applications.
- Improved Oil Recovery Methods: Oil industry professionals can adopt more efficient EOR methods, leading to higher oil recovery rates and reduced operational costs.
- Enhanced Research Capabilities: Researchers can expand their methodologies to include novel nanoparticle designs and microfluidic testing setups, advancing their experimental capabilities.
- By offering a more stable and effective nanoparticle design, this research simplifies the implementation of EOR techniques, making the designer's job more efficient and reducing the likelihood of nanoparticle aggregation issues.
- The detailed characterisation and performance evaluation of rectangular silica NPs provide valuable data that can improve the accuracy of nanofluid designs for EOR, assisting in overcoming challenges related to nanoparticle stability and efficiency.

Biography

Eng. Louey Tliba is a PhD researcher in Chemical and Process Engineering at the University of Leeds, UK. He holds a Master's degree (2017) and a Bachelor's degree (2014) in Petroleum Engineering. Louey has gained professional experience through various internships, including roles in reservoir engineering at Sonatrach Production, well services at the National Well Service Company, and well testing at Sonatrach National Company, Algeria. His research focuses on the application of nanoparticles in enhanced oil recovery methods and improving fluid flow for CCUS in legacy hydrocarbon reservoirs.

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Protein regression models as cornerstone of AI-Guided protein evolution

Protein engineering plays a central role in developing biocatalysts for biotechnology, biomedicine, and life science. Over recent years it has evolved significantly with the integration of Machine Learning (ML) techniques. Our study focuses on the application of ML algorithms in enhancing biocatalyst functionalities, including enzyme stability, function, and solubility. We have pioneered the use of ML algorithms as effective tools in protein engineering, specifically targeting biocatalysts.

Our methodology involves a two-step ML model application. Initially, our models proficiently predict protein sequence-to-function mappings. The approach does not require but can integrate detailed mechanistic or structural data. The application has proven particularly effective in low data regimes, even when only a few dozen functionally assayed sequence variants are available. Subsequently, we employ these predictions in a Bayesian optimization framework to guide the selection of candidates for experimental validation. This process allows simultaneous optimization of multiple parameters, such as stability, catalytic speed, and substrate specificity.

A notable achievement of our research is the superior performance of our prediction algorithms. They consistently outperform current state-of-the-art methods, including a recent algorithm developed by Novartis, across various datasets and benchmarks. The practical applicability of our algorithms was further validated through successful protein engineering campaigns, enhancing the functionality of complex enzymes like carboxylases, hydrogenases, and phosphohydrolases.

Our findings underscore the potential of ML methods in expediting directed evolution and rational design of proteins. By harnessing the power of existing sequence variant data, these methods effectively predict and select sequences with enhanced properties. During the talk, we will delve into these advancements in detail, highlighting practical applications, limitations and their significant impact on the future of protein engineering.

Audience Take Away Notes

- **The growing importance of machine learning in protein engineering:** This presentation will deepen the audience's understanding of how machine learning is revolutionizing protein engineering, highlighting a specific methodology that is transforming current practices in the field.
- **Enhancing protein engineering with regression models:** Gain insights into how advanced protein regression models can significantly elevate the outcomes of protein engineering projects.
- **Efficient variant extrapolation:** Learn how recent advancements in these regression models enable the use of only a few dozen functionally assayed protein variants to extrapolate to superior sequences efficiently.
- **Orthogonal approach to conventional techniques:** Understand how such approaches offer a unique, orthogonal approach, complementing and overcoming limitations of traditional methods

like directed evolution (restricted by trial-and-error processes) and structure-guided rational design (dependent on precise mechanistic knowledge).

Biography

Lukas Pluska the path from scientific discovery to biotechnological product is full of pitfalls. How to overcome these fascinated Lukas throughout his academic career, during which he worked on basic research questions in environments strongly focused on translational science. This included the Max-Delbrück Center for Molecular Medicine, the Berlin School of Integrative Oncology and the Leibniz-Institute for Molecular Pharmacology in Berlin. A biochemist by training, Lukas obtained his PhD (summa cum laude) from the Humboldt-Universität zu Berlin. During his doctoral research he discovered and characterized an unusual mechanism-of-action in the ubiquitin field. As a postdoctoral researcher, he elucidated novel functions of ubiquitin-conjugating enzymes using data exploration, proteomics and cell biology. Building upon his rich experience with multi-disciplinary research teams and developing state-of-the-art technologies in a variety of fields, Lukas moved on to become a biotech and pharma consultant. There, he applied his scientific acumen and communication skills to translate complex data into comprehensible stories to facilitate strategic decision-making. Now, he helps Exazyme's partners and clients to make the most out of the company's proprietary AI protein design tools.

Michael Radicone
HTRI, United States

Nanobubble vapor infusion for heat exchanger fouling prevention

Vapor infusion is an antifouling technology that reduces HX fouling and carbon expression through the creation of a chemically and mechanically induced nanobubble formation.

Cooling water used in the heat exchange processes may contain dissolved, sedimentary, or planktonic fouling agents. They will attach to heat transfer surfaces, forming intrusive, insulating beds through adhesion and solidification that impede water flow and heat transfer. This type of fouling impacts the mechanical or electrical system associated with the heat exchanger. Responding to reduced heat transfer or elevated pressure drop often means compensatory action to increase water flow, which in turn necessitates additional energy draw that, through fuel burn, elicits elevated carbon presentation.

Heat exchangers are a vital component in most industrial process systems, and carbon expression associated with heat exchanger fouling could account for a significant amount of atmospheric discharge. Any achievable improvement could offer broad impactful environmental and energy saving benefits. Providing a sufficient water supply, without fouling, is key to this endeavor.

Nanobubbles are tiny vapor-filled structures with a diameter of less than about 1 µm and are potentially 2500 times smaller than a single grain of sand. Nanobubbles have been shown to induce the removal of fouling mineral sites held together by minerals such as calcium carbonate and provide the cleaning of stainless-steel surfaces. The task of treating cooling water in an environment such as a heat exchanger necessitates a simple, easily integrated approach. Vapor infusion is just such an approach and can form high nanobubble concentrations.

This presentation will discuss vapor infusion and nanobubble science, nanobubble creation and development, impact on fouling, and commercial applications.

Biography
Michael Radicone is President and chief science officer of I_2 Air Fluid Innovation and Specialty Product Lead for HTRI. At I_2 Air Fluid Innovation, he has developed and patented technologies that address heat exchange fouling, toxic mercury presence in fluids, flue gas scrubber enhancement, medical and dental waterline microbial fouling and aortic catheter disinfection. As specialty Product Lead for HTRI, he oversees development and integration of the Vapor Nano Bubble Infusion technology. The recipient of seven governmental grants, he is published and peer reviewed and has presented the technology worldwide.

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An organic investigation of source rocks and oils of the upper cretaceous formations of the Sirt Basin, Libya

The source rocks and crude oils from two Upper Cretaceous Formations, the Sirte Shale, and Rachmat Formations of the Sirt Basin, have been investigated and characterized by a choice of geochemical techniques. The major aims of the study were to characterize the source rocks, thermal maturity, and depositional environments of the basin and attempt oil-source rock correlations and oil-oil correlations to improve our understanding of the origin of oil and gas in the basin. The dark gray and olive black shales of the Sirte Shale and Rachmat Formations that are deposited in a marine environment with varying water depths and are dominated by aquatic organic matter with minor contributions of plant materials. For both formations, the shales are rich in organic matter and of marginal, moderate to late middle maturity. The Sirte Shale source rock deposited in marine environments and the organic richness of this formation is higher than that of the Rachmat Formation. The Sirte Shale Formation also has a lower maturity level and fewer plant input than the Rachmat Formation and would therefore be expected to produce a high contribution to the oils found in the basin and is proposed to be more oil-prone than gas prone, while the Rachmat Formation has slightly more plant input could make a mixture of oil and gas prone. Oil- source and oil-oil correlation studies show that the crude oils discovered in both formations are produce from overlaying Sirte Shale Formation, while the Rachmat Formation has less produced mixtures of oil-gas and is the second source rocks in the basin. The petroleum system of the Sirt Basin is composed of impermeable sealing beds that well developed at the top and bottom of the Mesozoic and Cenozoic sequences, separating it from the Mesozoic and the lower Cenozoic strata to form an independent petroleum system. In this petroleum system, the source rocks are widely distribution of dark gray to olive black marine shales occurring in the Upper Cretaceous Campanian and Maastrichtian sequences, with a thickness of 150-700 m. The reservoir included Precambrian sandstone, Mesozoic sandstone, and Tertiary carbonate as carrier beds and reservoirs. The carbonate and clastic reservoirs have permeabilities of 0.2-900 md, 0.2-125 md, and porosities of 10-25%, and 5-30%, respectively. The regional cap rock is about 100-300 m thick of shale and evaporites in the Upper Cretaceous beds. Geochemical data showed that the migration was likely to have been over a short distance and that it occurred along both vertical and lateral pathways along the faults, in the Oligocene to Miocene, from the Sirte Shale and Rachmat source rocks to the reservoirs of the Upper Cretaceous-Tertiary sequences.

Keywords: Libya, Sirt Basin, Rift Basin, Source rocks, Reservoirs, Crude oils, Cretaceous, Marine shale, Depositional environments.

Biography

My name is Moftah Ahmed Ali Dieb, and I graduated with a Bachelor of Science in Geology from the Faculty of Science at Tripoli University in Libya in 1985. In 2004, I earned an MSc in Petroleum Geochemistry from Newcastle University, located in Newcastle Upon Tyne, UK. I worked for the Petroleum Research Center for 36 years, during which I gained experience in data interpretation related to source rocks, reservoir characterization, biomarkers, and the integration and interpretation of geological and geochemical data. I also collaborated on several joint geochemical studies and am familiar with a variety of geochemical software programs, including basin modeling and Integrated Geochemical Interpretation (IGI plus), which are crucial for integrating geological and geochemical data. One of my publications is about the petroleum system of the Sirt Basin in Libya, 2017. I am also teaching at universities in Libya.

Mohamad Shahrustami B Mohd Nadzeri
Operational Excellence, PETRONAS Carigali Sdn. Bhd.

Flexible pipelines risk based integrity management planning

This paper shares on recent effort in PETRONAS on standardization of risk model and Risk-Based Inspection (RBI) and Integrity Management Planning (IMP) for its flexible risers and pipelines asset. A semi quantitative approach is currently adopted by PETRONAS in determining the likelihood of failure by using set of descriptors, coupled with the company standard consequence of failure descriptors to define risk of each threat and damage mechanisms. Screening of credible threats involves understanding on the function and impact of each to flexible pipelines components and compared against failure statistics and experiences in industry. These were developed in-house by engineers and technical specialists which then used as a guideline to further establish an Integrity Management Plan (IMP) based on the risk rating i.e. High, Medium and Low, underlining respective inspection, monitoring and maintenance activities required to reduce and control the risk to As Low As Reasonable Practicable (ALARP). The result of this standardization on the risk model for flexible risers and pipelines aids PETRONAS to understand and determine its flexible and risers pipeline risk timely for intervention to prevent their failure. Meanwhile, with the IMP would enable the company to strategize and prioritize its resources to focus particularly to its high risk, thus high consequences flexible pipeline assets. In previous practice, each pipeline will be assessed based on engineering judgement through an exercise participated by various experts. While sometimes these criteria are not standardized from one pipeline to another, this exercise normally would take several days and sessions to complete due to the fact of lengthy review and challenge session to arrive to consensus on the final risk and its integrity management plan of each of its pipeline. Meanwhile, flexible risers and pipelines Risk-Based Inspection (RBI) is still considered new to the industry as the current practice is following a time-based approach defined by the manufacturer. This type of asset, originally installed on marginal fields with short lived economic life with very less or no maintenance at all. Nevertheless, most of these assets also have been operated beyond its design life as operators are continuously cutting down its production cost by reducing capital expenditure of these assets. Thus, a robust integrity management system is deemed necessary. It is imperative that with understanding on risk as well as exploring ways to maintain this kind of asset is becoming increasingly vital to balance between the risk of premature pipelines failure and production and operational cost.

Audience Take Away Notes:

- Understanding of a systematic and standardized approach of categorizing risk as well as identifying integrity management plan for flexible pipelines developed and implemented by PETRONAS
- Helps audience to adopt similar approach or to develop site specific Risk Based Integrity Management Planning for flexible pipelines
- Open for possible exchange of ideas and collaboration with others flexible pipeline operators to establish a standard approach for Flexible Pipelines RBI for inspection and maintenance optimization.

Biography:

Mr. Mohamad Shahrustami B Mohd Nadzeri, graduated as B.Eng from Universiti Teknologi PETRONAS in 2005. Working with PETRONAS since 2005, specializing in Pipeline Integrity Management (PIM) i.e. Inspection & Maintenance, Risk Assessment, Risk Based Inspection, Fitness for Service, Repair & Rehabilitation projects. Currently Team Lead for PETRONAS Flexible Pipeline Assurance Working Group to establish a Flexible Pipeline Integrity Management & Assurance within PETRONAS. Other recent major project he initiated PETRONAS Integrated Pipeline Integrity Assurance Solution (i-PIMS), in-house digital project for PIM which has been widely used by PETRONAS, and recently has been commercialized to other pipeline operators in Malaysia.

Mohamad Shahrustami B Mohd Nadzeri[1*], Dr Igor Kolesnikov[2], Mohd Izuwan Ilmi[2], Hamizah Syamimi Supian[3]
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Magnetic Tomographic Inspection (MTI) based fitness for service assessment

This paper discusses latest development in industry on Magnetic Tomographic Inspection (MTI) based Fitness for Service (FFS) assessment initiated by PETRONAS on couple of its pipeline in collaboration with Offshore Oilfield Services and IGSAT. The development uses MTM-G inspection result as one of the MTI's tools to determine remaining life of a pipeline based on predicted degradation profile of a pipeline from magnetic stress growth from metal loss, corrosion defects detected by the MTM-G. MTM-G measures the mechanical stress directly through magnetic field gradient of the pipeline under in situ conditions, thus it is not directly possible to apply a corrosion rate to the defect as compared to a geometrical features of a defect that detected by intelligent pigging, e.g. MFL or UT tool for instance. The reason that MTM-G used for this project was that it able to classify mechanical stresses by different component i.e. into hoop, longitudinal, and other any various complex combinations (bending, twisted, shear stresses, and so on), thus it is relatively straightforward to predict the degradation profile of a corrosion defect something similar to a corrosion rate properties as for a geometrical defect. Meanwhile, this scope of this FFS covers MTI technology that come with a failure or safe operating pressure, Pf and Psafe, respectively. It covers for metal loss type of defect only, covering current as well future integrity determination in a form of remaining life. In general, MTI anomalies are normally represented by Integral Risk Factor, F values which then derived into Pf of a defect. In predicting the future pipeline integrity, the concept of Psafe degradation over time is applied assuming that the corrosion degrades the integrity of a pipeline causing its failure or safe operating pressure reduces over time. There are 2 methods in estimating the projected pipeline integrity, either with or without previous inspection data. Previous inspection data in this manner is not necessarily restricted to MTI data, but it can be others inspection method as long as there is Psafe being identified or calculated from the inspection outcome. With the development of the MTI based Fitness for Services, un-piggable pipelines remaining life that were mostly inspected by MTI would be able to be identified, thus repair plan can be planned accordingly, or even risk-based inspection can be applied to determine reinspection plan prior to repair commencement. These promotes cost saving to PETRONAS in terms of inspection optimization where previously was following time based every 5-yearly at the same time prevent pre-mature failure of pipelines from timely intervention of pipeline repair before reaching its remaining life.

Audience Take Away Notes

- Understanding on Magnetic Tomographic Inspection (MTI) based Fitness for Service (FFS) assessment to estimate remaining life of a pipeline on metal loss due to corrosion defects.
- Determination on prevention or repair plan before estimated pipeline failure to prevent unwanted Loss of Primary Containment for un-piggable pipelines.
- Open for possible exchange of ideas, knowledge and experiences with others operators that are using MTI as one of alternatives for pipeline non-contact inspections for un-piggable pipelines.

Biography

Mr. Mohamad Shahrustami B Mohd Nadzeri, graduated as B.Eng from Universiti Teknologi PETRONAS in 2005. Working with PETRONAS since 2005, specializing in Pipeline Integrity Management (PIM) i.e. Inspection & Maintenance, Risk Assessment, Risk Based Inspection, Fitness for Service, Repair & Rehabilitation projects. Currently Team Lead for PETRONAS Flexible Pipeline Assurance Working Group to establish a Flexible Pipeline Integrity Management & Assurance within PETRONAS. Other recent major project he initiated PETRONAS Integrated Pipeline Integrity Assurance Solution (i-PIMS), in-house digital project for PIM which has been widely used by PETRONAS, and recently has been commercialized to other pipeline operators in Malaysia.

Mohamed Ali Tarassi
Waha Oil Company, Libya

Permeability reduction threats and the opportunity to enhance well productivity in geothermal tight sandstone reservoir

Introduction: Reservoir Permeability is a lifeline of hydrocarbon in a reservoir in which fluid travels through to wellbore. hence, any changes in nearby wellbore formation permeability will be tangible through oil rate at surface. If this effective permeability changed negatively, a reduction in oil rate will occur and will not be desired by any company.

A drastic reduction in well productivity has been noticed in 6J-Area (tight sandstone reservoir). This reduction in permeability is due to mechanical and chemical formation damage mechanisms. In literature, those mechanisms are documented but still not well understood.

Reservoir Hydraulic fracture stimulation practice has proved to be a success to create highly conductive channels in the formations having very low permeability values as well as improving well hydrocarbon recovery across the united State and Europe for decades.

This technology became an essential application in North Africa particularly (Sirte Basin) after the discovery of deep tight sandstone reservoirs.

The aim of this study is to assess a tight sandstone reservoir formation before and after hydraulic fracture treatment and the magnitude of the productivity enhancement and recovery increment.

Method and/or Theory: Well XX-9 has been chosen for work over due to sever well bore damages and, hence dramatically production losses. Also, all necessary data is available such as laboratory work on core.

In Dec-2008, well XX-9 was stimulated with alcoholic acid and showed a significant improvement to 2,155 BOPD with 400 psi WHP on 1" choke but the initial production of about 4,000 BOPD was not restored, and, therefore, it was decided to go ahead with hydraulic fracturing (HF) stimulation.

An effective hydraulic fracturing design is a key to achieve the expected results in low permeability reservoirs. All relevant available static and dynamic data were gathered to optimize the fracking input parameters and two and three dimensional models were developed in the three candidate oil wells (XX-9) in north Gialo field (Sirt Basin) operated by Waha Oil Company.

Results, Observations, Conclusions: In conclusion, the hydraulic fracture can be considered as a very successful stimulation job practically and economically for low permeability sandstone reservoirs with an increase of well flow rate of doubleincrease.

Alcohol acid stimulation has restored back some production which is 53.87% from initial production. Therefore, this method was not as effective as desired to apply on entire field.

The well has shown about 9-fold improvement in the productivity index from 0.7 STB/D/psi before frac to about 6.1 STB/D/psi after frac. The corresponding absolute open flow potentials are 2,879 and 25,928STB/D, respectively.

Rafael H. V. Abreu[1], Nicolas Alexandros Papadopoulos[1*], Flávio Magno Araújo[1], Daniel Luiz de Mattos Nascimento[2], Rodrigo Petrus[3]
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Standardized practices and digital optimization: Enhancing subsea asset management with OpenBIM and IFC

The Subsea sector of the oil and gas industry faces a critical need for standardized practices to ensure seamless data exchange and interoperability. This article navigates the intricate landscape of global and industry-specific standards, unveiling their indispensable roles in enhancing efficiency, reliability, and sustainability across various phases of Subsea projects. Standards such as ISO 15926, DEXPI, CFIHOS, IEC ISO 81346, IFC, and the foundational ISO 10303 (STEP) establish a common language and framework, promoting consistency and safety in operations. However, it is crucial to highlight that, unlike IFC, these standards have yet to demonstrate immediate applicability to Subsea interconnection projects and installations. Often confined to highly specific software and proprietary standards, their effectiveness is limited in a broader context. Challenges in data exchange, including format conversions, document-based exchanges, and a lack of consensus on reference data, underscore the urgency of standardized specifications. The research investigates the implementation of the Industry Foundation Classes (IFC) standard in the Subsea engineering sector within the OpenBIM methodology. As a proof of concept, a data model for flexible pipe systems was developed through a joint initiative involving Petrobras and TechnipTMC, in collaboration with the CERTI Foundation (an oil and gas research center). This initiative incorporated a domain expansion to characterize the scope of the supply chain and installation, utilizing tools such as IfcOpenShell and BlenderBIM. This article advocates for the transformative potential of the OpenBIM methodology, providing a comprehensive solution to manage Subsea assets by leveraging standardized practices and interoperable platforms. It enhances integrity management and propels the Subsea sector into an era of informed decision-making and digital optimization.

Audience Take Away Notes

- The importance of standardized practices in the Subsea industry.
- The transformative potential of the OpenBIM methodology and interoperable platforms in managing Subsea assets through standardized practices.
- The audience will learn how to adapt the use of IFC (Industry Foundation Classes) for application in the Subsea oil and gas industry.
- **Address Data Exchange Challenges**: They can develop strategies to overcome challenges like format conversions and lack of consensus on reference data, improving the efficiency and reliability of data exchange processes.
- **Leverage OpenBIM Methodology:** They can use this presentation example to adopt the OpenBIM methodology, IfcOpenShell, BlenderBIM to manage assets effectively, enhancing integrity management and decision-making.
- **Drive Digital Transformation:** They can drive digital transformation within their organizations by embracing digital optimization tools and standardized practices, improving data management and project efficiency.

- **Collaborate Across Teams:** They can enhance collaboration across teams, contractors, and stakeholders by using common standards and interoperable platforms, leading to smoother workflows and improved project outcomes.
- **Driving Innovation:** The adoption of digital optimization tools and methodologies fosters innovation and digital transformation within their organizations, keeping them competitive in the market.
- **Improving Data Accuracy:** Consistent standards ensure data accuracy and integrity, reducing errors and enhancing decision-making.
- **Enhancing Collaboration**: Common standards and interoperable platforms facilitate seamless collaboration with colleagues, contractors, and stakeholders, leading to smoother project execution.
- Yes, this research can be used by other faculty to expand their research or enhance their teaching by:
- Collaborating with industry partners to validate research findings and develop real-world applications of standardized practices and digital optimization tools.
- Conducting further studies on the implementation and impact of standardized practices in different sectors within the oil and gas industry.
- Faculty members can integrate real-world examples and case studies from the research to illustrate key concepts, challenges, and best practices in the field.
- Yes, this research provides a practical solution to problems that can simplify and make a designer's job more efficient by:
- Offering standardized data exchange capabilities through IFC, which may reduce the complexities associated with manual format conversions and improve overall workflow efficiency.
- Facilitating interoperability among different software platforms, potentially enhancing collaboration between designers, contractors, and stakeholders involved in Subsea projects.
- Providing a framework for more efficient project management by promoting consistent data representation and alignment with industry standards, which may lead to streamlined processes and reduced project timelines.
- Supporting innovation and digital transformation efforts within design organizations by leveraging the capabilities of IFC, helping them stay adaptable and competitive in the evolving industry landscape.
- Yes, implementing the IFC (Industry Foundation Classes) standard can significantly improve the accuracy of a design and provide new information to assist in solving design problems. Here's how:
- **Consistent Data Representation:** IFC promotes a standardized data schema and structure, ensuring consistent representation of design data. This consistency reduces errors and discrepancies in the design, leading to improved accuracy.
- **Integrated Design Processes:** With IFC, designers can integrate data from various disciplines seamlessly. This integration enables a more holistic approach to design, providing comprehensive information that can assist in addressing complex design problems effectively.
- **Data-driven Decision Making:** IFC enables access to a broader range of data, including information from different systems and software tools. This data availability supports data-driven decision-making, providing valuable insights to address design challenges.
- **Improved Collaboration:** By fostering interoperability among different software platforms, IFC enhances collaboration between design teams, contractors, and stakeholders. This collaborative environment allows for the exchange of ideas and expertise, leading to innovative solutions and improved design accuracy.
- **Cost Savings**: Standardized data exchange and interoperability can lead to cost savings by minimizing errors, reducing rework, and streamlining project management processes.
- **Scalability**: IFC is scalable and adaptable to various project sizes and complexities, making it suitable for both small-scale and large-scale Subsea engineering projects.
- **Compliance**: Using IFC helps ensure compliance with industry standards and regulations, enhancing

project credibility and reducing risks associated with non-compliance.

- **Future-Proofing:** IFC is designed to evolve with technology advancements and industry trends, future-proofing design processes and ensuring compatibility with emerging software tools and platforms.

Biography

Nicolas Alexandros Papadopoulos is a Civil Engineer with a Bachelor's degree in Civil Engineering and a Master's degree in Structural Engineering from the Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio). With 8 years of experience as a Systems Analyst at the Tecgraf Innovation Center at PUC-Rio, he has developed and applied methodologies for multidisciplinary coordination using 3D models in Civil and Offshore Construction. Nicolas is also interested in renewable energy, having contributed to the development of photovoltaic plants in recent years. Currently, he is a BIM Researcher at the CERTI Foundation, focusing on projects involving interoperability, platform integration, and IFC data generation for the Oil and Gas industry.

Noreddin Mousa* and Giuma Maayouf
Petroleum Research Center, Libya

The integration between global hydraulic elements approach (petro- typing) and petrography to identify the best Intervals in the fluvial reservoir Sirte Basin Libya

The main objective of this study is to use Global Hydraulic Elements (GHE) Approach (Petro-typing or Rock Typing) to identify the best intervals during the hole of Fluvial sandstones reservoir sirte basin and integrating with Facies analysis. The most important emerging challenges of geoscientist and engineering is improved reservoir description, many reservoirs description program though detailed, have not always included description at the pore throat scale, reservoir description has many applications in the geology, petrophysics, reservoir engineering and production The Global Hydraulic Elements (GHE) has been developed to integrate geological and petroleum engineering data, Reservoir description is very important to understanding of the reservoir and it is generally hoped that more consideration of reservoir description may lead to less time spent history matching in reservoir modelling, in this study one well have been selected (X1, concession X sirte Basin). The Global Hydraulic Element (GHE) approach has applied to improve the reservoir description and identify petrophysical rock types for this reservoir. The methodology involves the analysis of routine core analysis porosity, permeability and calculation of Normalized porosity (Φ z), Reservoir Quality Index (RQI), Flow Zone Indicator (FZI) and Facies association has been performed to better define their relationship. The rock type distribution and facies associations as an aid to identifying the best reservoir intervals and better understanding and delineation of fluid flow. The results of this study show a good matching with this integration.

Keywords: GHE, Flow zone Indicator, Petro typing, Reservoir, Facies

Biography

Noreddin Issa A. Mousa received his BSc in Geological Engineering from faculty of Petroleum and mining engineering, Tripoli university Libya in 1985 and Master of philosophy (MPhil) in petroleum engineering from Institute of Petroleum Engineering Heriot Watt University Edinburg UK in 2008. Noreddin Mousa has 36 years' experience covered data interpretation including reservoir characterization, special core analysis, well logging, the integration between static and dynamic in reservoir simulation, several joint venture studies, familiar with the new technique of Global Hydraulic Elements Approach (Petro-typing) for sandstone reservoir which was development in institute of Petroleum Engineering Heriot Watt University Edinburg UK this technique is very important to integration between geology and engineering and some publication one of them is in SPWLA, PETROPHYSICS, VOL. 51, NO. 4 (AUGUST 2010); P. 264-270; 9 FIGURES; 5 TABLES and university teaching.

Orchidea Maria Lecian
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Markov chain of the k-Ras4B dynamics and new pertinent markov-state model

The finite Markov chain originating the Markov-State Model of the conformational dynamics of the K-Ras4B proteins in the catalytic reaction is spelled. The corresponding Markov-Sates-Models are studied according t the experiment described in [H. Zhang et al., Markov State Models and Molecular Dynamics Simulations Reveal the Conformational Transition of the Intrinsically Disordered Hypervariable Region of K-Ras4B to the Ordered Conformation, J. Chem. Inf. Model. 62, 4222 (2022)]: The study is based on the large-scale conformational changes of the Hypervariable Region from its intrisicaly-disordered state to the ordered state.

Crucially, the conformal substates along the transition paths are reviewed in the path description; interactions between the HVR and the catalytic domain are recapitulated to be possible. Two possibilities are studied from the Markov landsscape accessible to the systems as one five-states Markov-State Model and one four-states Markov-State Model. A new two-states Markov-State Model is constructed, according to the qualities of the K-Ras4B dynamics processes; the new analysis of the transition to the final state is newly analytically studied. The Galerkin description's final-state transition's related eigenvalue's time evolution is newly spelled out from the new 2-states Markov State Model.

As a result, the new tools needed in the analytical computation of the relative error are ready. The relative error is newly analytically calculated. The experimental data and the characterisation of the lag time in shaping the discretization error are used to write new analytical formulations of the time evolution of the eigenvalue corresponding to the final-state transition. The new analysis is proposed, on the discretization error's features, according to which the discretization error is expected to increase monotonically with increasing lag time. The comparison with the experimental data is exposed.

Audience Take Away Notes

- Anticancer drug design; clinical study for drug discovery;
- New analysis of the K-Ras4B dynamics according to the qualities of the new Markov-State Model, to the new analytical calculation of the relative error, and to the new implementation of the definition of the discretisation error due to the lag time.
- A new Markov-State Model is analytically spelled, according to which the K-Ras4B dynamics is analytically described as far as the transition to the final state is concerned?
- The new Markov-state Models is simpler to handle; the new protocols of the analytical calculation of the relative error and those for the that of the discretisation error- according to the lag time- are newly provided with?
- New role of the conformational dynamics in pharmaceutical uses envisaged accoriding to the new Markov-States Model

- New paradigms for the understanding of the conformational dynamics of the K-Ras4B proteins, of their interaction with the catalytical environment and the new application applications are provided with.

Biography

Prof. Orchidea Maria Lecian graduated in Theoretical Physics at Sapienza University of Rome and ICRA- International Center for Relativistic Astrophysics in 2005 ad completed her International Relativistic Astrophysics Phd at Sapienza University and ICRA. She was post-doctoral Fellow at IHES (Bures-sur-Yvette, France), AEI-MPI (Potsdam-Golm, Germany) and Sapienza University of Rome. She has taken part in intensive research prorammes at AEI-MPI (Potsdam-Golm, Germany) and The Fields Institute for Research in Mathematical Sciences (Toronto, Canada). She has been researcher for SAIA- NS'P (The National Scholarship Programme of the Slovak Republic- National S'tipendium Program) as Research grantee and appointed Erasmus Lecturer at Comenius University in Bratislava, Faculty of Mathematics, Physics and Informatics, Department of Theoretical Physics and Physics Education- KTFDF. She has been Assistant Professor at Sapienza University of Rome and is Professor at Sapienza University of Rome. She is was Visiting Professor at Kursk State University, Chair of Algebra, Geometry and Didactics of Mathematics Theory within the Programme Education in Russia for Foreign Nationals of the Ministry of Science and Higher Education of the Russian Federation in 2022-2023. She has contributed in national conferences and international conferences. She is member of several Research Consortia. She is author of research papers, conference papers, review papers, invited papers and two books. She is reviewer and editorial-board member of several international Journals.

D.Sc./B.Sc. Orlando Elguera Ysnaga
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Review of research topics for scaling-up of sonochemical reactors (Sono-Reactors)

This study is aimed to review the topics of chemical engineering to take in consideration for the scaling-up of reactors, in order to perform processes based on the application of the sonochemistry at industrial level. Sonochemistry is an emergent technology, defined as chemistry made with ultrasound. The characteristic ultrasound frequencies are in the range of 1-10MHz, and in particular for sonochemistry in the sub-range 16-100 KHz. Chemical effects of ultrasound exist when there are changes in the path-ways of reactions, yields and/or selectivities of the products due to the ultrasonic activation. At laboratory level, the sonochemistry has shown fantastic results, because it is based on the phenomenon of acoustic cavitation in liquids, thus, producing very high temperatures (some thousands of Kelvin degrees) and high pressures (some hundreds of atmospheres) during very short times (from tenths to hundreds of microseconds). Cavitation is the phenomenon with the most important effect for intensification of physical and chemical processing. Under these conditions, the yields of sonochemical reactions increase drastically, and their selectivities are improved, thus generating new mechanisms of reaction involving inorganic and organic syntheses. It is not easy to reproduce experimental results of quantification of sonochemical intensity, which is significant for the efficient scaling-up of sonochemical reactors (sono-reactors) for the progress of industrial applications of sonochemistry. This technology has application at industrial level for the treatment of waste-water and black-water. Sonochemistry can be considered as Green Chemistry, presenting the following advantages: low waste, low consumption of materials and energy with optimized use of non- renewable resources and use of renewable energies. Few studies were aimed about optimum design and scaling-up of sonochemical reactors. The implementation of sonochemistry at the industrial level will be feasible when the use of cavitational energy can be adequately controlled.

Audience Take Away Notes

- It is expected that this review can collaborate in the diffusion and development of this emergent technology, due to the advantages that possess: 1) Enhancement of the yields of chemical reactions significantly, 2) Improvement of selectivities, 3) Generation of new reaction pathways.
- This technology has applications at industrial level for the treatment of wastewater.
- Sonochemistry can be considered as Green Chemistry.

Biography

D.Sc./B.Sc. Orlando Elguera studied Chemical Engineering at the National University of Engineering (Lima-Peru) with Master's studies in Chemistry Sciences at the National University of Engineering (Lima-Peru), and with Doctorate of Science with Major in Analytical and Inorganic Chemistry at the University of São Paulo (São Paulo-Brazil). He performed as Analyst of the Laboratory of samples of Geochemical Exploration and Inorganic Compounds at SGS del Perú S.A.C (almost 5 years). He has experience in the following method of analysis: Atomic Absorption Spectrometry, Inductively Coupled Plasma Optical Emission- Mass Spectrometry and X-ray Fluorescence. He has published 9 research articles in journals.

D.Sc./B.Sc. Orlando Elguera Ysnaga
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Strategies in petrochemical processes part-I: Case of peruvian oil

The great importance of oil in today's world economy is based on their contribution the total energy supply. In 2020, the world consumed 91.3 million barrels of oil per day. Depending on the quality of the crude (chemical and physical properties), the different types of oil are commercialized around the world. For two decades ago, approximately, there are tendencies up to lower or free Sulphur fuels (content under 50 ppm) for vehicles in order to reduce the emissions generated. The sulfur content of crudes is important for the determination of commercial values. Peru exports most of their crude, due to this is too heavy in Sulphur content (2000-5000 ppm) for their refineries. Peru has undergone changes in the last three decades that increased the pressure about environmental issues. The Transport is considered one of the main causes of air pollution in several Peruvian cities. For this reason, it is imperative the development strategies in order to reduce the emissions of Sulphur compounds and/or improve the existent chemical processes of petrochemical industry. We present an alternative process design, corresponding to the Sulphur desorption unit for Peruvian crude oil, in order to minimize their content, previous to the distillation units. Sulphur contained in crude oil and processed by petrochemical industry can be represent a seriously environmental problem. For this reason, is critical develop strategies in order to reduce the emissions of Sulphur compounds and/or improve the existent processes of this industry, in order to recovery this element.

Audience Take Away Notes

- It is expected that this investigation can collaborate in the development of Technologies of Sulphur reduction in Petrochemical Industry.
- This technology can be very useful in order to reduce Environmental Contamination.
- This technology can be adapted at industrial level in existent Oil-Refining processes.

Biography
D.Sc./B.Sc. Orlando Elguera studied Chemical Engineering at the National University of Engineering (Lima-Peru) with Master's studies in Chemistry Sciences at the National University of Engineering (Lima-Peru), and with Doctorate of Science with Major in Analytical and Inorganic Chemistry at the University of São Paulo (São Paulo-Brazil). He performed as Analyst of the Laboratory of samples of Geochemical Exploration and Inorganic Compounds at SGS del Perú S.A.C (almost 5 years). He has experience in the following method of analysis: Atomic Absorption Spectrometry, Inductively Coupled Plasma Optical Emission- Mass Spectrometry and X-ray Fluorescence. He has published 9 research articles in journals.

Osman Adiguzel
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Shape reversibility and functional characterization of shape memory alloys

A series of alloy system take place in a class of functional materials, by giving stimulus response to external effect. Shape memory alloys take place in this class by exhibiting a peculiar property called shape memory effect, with the chemical composition □-phase region. This phenomenon is characterized by the recoverability of two certain shapes of material at different conditions. Shape memory effect is initiated with thermomechanical processes on cooling and deformation and performed thermally on heating and cooling, with which shape of material cycle between original and deformed shape in reversible way. Therefore- this behavior can be called Thermoelasticity. This property is result of the crystallographic transformations, thermal and stress induced martensitic transformations. Thermal induced martensitic transformation occurs on cooling with cooperative movements of atoms by means of lattice invariant shears in <110 >-type directions on the {110} - type planes of austenite matrix, along with lattice twinning and ordered parent phase structures turn into the twinned martensite structures, and the twinned structures turn into the detwinned martensite structures by means of stress induced martensitic transformation, by stressing material in the martensitic condition.

These alloys exhibit another property called superelasticity, which is performed with stressing and releasing material at a constant temperature in parent phase region, and shape recovery is performed simultaneously upon releasing the applied stress. Superelasticity is performed in non-linear way; stressing and releasing paths are different in the stress-strain diagram, and hysteresis loop refers to energy dissipation. Superelasticity is also result of stress induced martensitic transformation and ordered parent phase structures turn into detwinned martensite structure with stressing in the parent phase region. These alloys are functional materials with these properties, and they are used as shape memory devices in many fields from biomedical application to the building industry with these properties.

Copper based alloys exhibit this property in metastable □-phase region, which has bcc-based structures at high temperature parent phase field. Lattice invariant shear and twinning is not uniform in copper based ternary alloys and gives rise to the formation of complex layered structures. The layered structures can be described by different unit cells as 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice. Unit cell and periodicity is completed through 18 layers, in 18R structure in ternary copper-based shape memory alloys.

In the present contribution, x-ray diffraction and Transmission Electron Microscopy (TEM) studies were carried out on copper based CuAlMn and CuZnAl alloys. X-ray diffraction profiles and electron diffraction patterns exhibit super lattice reflections. X-ray diffractograms taken in a long-time interval show that diffraction angles and intensities of diffraction peaks change with the aging duration at room temperature. This result refers to the rearrangement of atoms in diffusive manner.

Keywords: Shape memory effect, martensitic transformation, thermoelasticity, superelasticity, twinning, detwinning.

Audience Take Away Notes

- Shape memory alloys are functional materials and used in many fields from biomedical application to the building industry. This is a multidisciplinary conference, and I will introduce the basic terms and definition at the beginning of my talk and continue with experimental results. This is important, because, every scientist is not familiar with every subject of the science, and basic knowledge in elementary level, in order the audience will learn the basis of the presented lectures.

Biography

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has been retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Also, he joined over 120 virtual conferences in the same way in pandemic period of 2020-2022. He supervised 5 PhD- theses and 3 M. Sc- theses. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

P.D. Druetta, F. Picchioni
Department of Chemical Engineering, Faculty of Science and Engineering/ University of Groningen, Groningen, the Netherlands

Nanotechnology enhanced polymer flooding simulator

A new Enhanced Oil Recovery (EOR) method is proposed by combining the effects of a traditional polymer flooding and exploiting the advantages that nanotechnology presents in the oil industry. Combined flooding techniques have showed that the sweeping factors could be further increased by employing the synergy of the chemical species being injected in the reservoir. Thus, a novel technique is introduced and applied to a 2D reservoir model with a two-phase, five-component system (aqueous, oily phases and water, petroleum, polymer, nanoparticles and salt as components). Since the physical and chemical properties depend on the components' concentration, the compositional simulation approach is used to study the momentum and mass transport equations of the materials throughout the reservoir. For the polymer characterization, a novel approach is presented by considering the polymer's architecture and its degradation in order to calculate the physical properties, which has never been reported in reservoir simulation. The presence of the nanoparticles affects mainly the rheological behavior and the wettability of the rock, increasing the oily phase mobility. Moreover, negative effects such as particle aggregation and sedimentation are also modeled using a novel formulation in reservoir simulation. The combined action of polymers and nanoparticles along with their synergy allowed increasing the recovery factors beyond standard EOR processes, and it represents a suitable alternative to replace traditional combined methods, such as Surfactant-Polymer (SP) or Alkaline-Surfactant-Polymer (ASP) flooding processes. This is due to the fact that the nanoparticles act, to a greater or lesser extent, on the wettability, rheological and interfacial properties of fluids and rock formation, which is complemented with the polymer's viscosifying properties. Moreover, economic factors could also render this technique more attractive, since the nanoparticles' associated costs are substantially lower than those from surfactant flooding. This simulation proves the potential of nanotechnology as a mean to boost traditional EOR techniques in order to further increase the operative life of mature oil fields.

Audience Take Away Notes

- This model presents a new tool to analyze nano-boosted chemical EOR processes. The audience may use this to further improve and develop this technique.
- Academic/engineers in companies may get an insight of the potential of nanotechnology in EOR.
- Other universities may use this to develop novel research lines in polymer agents or different nanoparticles applicable to EOR.
- This job presents a new technique that could be applied in real life for oil companies to improve the productivity of mature oil fields under chemical EOR.

Biography

Dr. Pablo Druetta studied Mechanical Engineering in Buenos Aires, Argentina, graduating in 2004. Then, he worked during 11 years as project engineer for oil and gas companies carrying out many different projects before pursuing his PhD studies at the University of Groningen, in the Netherlands. He defended his thesis over numerical modelling of EOR processes in 2018. After this, he continued working as project engineer as well as an assistant professor of chemical product technology also at the University of Groningen. He has published more than 15 peer-reviewed articles and 3 books on the topic.

Dr. Pangkuan Chen
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π-Conjugated luminescent chiral macrocycles and the open-shell radical cations

π-Conjugated chiral nanorings with intriguing electronic structures and chiroptical properties have attracted considerable interests in synthetic chemistry and materials science. In particular, those macrocycles with robust redox chemistry are rarely reported in the literature as compared with the carbon-rich analogues. Over the past few years, incorporation of main group elements (such as B, N, P and Si) into organic systems has been established for decades to achieve functional modifications of organic π-conjugated materials. The B/N-doped main-group compounds have particularly attracted considerable research interests due to notable contribution to the electronic properties. New chiroptical materials with Circularly Polarized Luminescence (CPL) have recently found numerous applications in photonics, smarting sensing and (bio) imaging as well as information technology. This work will focus on the molecular design, synthetic methodology and characterization of organoborane macrocycles and CPL-active materials, and we will also discuss their redox-active behaviors that enable these macrocycles to be readily oxidized chemically and electrochemically, leading to the sequential production of a series of positively charged polycationic open-shell cyclophanes.

Audience Take Away Notes

- We will describe the design and synthesis of π-conjugated main-group chiral macrocycles.
- We will present the emission and circularly polarized luminescence properties.
- We will show the preparation and characterization of open-shell polycation species.
- We will also discuss some recent progress of chiral radical chemistry.

Biography
Dr. Pangkuan Chen has completed his PhD from Rutgers University with Prof. Frieder Jäkle, and postdoctoral studies from MIT with Prof. Niels Holten-Andersen. He is the full professor of Beijing Institute of Technology School of Chemistry, and he also serves as the director of Beijing Key Laboratory of Photoelectronic/Electrophotonic Conversion Materials. He has published more than 60 papers in reputed journals. His current research builds on organoborane chemistry, π-conjugated macrocycles, Near Infrared (NIR) circularly polarized luminescence, chiral radical chemistry and dynamic B/N Lewis pairs.

Paweł Grabowski*, Angelika Szwarczyńska, Aneta Nowakowska
The Faculty of Civil Engineering, Mechanics and Petrochemistry, Warsaw University of Technology; Plock, Poland

Anisidine number as a determinant of aging of ester biofuels

One of the challenges of testing the quality of biofuels is to study their oxidative stability, especially with variable feedstocks used for transesterification. Test methods developed according to the standards are based on measuring the time elapsed until the appearance of secondary reaction products that increase conductivity-the Rancimat method, the time to achieve a decrease in the value of maximum pressure in the measuring chamber by 10%-the Petrooxy method, or the sum of insoluble filterable and adherent precipitates formed under the test conditions. These methods are useful for testing oxidation resistance for freshly prepared fuel, but they are not authoritative for assessing oxidation resistance for testing over long periods of their storage. In such a case, it is useful to analyze the anisidine or acid number over time, which are standardly used in stability studies of cooking oils. The formation of stable oxidation products, such as carbonyl compounds, is then determined. Unfortunately, when testing the acid number, i.e., oxidation products that are organic acids, esterification can occur which affects the underestimation of this parameter and the problem in interpreting this parameter. The anisidine number, as an indicator of the total amount of secondary oxidation products that do not undergo further oxidation under the conditions of the experiment, can be the best indicator of oxidation resistance especially in studies conducted over a long period of time.

The purpose of this study was to determine the feasibility of using non-normal anisidine number to study changes after oxidation of methyl esters of higher fatty acids. The work used two methods to accelerate aging: elevated temperature and pure oxygen exposure.

The largest substitutions of anisidine number with time are observed for FAME obtained from frying oil and refined oil. The smallest changes are for FAME obtained from unrefined oil. The intensity of the changes directly indicates the relationship between the processes the oils undergo before transesterification and the quality and resistance of the FAME. The more extensive the refining or thermal degradation, the worse the quality of the FAME and its resistance to accelerated aging.

The study indicated a direct dependence of the anisidine number on the progressive oxidation of the tested samples of FAME produced from unrefined oil, refined oil and frying oil. These changes are reflected in the change in IR spectra obtained for the samples tested. The high R_2 coefficients of the dependence of anisidine number on transmittance at 3545 cm-1 and 3300 cm-1 indicate the applicability of spectrophotometry in the study of biodiesel aging.

Audience Take Away Notes

- How to determine the aging rate of ester biofuels?
- Are standard methods sufficient for assessing oxidative stability?
- Can spectroscopic methods be useful for biofuel aging studies?

Biography

Phd Eng Paweł Grabowski has completed his PhD in the year 2012 at the age of 29 years from Faculty of Chemistry at the Lodz University of Technology. Since 2014, he has been working at the Institute of Chemistry of the Warsaw University of Technology in the Department of Organic Chemistry and Technology, currently as an assistant professor. He has published more than 10 papers in reputed journals. Specialization - production of biodiesel, modification of biodiesel with the use of ionizing radiation, the use of ultrasounds in the production of biodiesel, catalysts in transesterification.

Pengju Wu*, Yangxian Liu
School of Energy and Power Engineering Jiangsu University, Zhenjiang, Jiangsu, China

Current research progress in heteroatom-doped carbon-based materials for adsorption of pollutants in gas stream

Lack of highly active functional groups on surface of carbon-based materials leads to low adsorption capacity of pollutants from gas stream, hindering the development of advanced carbon-based materials. Doping heterogeneous atoms into carbon-based materials is one of the most effective means to strengthen the formation of highly active functional groups on the surface of carbon-based materials. This article reviews the current research progress in doping heterogeneous atoms into carbon-based materials and adsorption of pollutants from gas stream by heteroatom-doped carbon-based materials. Various heteroatom doping means, performances and mechanisms, and their applications are commented. The adsorption performances and mechanisms of heteroatom-doped carbon-based materials for different pollutants from gas stream are also reviewed systematically. Some suggestions and prospects for the development of doping heterogeneous atoms and adsorption of pollutants from gas stream using heteroatom-doped carbon-based materials are also discussed. The purpose of this review is to advance the understanding of heteroatom-doped carbon-based materials in the field of pollutants from gas stream removal, and provide valuable guidance for the development and design of new and more efficient heteroatom-doped carbon-based materials.

Audience Take Away Notes

- The audience can understand the preparation method of heteroatom doped porous carbon.
- The audience can understand the application of heteroatom doped porous carbon in the field of gaseous pollutant removal.
- The audience can understand the adsorption mechanism of heteroatom-doped porous carbon for different gaseous pollutants.
- The audience can understand the challenges and prospects of porous carbon removal of gaseous pollutants.

Biography
Mr. Wu is a PHD student majoring in thermal engineering at the School of Energy and Power Engineering, Jiangsu University, China. He is mainly engaged in the research of flue gas mercury removal using biochar adsorption.

Pieter Samyn
Department of Circular Economy and Renewable materials, SIRRIS, Leuven, Belgium

Nanocellulose coatings for photocatalytic and photosynthetic properties

The fibrillated and crystalline nanocellulose fibers are a broad family of engineered renewable materials with favourable properties for industrial application in functional devices, used as free-standing films or coatings. Their role in catalytic processes can be exploited and optimized from a bio-mimicry approach through the replication of efficient biological features including structural identities and reactive chemical sites. The spray-coating application of nanocelluloses is a scalable process that allows for good reproducibility of the coating layers with required mechanical robustness and thickness. However, the additional control of porosity and morphologies is needed to increase the functional efficiency targeting either the bulk or surface properties of the coating layer. The coating structures can be introduced either by a bottom-up organization of the nanocellulose or top-down structuring of the deposited coating layers, resulting in the spatial replication of functional surface patterns. In particular, the interaction of light with nanofibrous structures for photocatalytic or photosynthetic activation can be further optimized as a primary requirement to enhance light harvesting, e.g., through a combination of functionalization with active chemical species and appropriate surface texturing. It will be demonstrated how novel functional nanocellulose structures and materials can be made by combining those principles, where the photocatalytic efficiency can be improved by the immobilization of photoreactive moieties or cells. In particular, the incorporation of algae or cyanobacteria in nanopaper coatings or a porous nanocellulose matrix has proven to serve as a platform for the design of photosynthetic cell factories and advanced artificial leaves.

Audience Take Away Notes

- Controlled deposition of nanocellulose coatings for industrial application.
- Additional structuring and porosity control of nanocellulose coatings.
- Functionalization of nanocellulose coatings for photocatalytic activity.
- Role of nanocelluloses in photosynthesis.

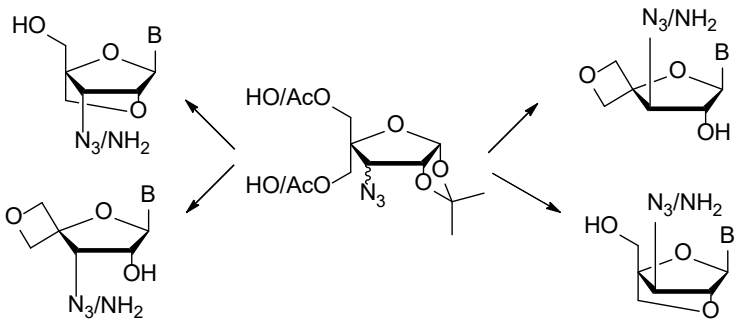
Biography
Dr. Ir. Pieter Samyn received Ph.D. in Materials Science and Engineering 2007 at Ghent University and followed an academic career at University Freiburg and Hasselt University, until 2021 when he joined the collective research center Sirris as a Senior Research Engineer. He has broad experience on the synthesis, processing and characterization of bio-based materials for composite and coating applications. His research focusses on surface functionalization and he subsequently led research projects on bio-inspired adhesion mechanisms, functional coatings for paper substrates and the development of (nano)composite materials from bio-based building blocks (cellulose, biopolymers).

Dr. Rajesh Kumar
Department of Chemistry, R.D.S. College (B.R.A. Bihar University), Muzaffarpur-842002, India

Lipase mediated synthesis of modified bicyclic nucleosides

Over two decades, a large number of nucleosides have been synthesized, which demonstrated potent antiviral and antitumour activities and have become cornerstones of treatment for patients with cancer or viral infections. Oligonucleotide-based antisense strategies represent a unique paradigm for the treatment of a wide variety of human diseases. In order to discover new class of nucleoside derivatives with enhanced biological activities, the modifications in the sugar moietiy have been attempted, which provide a remarkable level of control over nucleoside sugar puckering and its biological activity.

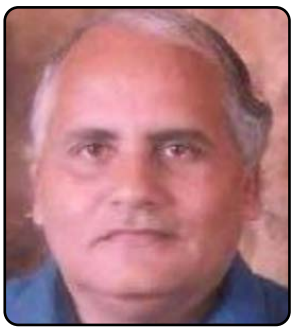
Herein, we report; (a) the selective biocatalytic acetylation studies on modified 3′-azido-4′-C-hydroxymethylated sugar derivatives with an aim to develop an efficient and easy method for the synthesis of ribo-azido/amino LNA monomers and xylo-azido/amino spiro-oxetano nucleosides and (b) the selective biocatalytic deacetylation studies on modified 3′-azido-4′-C-acetoxymethylated sugar derivatives with an aim to develop an efficient and easy method for the synthesis of ribo-azido/amino spiro-oxetano nucleosides and xylo-azido/amino LNA monomers.



B = Nucleo Bases (T, U, C & A)

Biography

Dr. Rajesh Kumar is currently working as an Assistant Professor at the P.G. Department of Chemistry, Ramdayalu Singh College, B.R.A. Bihar University, Muzaffarpur, India. Dr. Kumar has obtained his master's degree and pursued his doctoral research from the Department of Chemistry, University of Delhi, Delhi. His doctoral research focused on synthesised of modiafied nucleosides and their therapeutic applications. Dr. Kumar visited University of Southern Denmark, Denmark. During master's degree, he has qualified CSIR-JRF and Gate. He has published more than 40 publications in reputed international journal such as Journal of Organic Chemistry, European polymer journal, Theranostics etc. He has participated and delivered invited lecture in various international and national conferences in India and abroad (USA, Japan, Spain). His research interest lies in Metal complexes, Biotransformations, Catalysis, Green Chemistry, Nucleoside and Heterocyclic Chemistry.



Ram Sambhar Shuklaa[1*], N. Sudheesha[2]

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Rhodium-hexagonal mesoporous silica based effective heterogeneous catalyst for hydroformylationof vinyl esters

Hydroformylation, a catalytic reaction between double bond of an alkene with a mixture of carbon monoxide and hydrogen gases, syn gas ($CO+H_2$, in 1:1 p/p ratio), to add hydrogen and a formyl group across the double bond, is the most practiced reaction for the production of, industrially demanded aldehydes at commercial scale. Vinyl esters are the functionalized alkenes and their hydroformylation products, find a wide industrial applications. However vinyl ester hydroformylation are generally done in homogenous conditions, which have limitations of the separation of the cost effective metal based catalysts and products. Heterogeneous catalysis provides the potential advantage of easy separation and recycling of the catalyst and easy purification of the products. Heterogeneous catalysis studies on vinyl ester hydroformylation are very scanty. We have developed a heterogeneous catalyst, RhCl (TPPTS)3 (TPPTS=Triphenylphosphene-trisulfonic acid tri sodium salt) encapsulated HMS (hexagonal mesoporous silica) and investigated at laboratory scale, for the hydroformylation of four vinyl esters: vinyl acetate, vinyl propionate, vinyl butyrate and vinyl benzoate, using syn gas in a high pressure reactor. This heterogeneous catalyst is elegantly synthesized and thoroughly characterised. The catalyst is found to be effective enough to catalyze the hydroformylation of these studied esters, in which the best catalytic performance was observed with the smallest ester, vinyl acetate. Vinyl acetate, is used for the synthesis of propane diols, finding major applications as heat transfer fluid, anti-freezing agent and resins. Thus the detailed investigations performed with vinyl acetate by varying the catalyst amount, partial pressure of CO, partial pressure of H_2, temperature and agitation speed using toluene as solvent are accounted here. All these parameters were found to be effective to influence the hydroformylation rates. First order kinetics was observed with respect to the catalyst amount and vinyl acetate concentration. The partial pressure dependence of CO and H_2 also showed first order kinetics in each. Partial pressure of CO had shown an initial increase and then substrate inhibition kinetics. Oxidative addition of H_2 was found to be the rate determining step. Recycling aspects of the catalyst is studied. A suitable kinetic model was derived based on plausible reaction steps and compared with the experimental rates. In the line of above the talk will be presented and discussed.

Keywords: Heterogeneous catalyst, Hydroformylation, kinetics, Vinyl ester, Kinetic modelling.

Audience Take Away Notes

- The present work shows the efficiency of a heterogeneous catalyst, RhCl (TPPTS)3 (TPPTS= triphenylphosphene-trisulfonic acid tri sodium salt) encapsulated HMS (hexagonal mesoporous silica), for hydroformylation of vinyl ester with the recyclability and reusability of the catalyst. The mesopores of the heterogeneous catalyst afforded to act as nanophase reactors. The effective parameters for hydroformylation of vinyl acetate are kinetically optimized at laboratory scale, to address the concern of the improvement of the catalyst system for offering the required basic information to design and use high volume appropriate reactors to further scale up the hydroformylation reaction.

Biography

Dr. Ram Sambhar Shukla received B.Sc. (1975), M.Sc. (1977), Ph.D. (1981) degrees and PDF of CSIR (1981-83) from University of Allahabad, India and joined Inorganic Materials and Catalysis Division of CSIR- Central Salt and Marine Chemicals Research Institute, Bhavnagar, India as research scientist since 1983. His specializations include catalyst materials, green organic transformations of O_2, CO_2, CO, H_2 and CH_4, high temperature-pressure material and catalysis. He is Life Member of National Academy of Sciences-India, Allahabad and Catalysis Society of -India, Madras. He was Member of Indian Reference Materials, Delhi and was Chairman (Alternate), Inorganic Materials Sectional Committee of Bureau of Indian Standard, Delhi. As Bilateral Exchange of Scientists awardees visited France (CNRS, 1993) and Korea (KOSEF, 2002) for collaborative research on C-H and CO_2 respectively. Awarded brain pool scientist (2011) and researched in Korea on utilization of CO_2 as soft oxidant. Performed as faculty Professor for Ph.D. course, of Academy of Scientific and Innovative Research (AcSIR), and of Bhavnagar University. He is reviewer for reputed journals for materials and catalysis and Ph.D. examiner for Indian universities. He credited: 100 papers, 5 patents, 2 reviews, 4 book/chapters, 52 invited lectures: 21 international and 71 national conferences,17 students guidance and 20 research projects.

Ramy Mohamed Fahmy
Exploration Department, Rashid Petroleum Company, Cairo, Egypt

Novel approach to detect AVO anomalies supported by direct hydrocarbon indicators in the deep miocene of the offshore mediterranean, Egypt

To counteract declining in the production and ensure project economic viability, success in exploiting deep Miocene targets is crucial, following decades of focusing on shallow Pliocene targets. Utilizing the Amplitude Versus Offset (AVO) Class-III approach, all identified fields were drilled. Pre-Messinian wells typically exhibit water sand characteristics with a distinct hark-kick response, classified as AVO class I. This paper introduces a methodology designed to detect soft-kick gas sand supported by Direct Hydrocarbon Indicators (DHI) in the Miocene.

The workflow commences with the rock physics study to examine the feasibility of all potential scenarios for AVO class-II soft kick in the Miocene region. A fluid substitution technique was employed to generate well logs exhibiting gas responses. Subsequently, comprehensive research was conducted to monitor all possible scenarios of soft kick gas sand and its properties. Subsequently, a stochastic Monte Carlo simulation was utilized to construct the AVO class-II scenarios.

Subsequently, numerous opportunities were created with identical finalized situations to provide DHI assistance for AVO class-II soft kick. The seismic signature of this Avo class-II is a subtle, gentle impulse in the seismic data that appears brighter in the far stack. A study of the results helps to estimate the probability of success for exploration prospects with a low to transparent seismic amplitude (AVO class-II). Geological derisking was also examined to reduce the risks associated with these new opportunities.

Audience Take Away Notes

- They will try to extract DHI for deep targets.
- They will increase the portfolios that including deep targets anomalies with DHI that not clear before.
- Yes, this research that other faculty could use to expand their research or teaching
- Yes, the issue that the shallow targets in general have DHI support low risk. The deep targets not have clear or easily to extract the DHI. This research help to extract DHI for deep targets with low risk.

Biography
Ramy Fahmy is a Senior Geophysicist with over 15 years at Rashid Petroleum Co., Shell Egypt's partner, excelling in prospect generation and maturation. He has advanced geophysical and geological technologies, focusing on de-risking and ranking prospects, and played a key role in discovering the "Swan-E" well. Currently, as a Field Development Geophysicist, he leads initiatives to unlock new hydrocarbon plays in various geological settings. Ramy is pursuing a PhD in geophysics at Cairo University, applying machine learning to gas reservoirs. He holds a M.Sc. in geophysics from Cairo University and a B.Sc. from Ain Shams University.

Dr. Reena Saxena
School of Applied Sciences, Suresh Gyan Vihar University, Jaipur

Structural and functional evaluation of biochar produced from Spent Coffee Grounds (SCG) for agnps removal from industrial effluent

Silver is one of the precious metals and is most popular for its diverse applications in various industries. Major industries such as textiles, coatings, paint and pigments, cosmetics, medical and packaging utilized Silver Nanoparticles (AgNPs) during their manufacturing process. More than 1700 different products of these industries are available in the market which contains silver nanopatricles. According to the survey it has been found that total environmental emissions for AgNPs has raised upto 90% globally and around 83% at per industrial sector. These results show that AgNPs show the major environmental impact. Due to waste discharge from all these industries AgNPs get mixes with water bodies and contaminated on large scale. However, environmental exposure to these silver ions or silver nanoparticles through waste streams has become major threats for human health as well as for ecosystem. Biochar is a potential support matrix to immobilize nanoparticles on its surface due to presence of various functional groups on biochar surface with its porous structure which can be an advantageous factor for removing AgNPs from waste water stream. SCG is considered as one of the most common biomass waste with an estimated production of about 7×109 kg/year. Biochar which is derived from SCG exhibits a significant amount of oxygen surface site with high surface area and some quantity of minerals. This work reviews the compositional and characteristics evaluation of SCGs derived biochar after pyrolyzed at several heat levels for better adsorption of AgNPs.

Key words: Spent coffee ground, Agnps, Biochar, Biomass, Remediation, Industrial effluent.

Audience Take Away Notes

- This presentation will explain about cost effective methodology for waste water treatment so audience can have an idea about biochar application for environmental remediation.
- Water pollution is main focused are at current time in which every industry and research laboratory is working so proposed knowledge can be helpful at industrial level.
- Most of the courses include environmental remediation in their curriculum so it is very much relevant for teachers and it is also a focused area in every country in which government is giving more concern so all researchers will get benefited by this knowledge.
- Biochar is cost effective and more efficient so it can be utilized commercially after successful results.
- This type of water remediation will help out ecosystem also to balance as mostly industry discharge their waste in water bodies due to which ecosystem get affected.
- Spent coffee ground biochar is producing in large quantity worldwide by this presentation researchers will come to know the utilization of SCG based biochar.

Biography

Dr. Reena Saxena is currently working in School of Applied Sciences of Suresh Gyan Vihar University, Jaipur. Before this she has worked for ten years in other academic institution as a faculty and researcher. Her research area is synthesis of nanommaterials and nano composites for air and water remediation. She has attended around 10 national and international conferences. She has published 4 book chapters and 5 research articles in reputed journals. She has also edited two books and received one young scientist award for outstanding paper presentation during International conference.

Dr. Saad AlSahlawi
Kuwait Oil Company, Kuwait

Field implementation and experimental validationof eMCM

Motor Condition Monitoring (MCM) plays a critical role in ensuring the reliable operation of electric motors, which are essential across diverse industries. Traditional MCM techniques often involve physical sensors to measure parameters like vibration and temperature. However, these methods face challenges, including high installation costs, complex data management, and susceptibility to environmental interference. In response to these challenges, we introduce a sensorless motor condition monitoring system, eMCM, which leverages advancedsignal processing and machine learning algorithms to analyze inherent electrical signals within the motor itself. This study presents the field implementation and experimental validation of eMCM in a real-world industrial setting.

We selected a diverse range of motor systems for field testing, ensuring representation across various applications and operational conditions. The eMCM system was installed on these motors, and continuous monitoring of voltage and current waveforms was conducted. The data collected was analyzed to detect patterns and anomalies indicative of potential motor faults. Forcomparative validation, traditional sensor-based monitoring techniques were simultaneously applied to a control group of motors under identical operational conditions.

The experimental results demonstrated the efficacy of eMCM in accurately detecting a range of motor faults, including misalignment, bearing wear, rotor bar defects, and electrical imbalances.The eMCM system outperformed traditional methods in terms of detection speed, sensitivity to minor anomalies, and overall cost-effectiveness. Notably, the sensorless approach significantly reduced installation complexity and maintenance requirements while providing real-time, high- resolution data analysis.

In conclusion, eMCM offers a transformative approach to motor condition monitoring, addressing the limitations of traditional sensor-based methods. Its ability to provide reliable, cost-effective monitoring with minimal maintenance makes it a promising solution for industries seeking to enhance operational efficiency and reduce downtime. Future research will focus on further refining the system's capabilities and expanding its applicability across different types ofmachinery.

Keywords: Motor condition monitoring, Sensorless monitoring, eMCM, Signal processing,Machine learning, Industrial applications, Fault detection.

Biography

Dr. Saad AlSahlawi is a seasoned mechanical engineer with a Ph.D. in Mechanical Engineer- ing from the University of Nottingham, UK. He specializes in technology management and Innovation, with extensive expertise in research and development. Dr. AlSahlawi also holds an MSc in Engineering Management and Technology and a Bachelor's in Mechanical Design and Technology from Northumbria University, UK. Additionally, he has international diplo mas in Occupational Safety and Health and Environmental Management from the British Safety Council, UK. His patented innovations in alternative energy, recognized in the U.S.. highlight his significant contributions. His dedication to advancing technology and fostering Innovation positions him as a valuable leader in technology management

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Magnetically induced heterogeneous catalysis for energy storage applications: Methanation of CO_2

Climate change is a major worldwide challenge, with the energy and industrial sectors being responsible for the majority of GHG emissions. A variety of solutions are being studied, such as the electrification of industrial heating and power-to-gas storage solutions. In this study, we aim to study an innovative magnetically heated pilot-scale methanation reactor. Induction heating presents a unique advantage in this context, offering rapid and localized heating directly to the catalytic bed via the heating agent, which improves reaction kinetics, energy efficiency and reactor control. The heating agent is Iron wool, a commercially available, low cost and versatile material that has been successfully used by our group for a variety of magnetically induced heterogeneous catalytic reactions. Our study investigates both the magnetic heating of our catalytic bed as well as the advantages in terms of high conversion rates of CO_2 into methane, low power consumption, and a dynamic reactor control which is suitable for PtG applications. First, the effect of packing and geometrical factors on the heating were studied, and the heating mechanisms were defined. In addition, the pilot reactor showed extremely fast start-up times compared to current industrial methanation reactors, with the possibility to dynamically control the heating. High CO_2 conversion rates (>90%) and high CH4 selectivity (>98%) were obtained. The experimental results were then replicated with the developed numerical model and further simulations and operating conditions were explored. This research not only highlights the feasibility of using induction heating in the methanation process but also underscores its broader implications for the future of industrial process electrification, aiming to contribute to more sustainable and flexible energy systems.

Biography

Salim Daccache studied chemistry at the Saint-Joseph University of Beyrouth and graduated in 2017. He then joined ESIB (Ecole Superieur d'Ingenieurie de Beyrouth) to study chemical engineering and finished his engineering degree at INP ENSIACET in Toulouse while also obtaining a MS in process engineering in 2021. Afterwards, he joined the research group of Prof. Julian CARREY at the LPCNO (Laboratory of physics and chemistry of nano-objects) to undergo a PhD program with the aim of studying and simulating a methanation reactor which is activated by magnetic induction.

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Consumer experience v/s expectations in the digital era in downstream oil & gas industry in India

Many far-reaching trends accentuated by the rise of alternative energy, emerging models in mobility, and heightened customer expectations converging around convenience and personalisation are disrupting the retail fuel markets worldwide. Customers express the need to recognise each individual and tailor products & services. Digital plays a dominant role in the emerging scenario. Customer buying behaviour is changing over time with the advancement of technology. Accordingly, drivers influencing the customer experience have also evolved. The study aims to find how digital technology has affected customers and provides perspective on customer experience.

Technology advancements significantly impact consumers and industries and wholly transform people's lifestyles and behaviour. While the internet changed how humans interact, the Internet of Things (IoT) is expected to change how machines interact. Innovations have been seen in customer engagement and satisfaction in retail, influencing the customers' buying behaviour. IoT, AI, and predictive analytic tools play a significant role in building up customer-facing initiatives leading to the design of service protocols for the enhanced buying experience.

Technology adoption in petro retail is distributed with Automation, IoT, and AI & ML-based technological solutions tried in a scattered way without a centralised view of the entire value chain. Such technology is adopted predominantly towards operational efficiency, improving asset utilisation. However, few usages have been tried to enhance customers' buying behaviour, including customer identification and satisfaction. Adopting a central monitoring system in various sectors showed that the availability of real-time KPI monitoring, AI&ML-driven analytics, and alerts of exceptions of standard Operation processes resulted in achieving operational excellence and building trust in the customer's mind. With the advancement of technology, customer habits, lifestyles, and preferences have shifted and are still evolving. While general retail is exploring technologies like VR for the average customer, petro-retail is yet to catch up. An apparent gap between customer expectations in petro retail vs broad retail context seems to exist. IoT is changing in the Digital era, influencing Customer expectations and managing experience in the petro retail sector in India from both customer & service provider perspectives (a dyadic approach). The study is one of its kind on the aspect of petro retail.

IoTs are the technology on which future society will ride. IoT will significantly impact the service industry, including Petro retail. Hence, the analysis of the gap in an adoption shall be helpful for the academicians and managers in Oil & Gas industry for further review, study and implementation of better service protocols.

Audience Take Away Notes

- The topic shall allow the industry audience to evaluate their existing process and to adopt IoT

technology towards digital transformation in their organisation.

- The topic shall help the researcher to align and adopt the technology & processes that follow to enhance their research fieldwork.
- The presentation shall help understand the practical solution to a problem that could help efficiently design the process using IoT, ML and AI technology.

Biography

Santanu Purohit, an engineering graduate in instrumentation and electronics with an MBA in marketing, has more than 24 years of experience in India's downstream oil and gas industry. He has five years of experience in research in Service Marketing with the University of Petroleum & Energy Studies, Dehradun, India. He is pursuing his doctoral research in Petro Retail in the field of inclusion of technology in services towards better efficiency and enhanced customer experience. He has published 22 research papers in various National & International Journals. He won "The International Scientist Awards on Engineering, Science and Medicine" as the "Best Researcher Award" in 2022. He was also awarded the "International Best Researcher Award" in Management by "ISSN International Science & Technology Awards and Congress 2022" for his published paper titled "Leveraging IoT and AI for Delivering tailor-made customer experiences in Indian Petro Retailing". He has also presented papers at 5 Academic international academic conferences and also in India Energy Week 2023 7 ADIPEC 2023.

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Digital transformation–Usage of technologies for efficiency and effectivity–A fuel retail success story

Digital Technology is the "New Oil' but with unlimited reserves. BPCL has always been a pioneer in leveraging technology to innovate solutions. With this vision 2 years back, Project Anubhav was started, focusing on delivering the best customer experience across all touchpoints, meeting their evolving needs and achieving operation efficiencies. This feat to create exceptional and consistent customer experience rests on 3 foundational pillars– Trust, Convenience and personalisation.

Project Anubhav has given various solutions to businesses like an AI-based chatbot called "URJA Chatbot", which could communicate in more than 13 languages and perform multiple tasks, UPI and QR-based touchless fueling solution "UFILL", at BPCL's retail outlets across the country which ensures a complete trustful and transparent fueling experience, along with convenience and reduced fueling time. The Advanced Loyalty Program on the "HelloBPCL" App provides convenient and personalised solutions, cash management for fleet owners, enhanced features like a green pin for cards, instant activation/ deactivation of virtual cards, etc. Lubes QR Code Solution has been developed for a highly competitive lubricant business that delivers end-to-product traceability across the supply chain, provides genuineness checks to customers, and loyalty schemes to mechanics & retailers. IRIS remotely monitors Retail Outlets, Oil Installations, LPG plants, Vehicle Tracking Systems, and Video Analytics through digital signals received from 1000+ IoT sensors installed at the locations. The CRM solution 'SalesBuddy' provides a customer 360-degree perspective that helps us generate and manage business opportunities, customer grievance resolution, and channel management. The I&C B2B Portal caters to the needs of industrial customers for petroleum and petrochemical products.

BPCL has taken a leap in the journey of Digital Transformation, and the initiatives under project Anubhav offer customers a highly immersive digital experience backed by state-of-the-art technologies to ensure smooth and continuous service at all times with the ability to scale.

Customer expectations are changing rapidly with the adoption of advanced digital technology. BPCL has done massive exercises to identify changing customer needs. More than 400 officers were engaged in the ideation workshop. More than 22 teams created the business cases. A team of more than 60 members defined the user stories. Four themes that will take care of the futuristic trends and customer requirements were finalised-Customer engagement portal, Command and control centre, Integrated supply chain and Digital Marketing. Under the above themes, all the solutions, i.e. UFILL, ALP, URJA CHATBOT, B2B PORTAL, IRIS, SALESBUDDY CRM, LUBES QR CODE, were developed.

All initiatives go live and are clubbed along with a detailed plan on post-go-live support, which we define as Hyper care to take care of any technical support requirement round the clock to ensure the smooth functioning of the business. In parallel, a well-structured communication plan is devised to promote the new initiative to the internal stakeholders, and feedback is taken on a regular basis through surveys and

workshops. All the developments are documented in a strategic manner to ensure a smooth transfer of knowledge between stakeholders.

Audience Take Away Notes

- The topic shall allow the industry audience to evaluate their existing process and to bring suitable technology towards digital transformation in their organisation.
- The topic shall help the researcher to align and adopt the technology & processes that follow to enhance their research fieldwork.
- The presentation shall help understand the practical solution to a problem that could help efficiently design the process.

Biography

Santanu Purohit, an engineering graduate in instrumentation and electronics with an MBA in marketing, has more than 24 years of experience in India's downstream oil and gas industry. He has five years of experience in research in Service Marketing with the University of Petroleum & Energy Studies, Dehradun, India. He is pursuing his doctoral research in Petro Retail in the field of inclusion of technology in services towards better efficiency and enhanced customer experience. He has published 22 research papers in various National & International Journals. He won "The International Scientist Awards on Engineering, Science and Medicine" as the "Best Researcher Award" in 2022. He was also awarded the "International Best Researcher Award" in Management by "ISSN International Science & Technology Awards and Congress 2022" for his published paper titled "Leveraging IoT and AI for Delivering tailor-made customer experiences in Indian Petro Retailing". He has also presented papers at 5 Academic international academic conferences and also in India Energy Week 2023 7 ADIPEC 2023.

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Towards sustainable textile and apparel waste management: A comprehensive review

With the global population on the rise and a marked improvement in living standards, the textile industry has witnessed unprecedented growth, leading to a surge in waste production. This study addresses the accelerating environmental challenges posed by the exponential growth in textile production and waste generation, driven by population growth and improved living standards. The textile industry has become a major contributor to environmental degradation, particularly through improper disposal of wastewater and fiber waste. This paper aims to address the current state of waste production, its sources, and characteristics within the textile sector, highlighting the urgent need for global waste management solutions. The focus is on identifying challenges and analyzing waste sources to underscore the importance of adopting sustainable practices, emphasizing the principles of reduce, reuse, and recycle. The study advocates for heightened awareness of these practices to drive economic and environmental improvements in the textile industry. Furthermore, it proposes a robust framework for textile waste management, emphasizing the transformation of waste into value-added products in the textile and apparel sector. Highlighting the inadequacies in current waste management approaches, the study strives to pave the way for future developments in this crucial field. Through insights into current waste generation trends and environmental concerns, this study contributes to the ongoing discourse on sustainable waste management in the textile and apparel industry. In conclusion, it offers actionable guidance for industry stakeholders striving to achieve a harmonious balance between economic prosperity and environmental stewardship in activity of a sustainable future.

Keywords: Textile waste, Environmental degradation, Sustainable practices, Waste management, Textile industry.

Biography

Sasmita Chand is working as an Assistant Professor in Manipal School of Architecture and Planning, Manipal Academy of Higher Education, Manipal, Karnataka, India. She has completed her PhD in Environmental Science and Engineering from IIT (ISM), Dhanbad, MTech in Environmental Science and Engineering from Birla Institute of Technology (BIT) Mesra, Ranchi, and MSc in Environmental Sciences from Utkal University, Odisha, India. She has key research interest in the field of industrial waste management and leaching of constituent elements from industrial solid waste.

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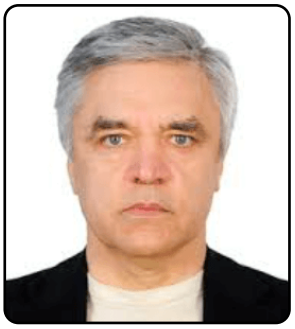
Experimental investigation and parametric optimization with RSM and ANN for floating drum anaerobic bio digester

The primary goal of this research is to use Artificial Neural Networks (ANN) and Response Surface Methodology (RSM) to improve the ideal conditions for biogas yield from the anaerobic digestion of agricultural waste (rice straw). Temperature, pH, substrate concentration, and agitation time are considered model variables in the creation of prediction models. The experimental findings demonstrate the significant interacting effects ($p<0.05$) of the liner model variables temperature, substrate concentration, pH, and agitation time. The findings show that, when comparing the ANN model to the RSM model, the ideal process parameters had an impact on the increase in biogas yield. When compared to the RSM model, the ANN model shows that it is significantly more accurate and calculates the values of maximum biogas yield.

Keywords: Agricultural waste, Temperature, Rice straw, Agitation time, Response surface temperature, Artificial neural networks.



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Antibody-proteases as unique protein biomarkers, potential targets and translational tools of the next step generation to be applied for biotech-driven biotech and personalized and precision medical practice

Biomarkers as being a part of the ligand-receptor tandems have induced an impulse to prompt the development of an upgraded concept of the targeted therapy. So, the identification, impact and implementation of diagnostic, predictive and prognostic biomarkers of the next step generation be-comes the Holy Grail of platforms, algorithms and protocols, which are the crucial for Personalized & Precision Medicine (PPM).

High impact of Ab-proteases can be used to monitor both clinical and subclinical courses of chronic autoimmune inflammation in Autoimmune Thyroiditis (AIT), Multiple Sclerosis (MS) and autoim-mune myocarditis (AIM) to predict stepwise transformations of the course, starting from the pre-illness and to prognosticate the clinical illness finally. This information can allow to design the al-gorithms for combinatorial (preventive, prophylactic, therapeutic and rehabilitative) treatment, whilst developing unique tools for individually therapy for a number of diseases, such as a group of autoimmune diseases which holds a particular position.

Among the best-validated canonical biomarkers are autoimmunity-related ones (including antibod-ies/Abs) to predict and prognosticate risks of the chronification, complications and thus disabling. The latter is so much valuable and important since chronic autoimmune inflammation course is structured to consist from different stages including subclinical and clinical ones.

According to classical conception, Abs are specific proteins produced by the immune systems with exclusive function of Ag binding. But Abs against chemically stable analogues modelling the transi-tion states of chemical reaction, can catalyse many different reactions, and were thus called catalyt-ic Abs (catAbs) or abzymes (derived from Ab and enzymes), which thus to belong to Abs with a fea-ture of functionality.

Abs endowed with enzymatic properties have been described in human autoimmune manifestations for more than a decade in a variety of disorders. DNA- and RNA-hydrolyzing Abs (DNA and RNA-abzymes) have been isolated from the serum of patients with different systemic autoimmune dis-eases, including Systemic Erythematosus (SLE) and rheumatoid arthritis (RA). Proteolytic Abs (Ab-proteases) specific for Thyroglobulin (Tg), Cardiac Myosin (CM) and Myelin Basic Protein (MBP) have been reported in patients with Autoimmune Thyroiditis (AIT), Autoimmune Myocarditis (AIM) and multiple sclerosis (MS), respectively.

Disease-associated abzymes may have been "induced" by the Ag implicated in the disease. Secondly, the increased occurrence of abzymes in pathology may result from the loss of repressive control over abzyme-producing clones generated spontaneously under physiological conditions. A third explana-tion for the origin of abzymes in pathological conditions is based on idiotypic network and exacer-bated self-recognition in autoimmune disease.

The abzymes may complement the general alteration of the immune response. In this sense, Ab-proteases as the second stage of the discoveries in the area mentioned, would represent Abs to pro-vide the additional but highly targeted proteolytic effects. It is known that proteases precisely con-trol a wide variety of physiological processes and thus are important drug targets.

Meanwhile, canonical autoAbs play neither predictive nor discriminative role to affect the pre-early and/or subclinical stage of autoimmune conditions. So, there is urgently needed for biomarkers, which could clarify pathology (including subclinical one), monitor disease progression, response to treatment, and prognosis in the autoimmune inflammation. Overall, OMICS-related approaches can develop different therapeutic and diagnostic aspects of autoimmune conditions, from biomarker dis-covery to PPM.

Regarding abzymes, their phenomenal property mentioned is buried in the Fab-fragment of the Ig molecule and is appearing to sound as a functional property of the Ab molecule. In this sense, Ab-proteases as a significant portion of the big family of abzymes represent Abs endowed with a capaci-ty to provide targeted proteolytic effect.

The activity of Ab-proteases being identified in AIM, AIT and MS patients was first registered in the patients and persons-at-risk at the subclinical stages 1-2 years prior to the clinical illness. And the activity of the Ab-proteases revealed significant correlation with scales of autoimmune inflam-mation and the disability of the patients as well.

Moreover, sequence-specific Ab-proteases being studied in MS patients and persons-at-risk, have proved to be greatly informative and thus valuable as biomarkers to monitor chronic autoimmune diseases at both subclinical and clinical stages! Therefore, the proposed predictive value of the tar-geted Ab-proteases for the development of the above-mentioned autoimmune disorders is being challenged! So, the activity of Ab-proteases and its dynamics tested would confirm a high subclini-cal and predictive value of the tools as applicable for monitoring protocols!

The primary translational potential of abzymes and thus of this knowledge is in the rational design of new therapeutics to exploit the role of the key pathways in influencing disease. Of tremendous value are Ab-proteases directly affecting remodelling of tissues with multilevel architectonics (for instance, myelin or cardiac muscle). By changing sequence specificity one may reach reduction of a density of the negative proteolytic effects within the myelin sheath and thus minimizing scales of demyelination.

The traditional goal of Ab engineering is to combine various Ab domains to generate customized Abs that show specialized binding properties, optimal half-lives and desirable effector functions. Abs can be engineered to make proteins of higher affinity or smaller molecular variants that retain or change the

functional properties of the original Ab. In this context, targeted Ab-mediated prote-olysis could thus be applied to isolate from Ig molecules catalytic domains directed, in MS human and animal models, against encephalitogenic autoepitopes or domains containing segments to exert proteolytic activity and then be used as therapeutic modifiers. Ab-based therapeutics have entered the central stage of drug discovery as a result of a major shift in focus of many biotech and bio-pharma companies. And as the outcome of the latest initiatives, modified recombinant Abs have been designed to be more cytotoxic to enhance effector functions (bivalent Abs), whilst integrating canonical cytotoxic and upgraded catalysing (proteolytic) features. So, Ab-protease engineering would offer the ability to enhance or alter their sequence-specific activity to expand the clinical util-ity of the absolutely new tools.

In this sense, Ab-proteases can be programmed and reprogrammed to suit the requests and standards of regenerative medicine and re-myelination, in particular. In this sense and in terms of PPM, Ab-proteases can be programmed and re-programmed to suit the needs of the body metabolism or could be designed for the development of principally new catalysts with no natural counterparts.

So, further studies on Ab-mediated MBP degradation and other targeted Ab-mediated proteolysis may provide biomarkers of new generations and thus a supplementary tool for assessing the disease progression and predicting disability of the patients and persons-at-risks.

We are now experiencing a Renaissance primarily driven by the design-driven biotechnologies. And the new approach is needed to secure artificial or edited Ab-proteases as unique translational probes to diagnose, to monitor, to control and to treat and rehabilitate autoimmune conditions patients at clinical stages and to prevent the disorder at subclinical stages in persons-at-risks to secure the effi-cacy of preventive, prophylactic and restorative manipulations.

Audience Take Away Notes

- To implement special technologies into the lab practice and to be used the latter for monitoring the autoimmune inflammation.
- To get the clinical hospitals re-armed with technologies of the next step generation.

Biography

Sergey Suchkov graduated from Astrakhan State Medical University and awarded with MD, then in 1985 maintained his PhD at the Sechenov University and in 2001, maintained his Doctorship Degree at the Nat Inst of Immunology, Russia. From 1987 through 1989, he was at Koltzov Inst of Developmental Biology. From 1989 through 1995, he was a Head of the Lab of Clin Immunology, Helm-holtz Eye Res Institute in Moscow. From 1995 through 2004, a Chair of the Dept for Clin Immunology, MONIKI. Dr. Suchkov has been trained at: NIH; Wills Eye Hospital, PA, USA; Univ of Florida in Gainesville; UCSF, S-F, CA, USA; Johns Hopkins University, Baltimore, MD, USA. He was an Exe Secretary-in-Chief of the Edit Board, Biomedical Science, an Int Journal published jointly by the USSR Acade-my of Sciences and the Royal Society of Chemistry, UK. At present, Dr. Sergey Suchkov is a Chair, Dept for Personalized Medicine, Preci-sion Nutriciology and Biodesign at the Institute for Biotech & Global Health of RosBioTech and Professor of the Dept for Clinical Immu-nology of A.I. Evdokimov MGMSU, Russia. He is a member of the: New York Academy of Sciences, American Chemical Society (ACS), American Heart Association (AHA), EPMA (European Association for Predictive, Preventive and Personalized Medicine), Brussels, EU; ARVO (American Association for Research in Vision and Ophthalmology); ISER (International Society for Eye Research); PMC (Personal-ized Medicine Coalition), Washington, USA.

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Sustainable recycling of valuable materials from lithium-ion battery waste via hydrometallurgical process

The rapid growth in Lithium-Ion Batteries (LIBs) demand for various emerging applications, such as electric vehicles and energy storage systems, will result in waste and disposal problems in the next few years as these batteries reach END-OF-LIFE (EoL). The spent LIBs also include 5–20 wt.% Cobalt (Co), 1–7 wt.% lithium (Li), 5–15 wt.% Nickel (Ni) and 10-15 wt.% Manganese (Mn), the composition varying slightly with different manufacturers. Co is considered a rare and strategic metal as it is relatively expensive and the natural resources are primarily limited to the Democratic Republic of the Congo and Zambia. There is a unique opportunity to utilize these EoL batteries as a secondary source to recover this valuable metal. Over the years, various recycling processes, including pyrometallurgy, hydrometallurgy, and bioleaching, have been developed to effectively recover metals from spent batteries. The hydrometallurgy method has been considered as a facile, safe, and efficient process to extract and recover valuable metals from spent LIBs. However, conventional inorganic acids (HCl, H_2SO_4 and HNO_3) as leaching reagents are not considered environment-friendly. The current focus is to use greener solvents for metal recovery to reduce secondary pollution and negative impact on the environment.

Deep Eutectic Solvents (DESs) have emerged as green solvents for metal recovery from LIBs waste material. In this context, a naturally occurring organic compound known for its exceptional leaching efficiency has been used as a component of DES to assist the leaching process.

The present study will, therefore, focus on developing a closed-loop recycling process for the recovery of critically-rare metals from LIBs waste using a green solvent. The research will provide a comparative study for Co metal extraction from spent LIBs using DES and conventional acids. The effect of various operating parameters such as temperature, pH, liquid-solid ratio, and reaction time will be optimized by performing the experiments. An insight into the kinetic modelling of the DES-assisted extraction process will also be provided. Various physico-chemical characterization techniques such as XPS, XRD, and UV-Vis spectroscopy will be used to investigate the plausible mechanism for the extraction process.

Audience Take Away Notes

- This will help the audience to understand the necessity for the recycling of spent or discarded lithium-ion battery. Audience will get insight into the current practices of handling the battery waste and the current challenges associated with these methods.
- Yes, it will provide a sustainable solution for lithium-ion battery waste recycling problem which can be implemented at industrial scale.
- Usually during the recycling of lithium-ion battery waste, only 60-80% of lithium is recovered due

to losses at various process steps. Whereas, here we have proposed an efficient way for recycling the battery waste utilizing the selectivity property of green solvent thus limiting the losses of Li during the recovery process thereby, increasing the overall recovery efficiency of Li.

Biography

Shally Gupta is currently pursuing Ph.D. under the University of Queensland-IIT Delhi joint PhD program. Her Ph.D. work is focused on valuable metarials recovery from spent lithium-ion batteries via environmenatlly benign routes. The recovery of valuable metals (Li, Ni, Co and Mn) and graphite from the battery waste and their reutilization for energy materials are the main objectives of her Ph.D. work. Before joining the Ph.D. program, She worked at the Tata Research Development and Design Center (TRDDC), Pune as a researcher for four years. She has published 5 research articles in journals of international reputee and 1 book chapter. She has attended several national and international conferences.

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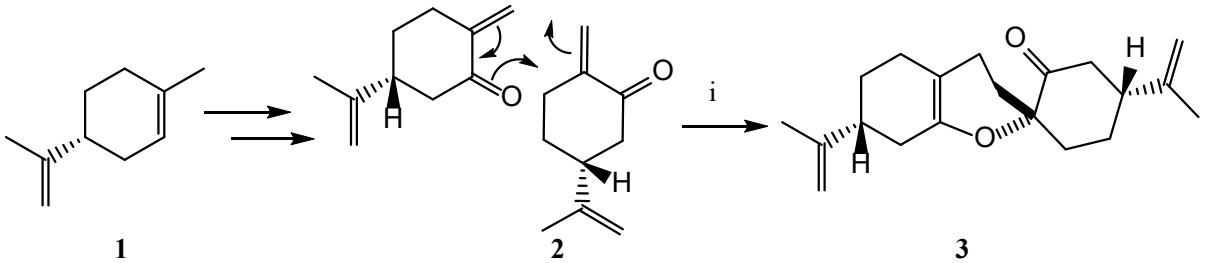
Serendipitous biomimetic synthesis of (+)-cymbodiacetal

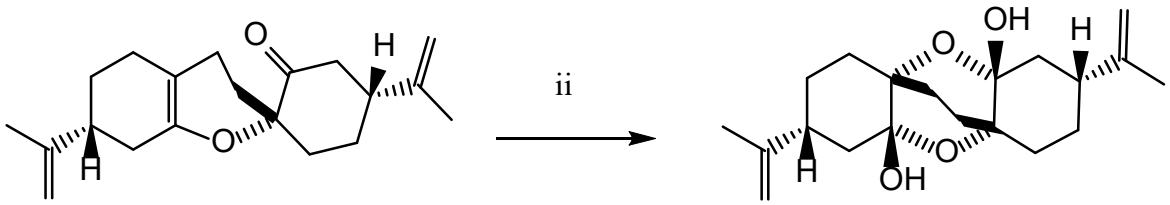
Part-1: Conversion of (+)-R-limonene 1 into hetero Diels Alder dimer.



1 **2** **3**

i) Hetero [4+2] cycloaddition

Part-2: Serendipitous discovery: Direct Conversion of 3 into (+)-cymbodiacetal 4 on silica gel column.



3 **4**

ii) $^1O_2$ intiated domino reactions

The domino reactions are initiated by $1O_2$ (singlet oxygen) and pass through the intermediates (not isolated) as follows:

P (unstable) ⟶ Q (via rearrangement) ⟶ R (enol α-epoxide) followed by acid catalysed rearrangement giving 4.

Highlights:

- Biosynthetic hypothesis led to a short and beautiful synthesis of (+)-cymbodiacetal 4.
- Single step serendipitous conversion of 3 in to 4 demonstrated amazingly simple biosynthetic route.
- The steps involved on silica gel column need further study for reproducibility.

Biography

Prof. Dr. S.K. Paknikar After getting a PhD from University of Pune under the supervision of Professor S.C. Bhattacharyya, Prof. Dr. S.K. Paknikar worked as a Research Associate in Organic Chemistry with Professor R. B. Bates the University of Arizona, Tucson and a visiting scientist at Czechoslovak Academy of Sciences, Prague, started his teaching career at Indian Institute of Technology, Mumbai and moved to Goa in1970. A Senior DAAD fellow at Pharmaceutical Institute University of Bonn, Germany and a National fellow of the University Grants Commission (UGC) India, while working as a Head, Department of Chemistry, Prof. Dr. S.K. Paknikar is a well known and respected name in the field of Natural products and Organic Chemistry. On the 26th June 2024, he completed 89 and at this young age, he continues his pursuit of excellence in Chemistry – having been a successful Industry Consultant with a few key industrial organizations, National & International for over 30 years post retirement. With a research experience of about 69 years that includes a teaching experience of 28 years, Prof. Dr. S. K. Paknikar has been a guide to 16 PhD students and published over 150+ research articles in peer reviewed National and International journals. He was a consultant with Merck, India (Goa) for 20+ years, with VERGO Pharma (Goa) for 7 Years & Siddharth Chemicals (Goa) for 25+ Years. Since 2022, he serves as the Honorary Research Advisor at Nishant Aromas, Palghar, India.

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Microbial Enhanced Oil Recovery (MEOR) utilizing biosurfactant-biopolymer synergies

The continuous depletion of petroleum from traditional crude oil reservoirs is a result of the world's population growth, economic expansion, increased energy use, and intense industrialization. The petroleum fluids are still the primary source of fuels and the conventional crude oil production is decreasing continuously. To speed up and increase the extraction of unrecovered crude oil, research has been undertaken using tertiary (enhanced) oil recovery techniques, such as thermal, chemical, and Microbial Enhanced Oil Recovery (MEOR) approaches. MEOR is one of the mechanisms for corporations looking for innovative ways to boost the returns on their previous investments. However, not all indigenous microorganisms can guarantee additional oil recovery. As the framework of microbial action is not well comprehended, the implementation of the knowledge of microbe to oil reserves is sometimes regarded as being uncertain. Despite the substantial number of studies that have been carried out on MEOR, the petroleum business has noticeably shown little to no fascination, which is apparent by the 400+ MEOR patents that are yet haven't been implemented by the petroleum industry. However, their ability to endure harsh reservoir conditions such high temperatures, salinities, and pressures deep inside the reservoir, bacterially generated metabolites such as biosurfactants, and biopolymers are chosen for MEOR applications. It is widely acknowledged that biological preparations comprising many symbiotic microbial isolates are significant due to their superior biotechnological properties and improved efficacy over monobacterial formulations.

The isolation of possible biosurfactant & biopolymer producing, gas-forming and crude oil-degrading strains from various oil collecting unit of Assam (in Eastern India) oil field production facilities is thoroughly described in the current work. Various strains were isolated from the oil field samples, and the growth of these strains was examined on Bushnell Haas agar enriched with crude oil. Based on its surface-active characteristics and growth profile, strains were selected for further investigation. Surface tension and interfacial tension were lowered when grown in nutrient broth medium in the range of 24–49 mN/m and –1.73 mN/m, respectively. Furthermore, each strain was individually examined for emulsification of oil, production of biopolymer, biosurfactant and the generation of gas and acids. The biosurfactant and biopolymer extracted were also chemically characterized using FTIR and H-NMR. Antagonistic activity of these indigenous bacterial isolates was examined by cross streaking and later on consortium was compared and constructed on the basis of their surface-active properties.

Successful isolation and screening efforts yield a diverse pool of microbial strains suitable for MEOR applications. These microbes exhibit unique adaptive mechanisms to thrive in challenging reservoir conditions, including high temperature, high pressure, salinity, and low nutrient availability. By harnessing the metabolic activities of selected microbes, MEOR strategies aim to improve oil recovery efficiency, reduce production costs, and minimize environmental impact.
Furthermore, the isolation and screening process contribute to the development of novel biotechnologies and microbial consortia tailored to specific reservoir conditions and oil recovery challenges. Integration

of advanced genetic engineering techniques enables the design and optimization of microbial strains with enhanced oil recovery capabilities, paving the way for innovative approaches in MEOR research and application.

Audience Take Away Notes

- Engineers, geologists, and professionals working in the oil and gas industry can apply MEOR techniques to improve oil recovery rates. By understanding the principles of MEOR, they can design and implement strategies to introduce beneficial microbes into reservoirs.
- This also benefit environmental scientists, policymakers, and regulatory agencies. Understanding the potential environmental impacts of microbial treatments helps develop guidelines and regulations for the safe application of MEOR techniques.
- Scientists and researchers in academia, government agencies, and private institutions can use insights from MEOR studies to further advance the field. They can explore new microbial strains, develop innovative biotechnologies, and conduct experiments to enhance the efficiency and effectiveness of MEOR processes.
- Industry partnerships, and academic-industry collaborations will facilitate the exchange of ideas, resources, and technologies.

Biography

Ms. Shilpa Nandi studied Microbiology at Lovely Professional University, Punjab and graduated as a gold medalist in 2019. She then joined as a research scholar at Centre for the Environment, Indian Institute of Technology, Guwahati, India in the year 2021 and currently working under the supervision of Prof. Pankaj Tiwari and Prof. Lalit Mohan Pandey. She was awarded the prestigious Prime Minister's Research Fellowship (PMRF) in the year 2022. Her scholarly pursuits focus on isolating desired microbes based on their surface-active properties for the utilization in petroleum industry for oil recovery.

Shruti Malik[1*], Muhammad Saad Khan[2], Mayur Pal[1], Sina Rezaei Gomari[3], Mohammad Azizur Rahman[4]

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Geochemical analysis for safe implementation of CO_2 storage in Lithuanian reservoirs

Carbon Capture and Storage (CCS), plays a pivotal role in reducing the increasing CO_2 emissions and addressing global warming. It achieves this by redirecting captured CO_2 into subsurface geological formations for secure, long-term storage. However, the efficacy of this process relies heavily on understanding and managing the complex geochemical interactions that occur within the subsurface environment. These interactions encompass a range of chemical reactions and transformations that influence the behavior and fate of stored CO_2, highlighting the need for thorough investigation and comprehension to ensure the effectiveness and safety of CCS initiatives.

Lithuanian reservoirs present great potential for carbon storage due to their considerable depth, petrophysical characteristics and storage capacity as discussed in published literatures. This study presents the importance of understanding the geochemical aspect of carbon storage in the subsurface reservoirs of Lithuania. CO_2 injection experiments were conducted on rock samples from formations analogous to Lithuanian reservoirs. The rock samples were initially saturated with brine solutions and brine injection was performed. This was followed by the CO_2 injection in liquid state into the rock samples. To understand the immediate impact of the CO_2 injection, the brine solution was again injected into the rock samples. The permeability measurements were performed both pre and post CO_2 injection resulting in a reduction in permeability post CO_2 injection. Considering the dominant quartz mineralogy of Lithuanian reservoirs, which is recognized for its limited reactivity to CO_2, this observation implies that mechanisms such as salt precipitation could exert a notable influence on permeability alterations. These findings highlight the intricate nature and the significance of understanding geochemical interactions and their impact on the safe, long-term storage of CO_2.

Audience Take Away Notes

- Lithuanian reservoirs offer great potential for CO_2 storage.
- Successful implementation of CO_2 storage in subsurface reservoirs requires an insight into the CO_2-brine-rock interaction.
- Salt precipitation could affect the CO_2 injection by reducing permeability at the injection site.
- Quartz is predominantly unreactive with CO_2.

Biography

Dr. Shruti Malik, Ph.D. from Indian Institute of Technology, Roorkee, India, specializes in rock property estimation using digital volumes of rock samples obtained through Micro x-ray CT-scanning technique. Currently, she is working as a post-doctoral researcher in the Department of Mathematical Modelling, Kaunas University of Technology (KTU), Lithuania, supported by a research grant from Research Council of Lithuania (RCL). Her work is focused on blending digital rock physics with AI & ML techniques to assess the impact of CO_2 & H_2 storage on the sub-surface reservoirs. The project also assesses the geochemical and geo-mechanical impact of subsurface carbon storage.

Suresh C. Ameta
Professor of Eminence, Department of Chemistry, Faculty of Science, PAHER University, UDAIPUR-313024 (Raj.), India

Photocatalysis: An emerging green chemical pathway

The whole world is facing two major burning problems of rapidly increasing pollution and upcoming shortage of energy resources. At this stage, advanced Oxidation Processes (AOPs) are emerging as green chemical pathways where photocatalysis is one of the promise process, It can provide oxidizing as well reducing environment simultaneously, which can solve both these issues. Hydrogen can be produced from photosplitting of water and it has been predicted as a fuel of future. Another existing challenge is global warming, where carbon dioxide has been considered to play a main role. It can also be reduced photocatalytically into useful fuels such as formic acid, formaldehyde, methanol, methane, etc. The major limitation of a photocatalyst is its little activity as it does not absorb in visible range as well as facile recombination of electron- hole pairs. Both these limitations can be controlled by increasing the photocatalytic activity of these semiconductors on modifying it using sensitization, composite formation, metal or non-metal doping, use of cocatalysts, Z-scheme, S-scheme, etc. This will be discussed in brief along with some other interesting applications of photocatalysis such as self-cleaning glasses, antifogging windscreen, antimicrobiological activity, etc.

Biography

Prof. Suresh C. Ameta obtained his masters degree from University of Udaipur and was awarded gold medal-1970. He secured First position in M. Phil-1978 in Vikram University, Ujjain (M. P.). He also obtained Ph. D degree from this University in 1980. He has served as Professor & Head, Department of Chemistry, North Gujarat University, Patan (1994) and M. L. Sukhadia University, Udaipur (2002-2005) & Head, Department of Polymer Science (2005-2008). He also served as Dean, P.G. Studies for a period of four years (2004-2008). He has served as Dean, Faculty of Science, PAHER University, Udaipur for six years (2011-2017). Presently, he is working as Professor of Eminence (Distinguished Professor of Chemistry) in Pacific University, Udaipur. Prof. Ameta has occupied the coveted position of President, Indian Chemical Society, Kotkata (2000-2001) and is now lifelong Advisor (2002-continue). He was awarded a number of prizes during his career like National prize twice for writing Chemistry books in Hindi (1976 & 1978), Scientist of the Year Award (2002), Prof. M. N. Desai Award (2004), Prof. G. V. Bakore Award (2007), prof. W. U. Malik Award (2008), national Teacher Award (2011), and above all, Life Time Achievement Awards by Indian Chemical Society, Kolkata (2011), Indian Council of Chemists, Agra (2015), Association of Chemistry Teachers, Mumbai (2018), North Gujarat University, Patan (2022). He has successfully guided 110 students for Ph. D. Dr. Ameta has more than 450 research papers and 36 books to his credit. He has contributed Chapters in Books published by Trans-Tech, Switzerland: Nova Science, Taylor & Francis, and Apple Academic Press, USA. Three books on Green Chemistry, Microwave Assisted Organic Synthesis and Chemical Applications of Symmetry and Group Theory have been published by Apple Academic Press, USA. Two more books on Solar Energy Conversion & Storage and Photocatalysis; An Emerging Technology have been recently released by Taylor & Francis, USA and a book on Waste Water Treatments by AOPs by Elsevier. He has completed 5 Major Research Projects by DST, UGC, CSIR, and Ministry of Energy, Govt. of India Prof. Ameta has delivered lectures and chaired sessions in National Conferences organized in almost every part of this country. He is also reviewer of number of international Journals. Prof. Ameta has an experience of more than 50 years of Teaching and Research. Indian Chemical Society, Kolkata has published a Special issue of Journal of Indian Chemical Society in December 2008 to felicitate him on his 60th birthday and has instituted aa Award in his name as Prof. Suresh C. Ameta Award to be given to a senior chemist of repute from 2003 onwards. He has delivered Keynote Addresses in International Conferences at Tokyo, Japan in May

2022, Hangzhou, China in July 2022 and Kunming, China in 2023. Above all, he has pointed out some problems in h-index and proposed a complimentary index as Ameta or A-index for further improving h-index and for this, he received approval of copyright for this improvement.

Tokeer Ahmad
Department of Chemistry, Jamia Millia Islamia, Jamia Nagar, New Delhi, India

Designing advanced heterostructured nanocatalysts for scalable H_2 production

Semiconductor based photochemical and photoelectrochemical water splitting is an ultimate source of hydrogen generation as renewable green energy for tackling the ongoing fuel crisis. g-C_3N_4 is an ideal candidate for overall water splitting as a result of the excellent alignment of its band edges with water redox potentials. However, a single catalyst with a limited number of active sites does not exhibit significant photo/electrocatalytic activity for hydrogen production. Therefore, we have developed the semiconductor heterostructures of g-C_3N_4 with $CuFe_2O_4$, Cu_2O, CdSe, CdS and MoS_2 NPs and QDs as the highly efficient nanocatalysts for enhanced hydrogen evolution reactions. The monophasic heterostructures have been designed in different weight ratios with fairly uniform distribution of nearly spherical particles and high specific surface area which creates an interfacial charge transfer between two semiconductors. As prepared heterostructures showed significant hydrogen evolution which is evident by observing high apparent quantum yield, low onset potential, lower overpotential and high electrochemical active surface area that will be presented in detail.

Biography

Prof. Tokeer Ahmad is graduated from IIT Roorkee and Ph.D. from IIT Delhi. Presently, he is full Professor at Department of Chemistry, Jamia Millia Islamia, New Delhi since 2019. Prof. Ahmad has supervised 16 PhD's, 77 postgraduates, 10 projects, published 183 research papers, one patent and three books with research citation of 6635, h-index of 48 and i10-index of 135. Prof. Ahmad is active reviewer of 159 journals, delivered 156 Invited talks, evaluated 56 external doctoral theses and presented 128 conference papers. Prof. Ahmad is the recipient of MRSI Medal, SMC Bronze Medal, ISCAS Medal, Inspired Teacher's President of India Award, DST-DFG award, Distinguished Scientist Award, Maulana Abul Kalam Azad Excellence Award of Education, Teacher's Excellence Award and elected as Member of National Academy of Sciences India. Prof. Ahmad has been figured in World Top 2% Scientists for consecutive four years since 2020 in both coveted lists including career long by Stanford University, USA. Prof. Ahmad has been recently admitted as Fellow of Royal Society of Chemistry (FRSC), UK.

Prof. V. K. Jain*, Sucheta Sengupta, Avshish Kumar, Abhishek Verma
Amity Institute for Advanced Research and Studies (Materials & Devices), Amity University Uttar Pradesh, Noida-201303

Fabrication of heterojunctions on silicon nanowires on Si Chip, Cds/p-Si for electricity generation from moisture and n-SnO_2/p-Si for UV detection

Creating a heterojunction on a Silicon Nanowire (Si NW) within a silicon chip holds significant promise for developing a variety of new devices through band gap engineering. One-dimensional heterojunction devices are gaining traction due to their enhanced carrier collection, which ultimately improves device efficiency. In our study, we detail the synthesis of CdS/p-Si Nanowire (NW) heterojunction devices using wet-chemical methods. These devices show great potential for generating electricity from atmospheric moisture. A single CdS/p-Si NWs heterojunction-based Moisture-Enabled Electricity Generator (MEG) device demonstrates a saturated maximum output voltage ranging between 250-300 mV, with a saturation current of approximately 0.2 μA in humid conditions. This rudimentary module represents a promising candidate for future energy generation devices. These devices can be easily scaled up by connecting individual units either in series or in parallel to generate high electrical power efficiently.

In addition, traditional UV sensors are typically made of silicon carbide, requiring significant processing time and costs. Here, we present the fabrication and characterization of an ultrafast, highly sensitive, and selective UV sensor using silicon nanowires on a silicon chip. We achieved this by employing Metal Assisted Chemical Etching of polycrystalline (pc) p-Si, resulting in vertically aligned, uniformly grown, highly dense pc-SiNWs. These nanowires, on a pc-p-Si substrate, are decorated with SnO_2 particles using the electro-deposition technique. The SiNWs/n-SnO_2 heterojunctions exhibit diode-like behavior under UV-light exposure, displaying significantly high rectification ratio, sensitivity, responsivity, and detectivity—approximately 172.3 at ±9 V, 64, 0.3456 A/W at 5 V, and 8.02869 x 1012 Jones, respectively. Barrier height calculations indicate that by decorating the Si nanowires with other desired metal oxides, the selectivity and sensitivity of the prepared heterojunction can be tailored for various applications such as Infrared (IR) and Terahertz (THz) sensing.

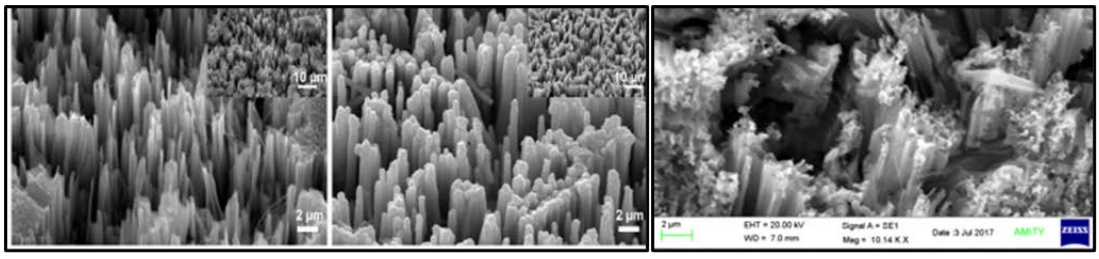


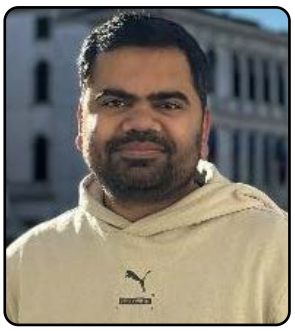
Figure 1: SEM images of SEM images of the as-grown pc-SiNWs on the pc-silicon substrate, (b) Si NWs and CdS/ p-Si NW heterostructure (Inset shows low magnification images in both the cases), (c) SEM images of n-SnO_2 decorated pc-SiNWs on the pc-silicon substrate.

Audience Take Away Notes

- In the range of new energy generation resources, the audience will be able to know about one more source, i.e., from moisture present in air.
- They can explore and enhance this concept by increasing the efficiency of this technique and towards device fabrication.
- Yes, this research that other faculty could use to expand their research or teaching.
- Definitely, today this is a small source, but may become a big source of energy in future.
- Yes, it will provide new information to assist in a design problem.
- As water is present in a very large quantity in the atmosphere in the form of moisture, this technique can become a very big source of energy at low cost, like solar cells.

Biography

Dr. Jain is presently working as a Distinguished Scientist and Prof. at Amity University. He has worked in SSPL, DRDO since 1972 and as Director Grade scientist upto 2003, after his PhD from IIT Delhi. He was head of silicon devices and MEMS division and developed & transferred various technologies. He has published > 200 journals papers and has filed > 60 patents (18 Granted). He got many awards like 'Technology award' 2002, "Power of Ideas" 2012, from Royal Academy of U.K. He is working in the areas of photovoltaics, solar energy, sensors, biosensors, water purification, MEMS, etc. He started two new Institutes at Amity University.



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Interplay between van der Waals, Kubas, and chemisorption process for hydrogen storage: A case of Sc-Functionalized BeN_4

Inspired by the recent successful synthesis of the Dirac material BeN_4, the interaction of dihydrogen with pristine and Sc-functionalized BeN_4 is investigated using dispersion-corrected density functional theory and ab-initio molecular dynamics simulations. The simulation results show that hydrogen molecules are physisorbed to pristine BeN_4 with an adsorption energy of −0.12 eV and have low H_2 uptake (~1.3 wt%) at 100 K. Functionalization of the scandium atom on BeN_4 monolayer enhances adsorption energy and desorption temperature of hydrogen molecules beyond room temperature, as calculated from ab-initio molecular dynamics simulations. Using the DFT-D_2 and DFT-D_3 dispersion corrected DFT, we report that each Sc atom functionalized on BeN_4 surface can reversibly adsorb five hydrogen molecules through Kubas interactions with an average adsorption energy of −0.53 and −0.42 eV/H_2, respectively. The storage capacity of hydrogen for Sc-decorated BeN_4 is 7.86 wt% at room temperature, which drops to 6% at 400 K. At 500 K, three hydrogen molecules get desorbed from the Sc-decorated BeN_4, and the remaining two dissociate into isolated H-atoms, leading to irreversible hydrogen storage. The diffusion barrier for the clustering of Sc atoms is found to be 3.41 eV, calculated using the CI-NEB method. This study builds an understanding of the interaction mechanisms responsible for practically suitable hydrogen uptake in metal- functionalized 2D nanomaterials.

Audience Take Away Notes

- The audience will be able to build an understanding to perform DFT simulations for energy applications.
- The researchers should be able to explore other materials suitable for H_2 storage.
- The researchers will be able to get a basic knowledge of computational code VASP, which they can learn and use in the research of material science.

Biography

Dr. Vikram studied Physics at the Indian Institute of Technology Delhi, India and graduated as M.Sc. in 2017. He then joined the research group of Prof. Alok Shukla at the Indian Institute of Technology Bombay, India. He received his PhD degree in 2022. After one and half year postdoctoral experience in India and Japan, Dr. Vikram is currently working as a postdoctoral scientist at the International Centre for Theoretical Physics, Trieste, Italy. He has published 16 research articles in SCI(E) journals.

Vishal Dhar*, Subrata K. Majumder, Pankaj Tiwari
Department of Chemical Engineering, Indian Institute of Technology, Guwahati, Assam, India,

A compositional model for CO_2 foam-based enhanced oil recovery for northeast Indian oil fields

Carbon dioxide (CO_2) flooding is one of the proven Enhanced Oil Recovery (EOR) techniques used to keep up with the ever-growing global energy demand with the added benefit of CO_2 storage in depleted oil reservoirs. But gravity override and viscous fingering decrease the potential of gas flooding for improving hydrocarbon production. However, foam flooding on the other hand results in better mobility control, enhanced sweep, and greatly improved oil recovery in comparison to sole-gas flooding. Surface-active agents such as surfactants are often used for foam generation and CO_2 bubbles stabilization. CO_2-based foams have inherent properties of smaller bubble size, larger expansion area, and better fluidity. The objective of this study is to evaluate the application of CO_2 foam injection as an enhanced oil recovery technique in sandstone reservoir of Northeast India and exploring possible improvements of oil production. For this purpose, a foam-based CO_2 injection model is generated using the CMG software. A generic reservoir model was build based on the reservoir and crude oil properties of Northeast Indian oil fields. Compositional reservoir simulation studies were performed to investigate the effect of uncertain reservoir parameters, flood design variables, and economic factors. The effectiveness of the process was evaluated through a sensitivity analysis, and by observing its effect on oil recovery factor and ultimate oil recovery.

By integrating experimental data with reservoir simulation, the study demonstrates a detail analysis of CO_2-foam EOR techniques, highlighting its advantages and limitations. Overall, this research provides valuable insights into the applicability and effectiveness of CO_2-foam based EOR in mature oilfields of Northeast India, contributing to the optimization of hydrocarbon recovery strategies in the region while addressing environmental concerns through CO_2 sequestration.

Audience Take Away Notes

- The study focuses on the utilization of carbon dioxide for Enhanced Oil Recovery as a method to combat climate change.
- The study will enable the audience to understand the effects of reservoir and fluid properties on the implementation of CO_2 EOR.
- Through this study an idea of how reservoir simulator (CMG) works is provided.

Biography
Mr. Vishal Dhar has completed his graduation in Petroleum Engineering from Dibrugarh University, Dibrugarh, India and his master's in Petroleum Engineering and Geo-engineering from Rajiv Gandhi Institute of Petroleum Technology, Rae Bareli, India. He is currently working as a Research Scholar at the Department of Chemical Engineering at the Indian Institute of Technology, Guwahati, India under the supervision of Prof. Pankaj Tiwari and Prof. Subrata Majumder. He was awarded the prestigious Prime Minister Research Fellowship in 2022. His PhD research is particularly focused on the utilization of CO_2 for Enhanced Oil Recovery in Northeast Indian Oilfields.

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Structured catalysts of biofules transformation into syngas: Design and performance

Efficient, inexpensive and stable to coking nanocomposite catalysts for transformation of natural gas/biogas/biofuels into syngas and hydrogen were developed comprised of nanoparticles of metals/alloys (Ni, Co, Pt, Ni+Pt, Ni+Ru) supported on perovskites (La1-xPrxMn1-yCryO_3-δ, CaTiO_3), fluorite Ln-Ce-Zr-O (Ln = La, Pr, Sm), rutile (Ln)TiO_2 and spinel MnxCr_3-xO_4 oxides and their nanocomposites with a high oxygen mobility and reactivity, either bulk or supported on doped $MgAl_2O_4$ with ordered mesoporous structure. Pulse microcalorimetry and transient kinetic studies (including SSITKA and FTIRS in situ for estimation of rate constants of reaction steps) revealed that mechanism of biofuels transformation on these catalysts can be described by a bifunctional red-ox scheme with activation of fuel molecules on Me/oxide sites and oxidants (H_2O, CO_2, O_2)- on reduced sites of the oxide support. Fast diffusion of surface oxygen (bridging M_2O) species to the Me/support interface provides the efficient transformation of activated fuel species into syngas by incorporation into C-C bond, thus preventing coking. Effect of the active component composition, specificity of the surface sites and nature of oxidant on mechanism of biofuels transformation into syngas was elucidated. Preparation procedures of active components were optimized to provide nanostructures ensuring high oxygen mobility and developed metal-support interface. Metal substrates for structured catalysts based on Ni-Al(C) foams, Fechraloy foils/honeycombs, gauzes and microchannel platelets were covered by protective $La_2Zr_2O_7$ - $LaAlO_3$ layers sintered by e-beams. Layers of optimized active components were supported on these substrates from suspension, and after drying were sintered either in the furnace or by e-beams. Structured catalysts were tested in pilot reactors in steam, dry, partial oxidation and autothermal reforming of biofuels at short contact times using concentrated feeds. A high yield of syngas approaching equilibrium and stable performance without coking were demonstrated even for such fuels as glycerol, acetic acid, acetone, sunflower and turpentine oils, better for the case of catalysts sintered by e-beams. Mathematical modeling demonstrated absence of any heat transfer limitations due to a high thermal conductivity of substrates. No spallation or cracking of the active component layers supported on substrates was revealed. Reactors equipped with internal heat exchanger were designed allowing stable and efficient operation in the autothermal mode of the mixture of natural gas and liquid biofuels at feeds inlet temperatures <50°C.

Support by the Russian Science Foundation grant 23-73-00045 is gratefully acknowledged.

Audience Take Away Notes

- The audience will be able to use this information in going from atomic-scale features of the catalysts structure to pilot-scale testing of structured catalysts performance in biofuels reforming.
- This provides a practical solution to problem of the efficient transformation of biofuels into syngas and hydrogen required by the concept of green energy.
- It will provide new information to assist in design of energy-efficient catalytic reactors for biofuels reforming.

Biography

Vladislav Sadykov is chief scientist at Boreskov Institute of Catalysis and Professor of Novosibirsk State University. His current research interest includes heterogeneous catalysis of red-ox processes for the energy production (including solid oxide fuel cells), catalytic processes of hydrogen and syngas generation, membrane reactors, technologies of nanophase and nanocomposite materials synthesis, solid state ionics. He has published more than 500 papers in peer-reviewed journals, four monographs and 7 Chapters in books. He is a member of the Editorial Boards of Applied Catalysis A, Membranes and Energies (MDPI), the member of the Materials Research Society (USA) and Russian Mendeleev Chemical Society.

Xia Li[1*], Yu Wei[1], Guyu Li[1], Wenying Ai[2]

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[2]School of Material and Chemical Engineering, Zhongyuan University of Technology, Zhengzhou, Henan Province 450007, China

Enantioselective total syntheses of flavonoid diels- Alder natural products

Numerous flavonoid Diels-Alder type natural products have been isolated and received great attention from the synthetic community. Due to their potent biological activities, including anti-inflammatory, anti-anticancer, and so on, the Diels-Alder natural products are intriguing synthetic targets. One of the most effective methods for the synthesis of these DA-type natural products is the Diels-Alder cycloaddition of substituted chalcones and diene substrates. Most methodologies led to facile synthesis of racemic Diels-Alder products, such as the thermal method, single electron transfer-initiated Diels-Alder cycloadditions and a silica-supported Silver Nanoparticle (AgNPs)-catalyzed Diels-Alder process. However, the enantioselective Diels-Alder cyclization is typically more challenging. Palomo's group developed the first substrate-controlled asymmetric synthesis of nicolaiodesin C through Diels-Alder cycloadditions by using the chiral dienophiles substrate. Then, Lei's group also synthesized nicolaiodesin C and related natural products under the promotion of stoichiometric amounts of chiral ligand-boron Lewis acid complex (1.2-2.5 equiv.), which is moisture-sensitive and needs to be prebuilt and handled under inert atmosphere. Lei's group also reported enzymatic intermolecular Diels-Alder reactions in synthesis. Herein we reported an efficient catalytic asymmetric Diels-Alder cycloaddition of 2□-hydroxychalcone and its derivatives using catalytic amount in situ generated chiral R-VANOL-Borate complex. In this protocol, the desired chiral cyclohexene skeleton could be afforded with high yields and enantioselectivities, which is critical to prepare natural product congeners for further biological studies.

Audience Take Away Notes

- an asymmetric synthetic method to construct cyclohexene skeletons via Diels-Alder reaction.
- The activity and enantioselectivity derive from the in situ generated chiral complex.
- The researchers will be able to apply this catalytic approach in their scientific research.

Biography

Dr. Li studied Chemistry at the Zhengzhou University, China and graduated as MS in 2008. She then joined the research group of Prof. Lei Xiaoguang at the National Institute of Biological Science (NIBS), Beijing & Tianjin University, Tianjin, China. She received her PhD degree in 2014 and joined the Tianjin Key Laboratory for Prevention and Control of Occupational and Environmental Hazards, China. She was recognized as an Associate Professor in 2019. Her specific research interests include the following: Development of new catalytic reactions for the efficient construction of substituted cyclohexanes, total synthesis of structurally complex and bioactive natural products, exploring the mechanism and target of action of anti-hypoxia active natural small molecules.

Xiao Zhang
Faculty of Chemical Engineering and Technology, Cracow University of Technology, Krakow, Poland

Construction of crystalline graphitic carbon nitride composites: Photocatalytic energy conversion

Combustion of fossil fuel has been one of the main causes for the rising pollutants level in the atmosphere that leads to global warming and anthropogenic climate change. Development of effective strategies that can reduce greenhouse emission and increase renewable energy utilization has been one of the top priorities to date due to the surging global energy demand and consumption. Among the various catalysts developed, solar-driven photocatalysts has been promising choices for a variety of catalytic energy conversion and environmental applications, e.g., CO_2 conversion, nitrogen reduction, H_2 and H_2O_2 production, etc. And layered graphitic carbon nitride (g-C_3N_4) has been a popular semiconductor base for constructing composite catalysts for photo-/electro-catalytic energy conversion applications. The photocatalytic performance of layered g-C_3N_4 based composites is often related to factors such as, morphology, crystallinity, and interfacial structure of the material. g-C_3N_4 based composites using highly crystalline g-C_3N_4 nanosheets base often show well-developed interfaces compared with the composites fabricated using amorphous g-C_3N_4 base. Various metal-based nanocomposite materials with excellent catalytic activity (e.g., WO_x, W_2C, W_2N, etc.) can be incorporated into the crystalline g-C_3N_4 substrate using the idea of nanoarchitectonics to attain enhanced photo-/electro-catalytic performances. For instance, a H_2O_2 evolution rate of 5550 $\mu Mg^{-1}h^{-1}$ could be observed for a two dimensional (2D)/2D $W_{18}O_{49}$ modified crystalline g-C_3N_4 based composites under full solar-spectrum condition. Since the development of high-performance g-C_3N_4-based materials/technologies for attaining practical applications is still challenging, investigation on g-C_3N_4 nanoarchitectonics can be pivotal for providing inspiration for the synthesis of g-C_3N_4 materials and the scale-up utilization of the materials for energy conversion and environmental related applications.

Audience Take Away Notes

- Knowledge/information on g-C_3N_4 materials with different crystallinity and morphology, as well as g-C_3N_4 nanoarchitectonics (a post-nanotechnology concept).
- Knowledge on the utilization of graphitic carbon nitride based composites in various photo-/electro-catalytic energy conversion applications.
- Providing inspiration for the synthesis of g-C_3N_4 based materials and the scale-up utilization of the materials.

Biography

Dr. Xiao Zhang obtained her Honours Bachelor of Science degree from University of Toronto (Canada) and Master of Philosophy degree from University of New South Wales (Australia). She was awarded with Doctor of Philosophy by Curtin University (Australia). Her research interests encompass carbon-based materials, carbon dioxide conversion, water splitting, photo-/electro-chemical catalysis, and photoluminescent materials. From 2022, Xiao Zhang joined Faculty of Chemical Engineering and Technology in Cracow University of Technology as assistant professor.

Yousef Alqaheem
Petroleum Research Center, Kuwait Institute for Scientific Research, Kuwait

A comparative study for natural gas treatment by amine process and membrane

Natural gas needs treatment as it contains amounts of carbon dioxide and hydrogen sulfide that can damage pipelines. Amine unit is widely used for the treatment but the process is energy intensive and suffers from solvent flooding. Alternatively, the membrane can treat natural gas with no flooding issue and lower energy input. In this work, a commercial membrane unit was simulated in UniSim® for the treatment of Kuwait sour gas to produce a gas that meets pipeline specifications. The system was compared to the amine unit in terms of product quality and quantity. Results show that the membrane system was not capable of reaching the performance of the amine process due to the tradeoff limitation in membranes between product purity and gas recovery.

Keywords: Natural gas, Sour gas, Gas-separation membrane, Amine process, UniSim®.

Biography:
Dr. Yousef Alqaheem is a research scientist at the Petroleum Research Center of Kuwait Institute for Scientific Research. He received his PhD degree in 2015 from Newcastle University (United Kingdom). Alqaheem prepared and evaluated polymeric membranes for hydrogen separation, oxygen enrichment, and carbon dioxide capture. He also developed membrane units in process simulators such as UniSIM® and CAPE-OPEN. Currently, he has a project with the refinery to assess the membranes for propane/propylene separation from technical and economic points of view. Alqaheem published 23 papers in refereed journals and presented 5 conference papers.

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3rd Edition of International Conference on

Oil, Gas, and Petroleum Engineering &

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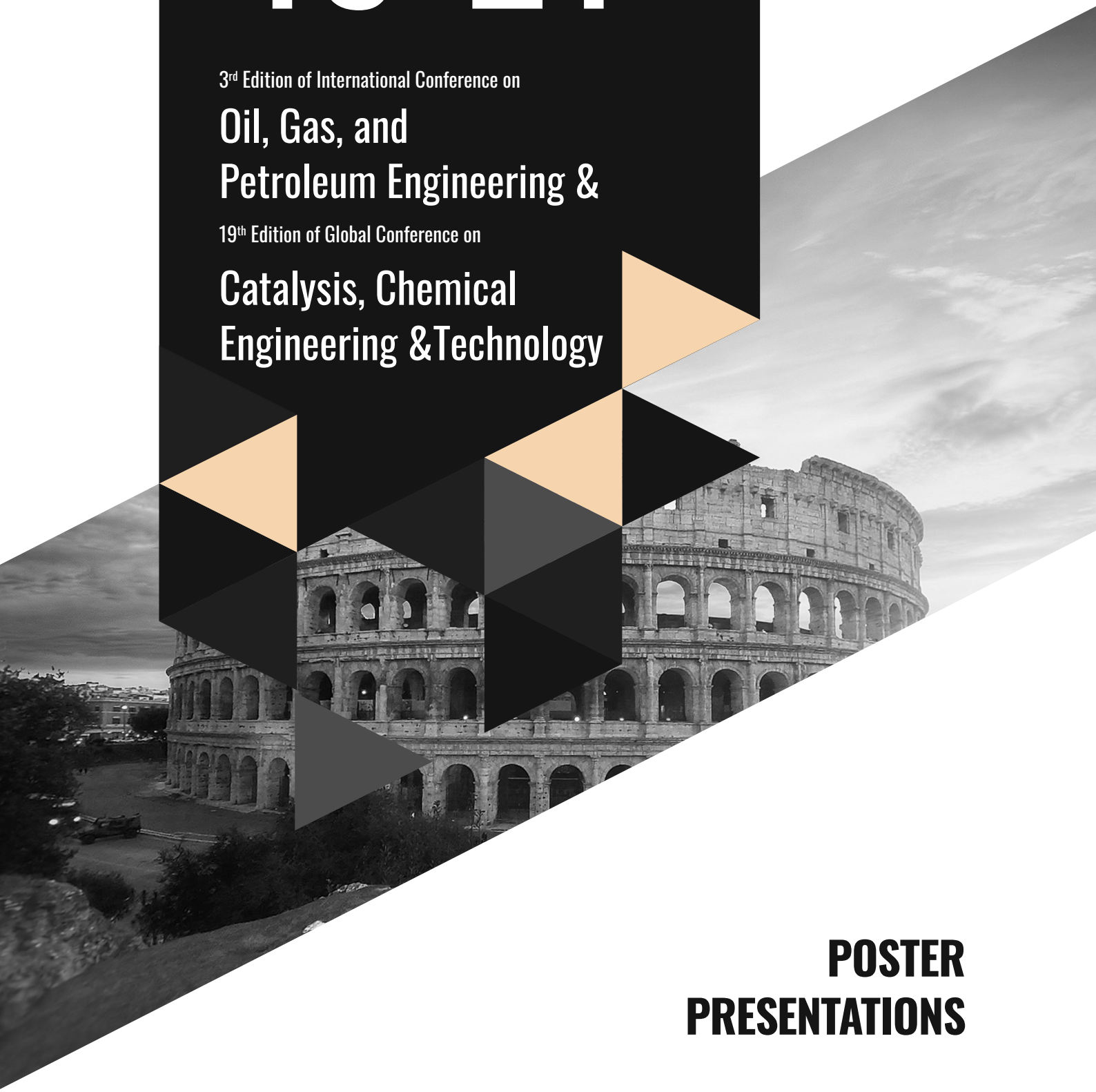

POSTER PRESENTATIONS

Anshuman Agrawal
Minimac Systems Pvt. Ltd, India

Enabling net zero industrial targets through decarbonizing lubricant life-cycle

Lubricants play an important role in keeping the machinery running smoothly and efficiently. The demands for lubricants are increasing and eventually impacting the environment. There is a need to balance the increased demand with the impact of lubricants on the environment. As the world is facing a climate emergency, industries are urged to decarbonize. With innovative technologies, industries can lower the carbon emissions from their operations and reduce their carbon footprints. As the world races towards achieving net zero emissions, industries play a crucial role in transitioning to sustainable practices. India has already declared its goal to achieve net zero by 2070. By decarbonizing the lubricant life-cycle, industries can make substantial progress towards their net-zero targets and enjoy various benefits like increased machine reliability, cost savings, saving time on oil change-outs, decreased oil disposal costs, and reduced environmental impacts. With this technical paper, we are attempting to explain the various strategies and technologies that can be employed to achieve this goal and will undoubtedly lay out a clear path for the sector to follow as it strives to adopt more eco-friendly practices, technologies, solutions, and move towards a net-zero carbon future.

Biography

Anshuman Agrawal is an IIT-ISM gold medalist in Mechanical Engineering, Anshuman Agrawal leads Minimac Systems with a passion for techno-preneurship and impacting the lubrication industry. He is a certified MLT I from ICML and a trained MLE from Noria Corporation. He is a member of 'The Society of Tribologists and Lubrication Engineers' (STLE) and 'The International Council for Machinery Lubrication' (ICML) and 'Tribology Society of India' (TSI), and 'Indian Chamber Of Commerce' (ICC), 'Condition Monitoring Society of India' (CMSI) and CII-certified professional in Resource Efficiency and Environmental Sustainability.

Bashar Al Enezi
Kuwait Oil Company, Kuwait

A novel subsurface description for jurassic marrat formation for improved reservoir management in greater Burgan field, Kuwait

Introduction: A new depositional and stratigraphic framework is proposed for Middle Marrat reservoirs. They are designed to improve the reservoir management and development plan in the Greater Burgan Field. The Middle Marrat reservoir of Kuwait was deposited during the Lower Jurassic Pliensbachian to Toarcian period, approximately 175-185 Ma, in a low-angle carbonate ramp setting on the neo-Tethys passive margin (Sharland et al., 2001). It comprises stacked shallow marine grainstone shoals and finer grained lagoonal and ramp sediments. The depositional architecture is overprinted by a range of diagenetic processes both reducing and enhancing reservoir quality.

The Greater Burgan Field has three different structural culminations i.e. Burgan, Magwa and Ahmadi. (Figure 1). Exploration and development activities in Middle Marrat of Greater Burgan Field is continuing since early 1980s.Drilling and production in Magwa field continued from that time, whereas Burgan exploration was halted intermittently and was finally development activities started from 2018. Ahmadi culmination was found to be unproductive. So far more than 80 wells have been drilled in Marrat Formation of Greater Burgan Field.

With continuing development of both Magwa and Burgan structures in Greater Burgan Field, a need for revision of the existing depositional and stratigraphic framework was felt to support reservoir management, infill drilling and future water injections.

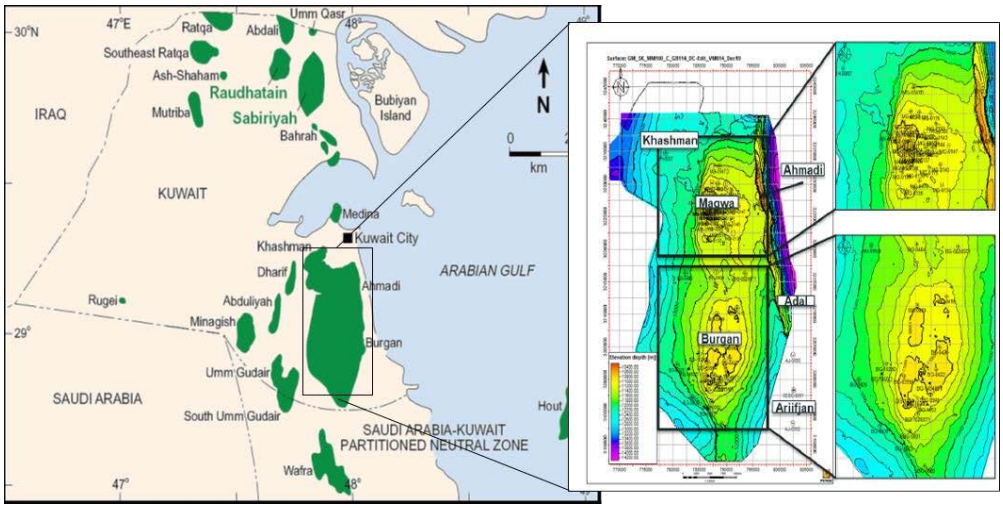

Figure 1:. The study Area

Method and/or Theory:

Depositional Model: Twenty-two Middle Marrat cores (~5500ft of core) were interpreted during this study and used to develop a thorough understanding of depositional facies, facies associations and depositional environments). These data were integrated with available petrography, well logs, dynamic, and seismic data and used to develop a facies scheme and depositional models. Two depositional models have been developed, both of which are consistent with core data and the limited biostratigraphic data which confirm a shallow water carbonate ramp setting.

1. "Ramp Barrier Model" which implies that the Middle Marrat member over Greater Burgan formed a barrier which created a land-attached subtidal lagoon behind it which progressively passes onto tidal flats and sabkha environments towards West Kuwait. This model, in the context of a very low angle carbonate ramp, would have resulted in relatively large-scale low-energy facies belts and relatively narrow and disconnected shoal belts.

2. "Ramp Bank Model" which predicts one or more isolated banks or islands in an otherwise mid-ramp setting, with each island forming on a relative bathymetric high, formed by local depositional or structural effects, or possibly a combination of the two.

It is important to stress out that both models are thought to be valid for the Middle Marrat member and most likely occurred in various proportions at different times and over different areas of Kuwait, with the ramp barrier model seen as dominant, based on the regional correlation work and the ramp bank model seen as more localized and episodic.

Core-based Facies and Facies Associations: A key element of this work has been to develop a common description of reservoir facies, their characteristics, associations, and spatial distribution. The objective was to deliver a systematic and consistent description of facies and facies associations, identification of key stratigraphic surfaces and integration of core data with petrographic and well-log data. Figure 2 shows individualised porosity- permeability cross-plots for each of the facies associations (including dolomitized facies) illustrating noticeable differences in poro-perm behaviours for each facies. It reflects the depositional control on reservoir quality and will impact key decisions in reservoir management. Another insight into depositional controls on fluid flow is provided by PLTs from a well. PLTs and ILTs are key pieces of surveillance data that can be used to understand controls behind zonal contributions to flow.

The new depositional scheme is consistent across all the studied wells and enables more effective comparisons of different vintages of core.

Stratigraphic Framework (Reservoir Zonation): The study provides a new single common stratigraphic framework across Magwa and Burgan domes linked to core observations and depositional facies interpretation. A simpler model has been proposed than previous frameworks with clearly defined criteria for each top.

In the present work, the Marrat wells have been interpreted with the aim of linking chronostratigraphic

surfaces through integration of insights from seismic, well-log and core data. The benefit of a chronostratigraphic approach is that it recognises lateral changes in facies. Recognition of this complexity can be very important for understanding and predicting fluid-flow in the subsurface. Intra-reservoir flow pathways can be complicated by subtle permeability contrasts found at changing facies boundaries. It is therefore necessary to recognize the potential for these events to understand how a reservoir might perform.

In the new framework (Figure 3), the tops start at "00" at the base (Top Lower Marrat) and end at "100" at the top Middle Marrat. Each stratigraphic top caps a zone of the same number, for instance top 100 (top Middle Marrat) caps zone 100 which overlies top 90 and zone 90.

The pick criteria are presented in Figure 2 against two type wells, one each for Magwa and Burgan, along with a brief interpretation of the pick and zone significance from a sequence stratigraphic standpoint.

The new pick set differ significantly however from past pick sets (Al-Jadi et al., 2015) in that it is rooted in an integrated interpretation of core-derived depositional elements combined with observations from seismic, petrography, and dynamic data. Other key differences relate to the definition of top criteria and importantly how they correlate across the Greater Burgan area. The new pick set provide an alternative view on lateral reservoir connectivity which can be tested with future infill drilling and data acquisition.

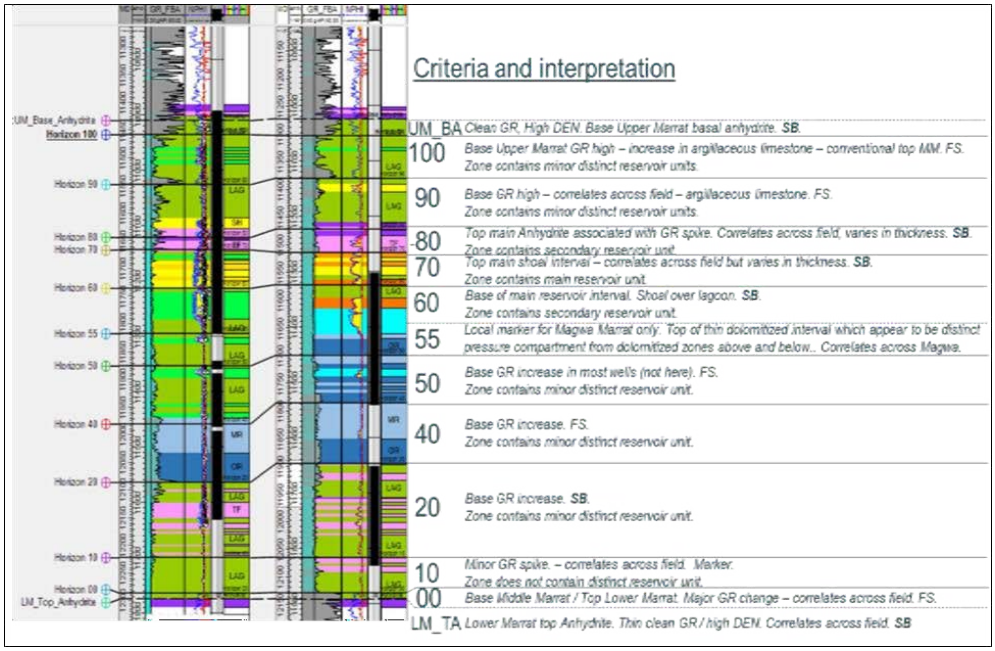

Figure 2: The new stratigraphic framework.

Reservoir Depositional Elements (RDE) Maps: Reservoir Depositional Elements are the depositional elements (e.g. carbonate shoal bodies or channel fills) that control reservoir dynamic behaviour during production. The shoal dimensions have been estimated using data from analogue databases and a number of published ancient and modern analogues. The main shoal depositional elements applicable to the Middle Marrat main reservoir interval are elongate shoal bars; small tide-influenced channels; ebb-tide and flood-tide deltas. Dimensions for the other facies associations (lagoon, tidal flats, etc) are not as well constrained but the depositional context leads us to expect very large regional depositional belts. Cartoons

were prepared with expected reservoir architectures across the range of reservoir intervals and ranges of reservoir permeability (based on RCA data) and quality of sweep (notional). Reservoir Depositional Element (RDE) maps aim to capture a 2D description of the distribution, stacking patterns and boundaries between depositional elements and any relevant diagenetic or syn- depostional structural features. They honour data (core, well-log or seismic) but are model driven between data points and may be drawn to specifically emphasize features of interest, such areas of dolomitization, anhydrite etc., which may impact the reservoirs dynamic behaviour.

Potential Depositional Controls on Fluid Flow: The Reservoir Depositional Element Maps (RDEs) and reservoir architecture cartoons provides useful insights into potential depositional controls on fluid flow. Figure 3 shows individualised porosity- permeability cross-plots for each of the facies associations (including dolomitized facies) illustrating noticeable differences in poro-perm behaviours for each facies. It reflects the depositional control on reservoir quality and will impact key decisions in reservoir management. Another insight into depositional controls on fluid flow is provided by PLTs from a well. PLTs and ILTs are key pieces of surveillance data that can be used to understand controls behind zonal contributions to flow.

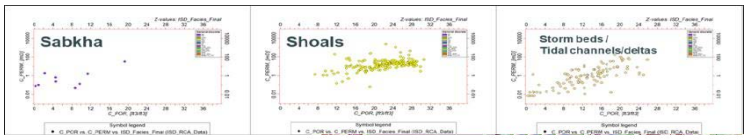

Figure 3: Porosity-Permeability cross plots

Conclusions: Two depositional models, i.e Ramp-barrier model and a ramp bank model have been developed, both were thought to be valid for Middle Marrat of Greater Burgan Field. A systematic and consistent description of facies and facies associations were done and key stratigraphic surfaces were identified. Reservoir depositional elements were also described. Expected reservoir architectures across the range of reservoir intervals and ranges of reservoir permeability (based on RCA data) and quality of sweep were envisaged.2D distribution of reservoir depositional elements, their stacking pattern were brought to the fore for important stratigraphic intervals. Depositional control on reservoir quality has been illustrated by the porosity-permeability cross-plots. Importance of PLT/ILT data in understanding zonal distribution of flow was discussed.

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Phase equilibria (VLE and LLE) of platform molecules for the optimization of separation processes

Building block molecules derived from biomass represent renewable and sustainable alternatives to fossil-based resources. These molecules can be manipulated and transformed into diverse compounds with specific functions. This versatility enables their utilization in various biotechnological processes, such as drug discovery, enzyme engineering and biofuel production.

In many biotechnological processes, platform molecules derived from biomass are initially found in complex solutions containing various organic and inorganic compounds among which water. Their extraction from these solutions is often necessary to isolate, purify and concentrate them, in order to use them effectively in different applications. Several extraction methods could be used: supercritical solvent extraction, liquid-liquid extraction, or membrane extraction. The most widely used and mature extraction method is liquid-liquid extraction.

With this aim, we studied Vapor-Liquid Equilibria (VLE) using a static apparatus designed and built in our laboratory, Fig.1.

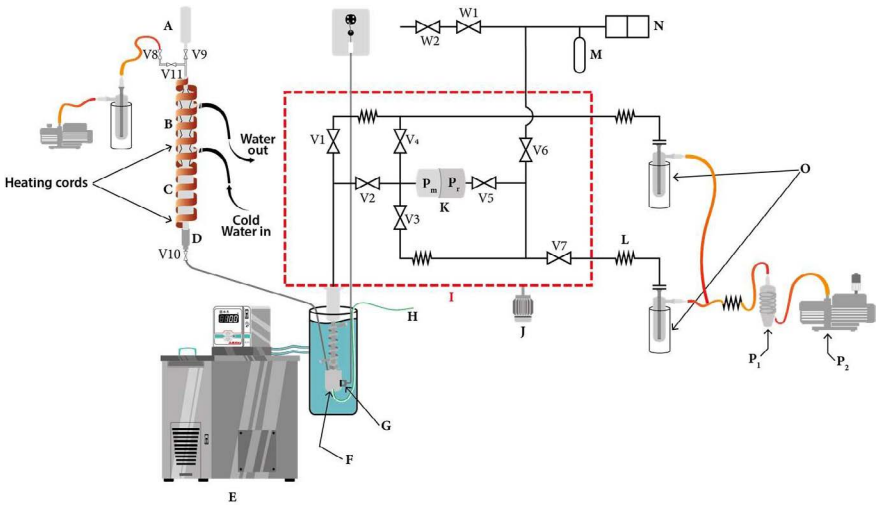

Figure 1: Static apparatus designed for the measurement of vapor pressures:1 Pa ≤ P/Pa ≤ 200kPa.

The apparatus allows pressure measurements down to 1 Pa and in the temperature range between (- 30°C to 150°C). The following platform molecules were studied:

1. VLE of pure compounds: 5-methylfurfural, 2-methylfuran or 2-methyltetrahydrofuran,
2. VLE of 2 binary systems: (5-methylfurfural+ 2-methyltetrahydrofuran) and (5-methylfurfural+ 2-methylfuran)

We also determined Liquid-Liquid Equilibria (LLE) using batch method i.e jacket glass vessel with a volume of approximately 300 mL. The concentrations of the solutes are close to the conditions observed in the fermentation broth: 2 to 6% in mass. The explored temperature range is between 10 and 60°C. We studied 3 binary systems and 2 ternary mixtures:

1. LLE (water+5methylfurfural)
2. LLE (water+2 methylfuran)
3. LLE (water+2methyltetrahydrofuran)
4. LLE (water+5methylfurfural+2 methylfuran
5. LLE (water+5-methylfurfural+2-methyltetrahydrofuran)

Almost all experimental data are new, no comparison was found in literature but they are crucial for developing and optimizing thermodynamic models used in various processes, especially in chemical engineering and biotechnology.
In a second step we fitted our binary data using the thermodynamic models UNIQUAC and NRTL. From the binary interactions, we predicted the composition of the ternary systems. Calculated and experimental data were compared.

Audience Take Away Notes

- The reported data are essential to design separation process.
- The reported data are useful for researchers working in simulation and thermodynamic models.
- For researchers, see the answers above. Students at Master level could also be interested. They could inject the data in software like Prosim or Aspen. They also could draw the binary and ternary diagrams.
- The study is essentially experimental: design of apparatus and development of analytical methodologies that could be applied for similar molecules. This last point saves time to the experimenter.
- The apparatus will be described and the delicate points and the type of pressure sensor will be given.

Biography
Ilham Mokbel studied analytical chemistry in the University Claude Bernard in Lyon, France. She joined the Institut of Analytical Sciences in Lyon in 2005 and obtained her PhD. She carried out one-year postdoctoral fellowship in the University of Delaware, USA. Now she is an Associate Professor at the Laboratoire des Multimatériaux et Interfaces in Lyon1.

Johnson Joachim Kasali[1*], Jun Li[1,3], Hongwei Yang[1], Fatna Adinani Said[2]

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[2]School of Petroleum Engineering, China University of Petroleum (East China), Qingdao, China

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Integrating deep learning for accurate pore pressure prediction in fractured conglomerate formation of the Junggar Basin

Accurate pore pressure is basic for optimal mud density window determination and hence plays an essential role in oil and gas fields' safety and successful drilling process. Diverse pressure mechanisms associated with the complex geological formation of the Upper Wuerhe Formation in the Jinlong 2 block in the Junggar Basin impair the accuracy of the conventional prediction methods. Most traditional methods rely on empirical relations between formation velocity and pressure extracted with insufficient consideration of unique geomechanical properties and underground structure; faults, fractures, and rapid change of burial depth. This study proposed a new nonparametric multivariate model leveraging the DNN machine learning technique. Five logs; Neutron Porosity, Density, Shale Content, Longitudinal Acoustic Velocity, Overage, and Anisotropy logs were used to predict the effective stress. Thus, the PP prediction was achieved by using the effective stress theorem. A total of 1746 measured data sets were extracted from well logs, of which 80% were used in model training and 20% in validation. The model shows a very good prediction performance with a coefficient of the determinant (R_2) of 0.9821 and Root Mean Square Value (RMSE) of 0.02594 g/cm3. By comparing with Sayer's and Eberhart Philip's performances (0.1256 g/cm3, 0.0975 g/cm3 for JLHW 204 and 0.6425 g/cm3, 0.6879 g/cm3 for JLHW 261 respectively), the DNN model outperforms and prevailing as a potential alternative multivariate prediction model capable on improving PP prediction accuracy in fracture conglomerate formation.

Audience Take Away Notes

- Learn the applicability of advanced machine learning techniques to improve pore pressure prediction.
- Learn the advantages of integrating multiple petrophysical data for enhanced geo-pressure analysis.
- Learn the comparative performance of DNN-based models against traditional methods like Sayer's and Eberhart Philip's.
- Promote and encourage the creation of more robust models by integrating several log parameters.
- Optimize mud density window determination in complex formation.
- Improve accuracy and reliability in drilling operations in similar formations.
- Yes, it provides a framework for incorporating machine learning in geomechanics.
- Offers a case study for advanced pore pressure prediction techniques in teaching.
- Can be a basis for further research on machine learning applications in petroleum.
- Yes, it simplifies the prediction process with a more accurate model.
- Reduces the need for extensive empirical calibration.
- Provides a robust tool for handling complex formations.
- Yes, it enhances the accuracy of pore pressure predictions that significantly enhance the precision of wellbore stability analyses.
- Provides new insights into geomechanical properties and fracture influences.
- Offers valuable data for designing effective drilling strategies.

Biography

Mr. Johnson studied Oil and Natural Gas Engineering at the China University of Geosciences-Wuhan and graduated as MS in 2019. He then joined the research group of Prof. Li Jun at the China University of Petroleum-Beijing. Currently, he doing a PhD study at the same University since 2019.

Laís Bubach Carvalho Simão[1*], Beatriz Bandeira dos Santos[1], Eduardo Ribeiro Nicolosi[2], Claudio Violante Ferreira[2], Marcelo Igor Lourenço de Sousa[1], Francisco José de Castro Moura Duarte[1], Ricardo Bruno Félix Nunes[1]

[1]COPPE-Universidade Federal do Rio de Janeiro/Rio de Janeiro, Rio de Janeiro, Brazil

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Analysis of operational risk management of health and safety criteria within a multi-criteria analysis methodology for a subsea equipment decommissioning project on an oil and gas production platform

The useful life of several offshore production units is coming to an end and in recent years, there has been growing concern from many sectors about how to deal with the decommissioning of these structures when their operational life ends (Watson et al., 2023). According to Caprece et al., (2023) due to the large number of interested parties involved, the decommissioning of these structures has emerged as a critical task due to the unpredictability of costs, high operational risks, potential social impacts, and addressing legal issues and environmental protection.

To assist the decision-making process committed to the various satakeholders, the decision-maker can use advanced approaches, such as Multi-Criteria Decision Analysis (MCDA), a new tool that improves the decision-making process ranking the different decommissioning options of O&G subsea assets. This model considers several attributes, divided between 6 criteria: Technical, Environment, Social, Economic, Life Cycle Assessment of Waste and Health&Safety, the main focus of this article. (COPPE, 2022).

Health and Safety aspects are assessed through five sub-criteria, three relating to Occupational Health (Exposure to Toxic Materials, Exposure to NORM, Exposure to Hyperbaric Conditions) and two relating to Worker Safety criteria (Fatal Accidents and Impact of Other Users of the Sea). The scores for the sub-criteria are determined through a risk assessment, determined in each of the decommissioning alternatives listed and their respective related activities.

Decisions regarding decommissioning involve multiple stakeholders and are multidisciplinary in nature and often conflicting (Martins et al., 2020) and their impacts involve several interest groups. The application of the MCDA methodology can guide the decision maker to find the right decision.

In this way, this article intends to present the contribution of the risk analysis carried out in the Health and Safety criteria to the process, which is intended to be based on the knowledge of the activities of workers who are involved in the execution of decommissioning activities of underwater oil and gas production equipment, presenting data that were tested in a project to decommission submarine equipment from an oil and gas production platform, located off the Brazilian coast.

Audience Take Away Notes

- The audience will have the opportunity to expand their understanding of health and safety risk analysis in decommissioning activities, particularly focusing on submarine systems of offshore oil and gas production platforms. Additionally, they will gain insight into the application of Multi-

Criteria Decision Analysis (MCDA) developed by COPPE/UFRJ to facilitate decision-making in complex processes.

- Health and safety risk analyses, as well as the application of the MCDA methodology, can help the audience to enhance data and perspectives in the development of decommissioning projects for subsea equipment on offshore oil and gas production platforms, considering more accurately the interests of the various stakeholders involved in the process.
- This research can advance the field of operational risk analysis in decommissioning processes by deepening the understanding of the activities performed by workers and closely aligning risk analysis with real activities. It aims to contribute to the development of research in this area while also enhancing the analysis methodology itself (Daniellou, 2007).
- Will it improve the accuracy of a design, or provide new information to assist in a design problem?

Biography

Laís Bubach, M.Sc. studied Architecture and Safefty Engineering at Universidade Federal do Espírito Santo, Brazil. In 2008 she joined the research group of Prof. Francisco Duarte at the Ergonomics and Design Laboratory, at Production Engineering Program, Universidade Federal do Rio de Janeiro. She received her Master degree in 2010 at the same institution, worked for many years at the Oil and Gas Brazilian industry and now she is member and currently, she works as a researcher and a doctoral student in the same program, conducting research focused on Ergonomics and Occupational Safety in the decommissioning of offshore oil and gas production platforms.

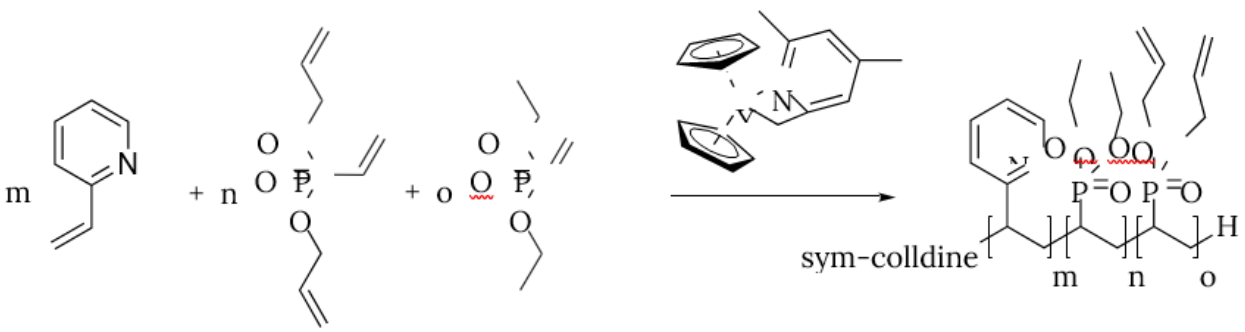
Lukas M. Eylert*, Bernhard Rieger
WACKER Chair of Macromolecular Chemistry, Technical University of Munich, Germany

Catalytically programmed functional nano-objects using artificial intelligence

Rare Earth Metal-Mediated Group Transfer Polymerisation (REM-GTP) enables the synthesis of high precision polymers - among them the group of polyvinylphosphonates.1 Furthermore, this particular case of living catalytic polymerisation combines the positive attributes of anionic and coordinative polymerisation. By activation of the initiator sym-collidine with $Cp_2Y(CH_2TMS)(THF)$ it is possible to produce a variety of polymers with a tailor-made polymer architecture.

Vinylphosphonates (VP) offer a broad range of applications due to their high water- solubility and biocompatibility, such as in dental adhesives or bone cement.3 In addition, aqueous polyvinylphosphonate solutions are characterized by their thermoresponsiveness. They exhibit a Lower Critical Solution Temperature (LCST), classifying them as smart materials. Depending on the substituents at the monomers in the preliminary stage, this opens the possibility to obtain a variety of polymers with different properties. Especially since the individual monomers can also be used for block copolymerisation (Scheme 1). However, the synthesis of these polymers is considerably more difficult due to the high sensitivity to hydrolysis and the resulting instability of the catalyst. Even a tiny amount of residual moisture in the reactant, solvent or reaction vessels immediately decomposes the catalyst, which requires very careful and clean, elaborate work.

To overcome the stability issues and to handle the catalyst in a facilitated way, we recently developed the first robot capable of performing a broad variety of homogeneously catalysed reactions autonomously. The apparatus can independently dose the water- and oxygen-sensitive monomers, catalysts and initiators in a highly controlled and precise manner into the reactor. The program controlling the robot is coded to combine up to seven different reactants at a time and to vary their ratio in every new reaction. In situ NMR analysis is used to adjust potential additional dosage of more reactants to obtain tailor-made polymers.



Scheme 1: Block copolymerisation of 2VP, Diethyl Vinylphosphonate (DEVP) and DAlVP with $Cp_2Y(CH_2(C_5H_2Me_2N))$ as catalyst.

Audience Take Away Notes

- Robot design and how to develop a laboratory automation program.
- Smart and cost-efficient way to dose precisely and autonomously small amounts of liquid under inert conditions.
- Insights on how to use artificial intelligence to automate chemical synthesis.
- Overview of the homogeneous catalysis in the field of vinylphosphonates.
- Unconventional and creative ways to transfer sensitive and instable reactants with limited resources.

Biography

Lukas Eylert studied Chemistry at the Technical University of Munich, where he graduated with a B. Sc. degree in 2021 and an M. Sc. degree in 2022. He started his PhD studies under the supervision of Prof. Bernhard Rieger and Prof. Job Boekhoven in the same year. His research focuses on developing an autonomous robot driven by and ai that can dose air- and oxygen-sensitive chemicals with high precision and react them and analyze the outcome.

Magdi Buaisha
The General Directorate of Inspection and Measurement - National Oil Corporation (NOC), Tripoli, Libya

Field proving of a liquid displacement meter using bi-directional pipe provers in custodytransfer applications; Case study of Libyan Zueitina oil port

In the oil and gas industry, the flow of liquids and gases must be measuredduring every phase of exploration, production and transportation. These applications demand the highest oil and gas meter accuracy and reliability, as well as long-term stability and a low cost-of ownership
Determining the meter accuracy, or proving the meter, is a very important job in the oil industry. Each meter must be checked periodically or proved, to determine its margin of error, that is, the difference between the amount registered and the true volume flowing through it. Meters measure the amount ofliquid flowing through them, they cannot do this with 100% accuracy. Since even small measurement errors can cost a lot of money, all meters must be proved periodically to determine if they are in error.
The recent growth in production cost and continuous fluctuation in crude oil prices calls for concern to improving fluid flow rate metering by the oil and gas producing, processing, and production companies. A good metering will enhanceflow metering accuracy, precision and better verification exercise.
In this paper, a field study on positive the displacement meter proving with Bi- Directional Pipe Provers in Zueitina Oil Port– Libya as a case study was carried out. Equipment, Procedures, Requirements, National and International standards and precautions that will ensure accurate metering of fluids were considered. Theresults from this case study showed that improved metering system and follow the procedures and requirements of meter proving according to National and International standards, can lead to success in implementing Meter-proving process and ensure that measurements are accurate allowing operations to proceed in a safe and timely manner.

Audience Take Away Notes

- The audience will be able to use procedures, requirements, International standards and precautions that will ensure accurate metering of oil fluids presented in my article
- This presentation will help audience in his job by using this International methodology to ensure accurate metering of oil fluids
- This presentation will be a good reference
- This presentation will provide a practical solution to a problem that could simplify or make an operator's job more efficient
- This presentation will improve the accuracy of oil meteringsystem in operating stage

Biography

Dr. Magdi Buaisha studied Process Safety and loss prevention at the Sheffield University, Sheffield, UK and graduated as MS in 2014. He received his PhD degree in 2019 at Atilim university, Ankara, Turkey. He has more than ten papers. Number of citation of all his papers are 189, which is presented in Google scholar and Research gate. His focus in a broad of process chemical/oil measurement engineering functionsand professional in operation, mathematical modeling and computational simulation in the core of chemical engineering field. His Current position is Coordinator of inspection and measurement in The General Directorate ofInspection and Measurement - National Oil Corporation (NOC), Tripoli, Libya His job includes Verifying the quality and quantity of petroleum products during variousstages of production, transportation, and storage. Verifying t Procedures of Dynamic Shore measurements, which will beimplemented Verifying the tools and methods, which are used to measure, sample, test, and documenting the physical and chemical properties of crude oil, refinedproducts, and by-products. Ensuring that the products comply with the specifications, standards, andregulations of the industry and the clients.

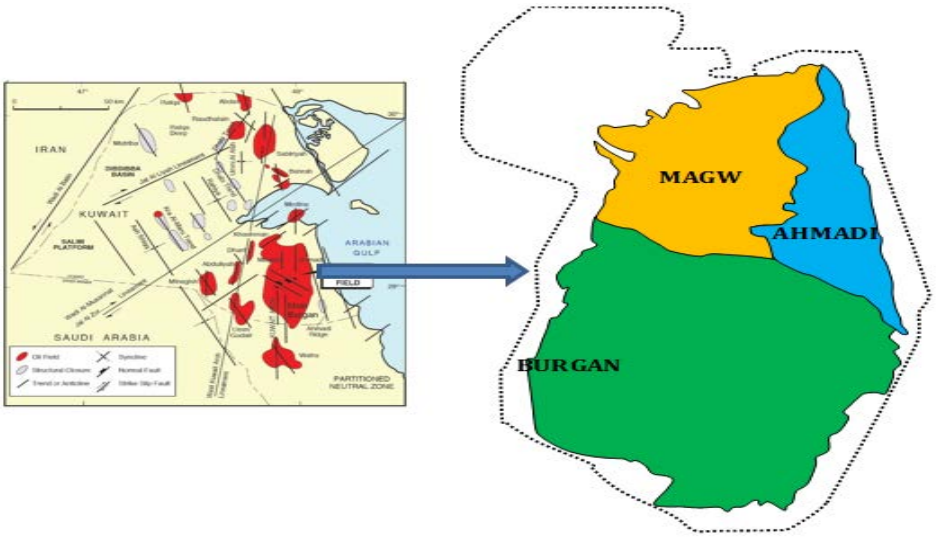
Salim Almutairi
Kuwait Oil Company, Kuwait

Infill drilling in the largest clastic reservoir _a challenge

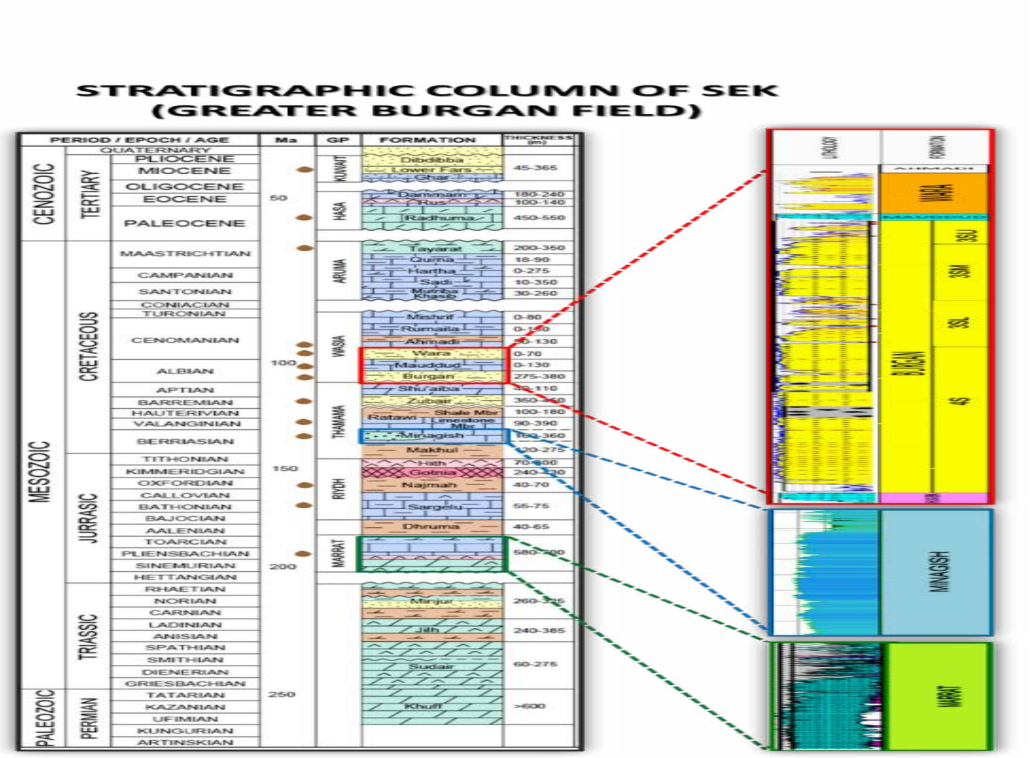
Introduction: Infill Drilling is done in Greater Burgan field as in any brown field to drain the reservoir systematically and maximize the Oil recovery. For a brown field, the process of infill drilling is a complex as the well density is high and anti-collision issues. Unlike in a green field, pattern drilling is not the easiest option as surface constraints, structural variations, reservoir heterogeneities, unexpected water movement and differential draining of the reservoirs have to be reckoned with. Greater Burgan field comprises of multilayered reservoir. Eocene Burgan Formation, covering an area of over 1250 sq. km. down to the original OWC.

Geological Setting: The Cretaceous Burgan Formation of the Greater Burgan Field, Kuwait (Figure 1) is the largest clastic reservoir in the world. Hydrocarbons are trapped in an enormous doubly-plunging Anticline (65 X 25 km), that has three prominent culminations namely Main Burgan, Magwa and Ahmadi. The hydrocarbon accumulation is four-way dip-closed beneath Middle Cretaceous Ahmadi mudstones and has a common OWC of 4472 ft. TVDSS, while small primary gas caps exist in Magwa and Ahmadi.

To accelerate the production from these clastic reservoirs, a number of horizontal wells have been drilled in previous years. The targeted reservoir sands show a lot of heterogeneity and flow barriers. Predicting sand continuity in such a scenario is a challenge. Moreover, velocity anomalies in the shallow sections and structural complexity in some areas brings in a great deal of uncertainty in the depth prediction.



(Figure 1)



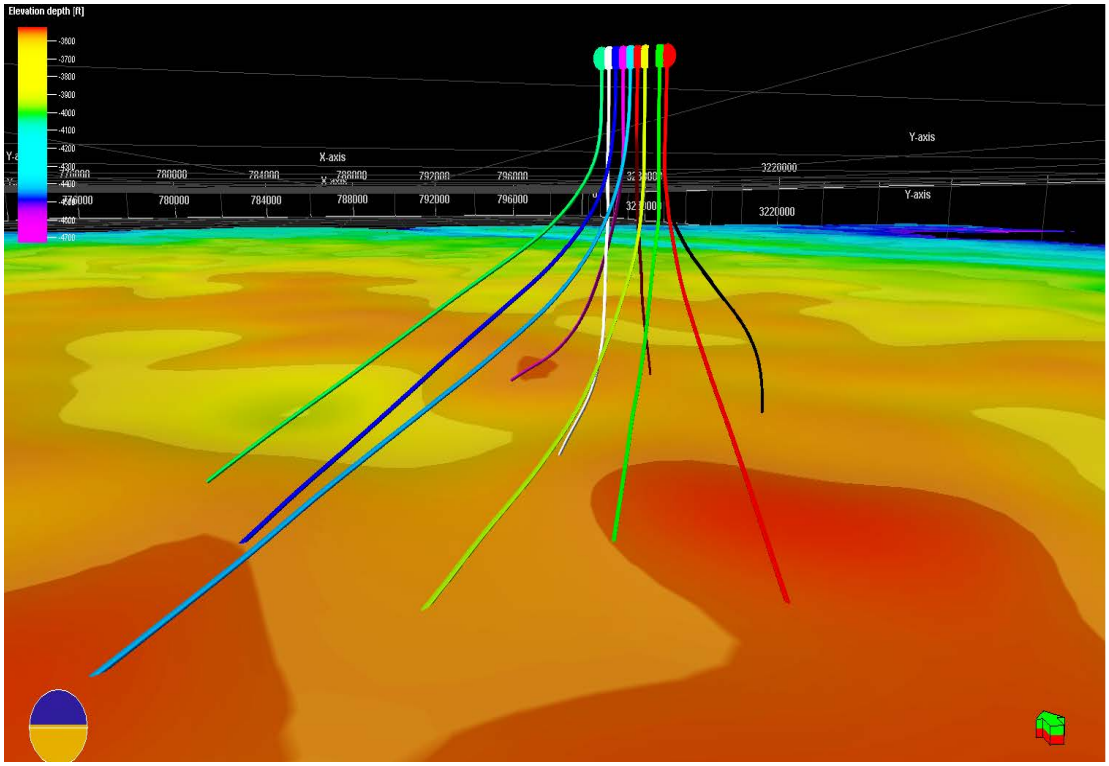
(Figure 2)

Burgan Formation has a dominantly fluvial to tidal and shallow marine environment of deposition and the reservoir is segregated in to three major units, Upper, Middle and Lower. Greater Burgan field was discovered in 1938 and put on production since 1946, and Burgan reservoir has the largest share in production.

The annual infill drilling program is driven by production target, which is again market driven. The types and number of wells to be drilled is also governed by the number of rigs and material available. However, the cornerstone for the entire exercise is the geological model of the reservoir and the production potential under given constraints. The reservoir is oil bearing down to a depth of 4472 ft. subsea with initial net pay thickness of over 700 ft. with exceptionally high quality reservoir. Initially an infill drilling program on a grid of 500 meters had been adopted effectively for sweeping the fluvial sands, supported by an active bottom and edge water drive.

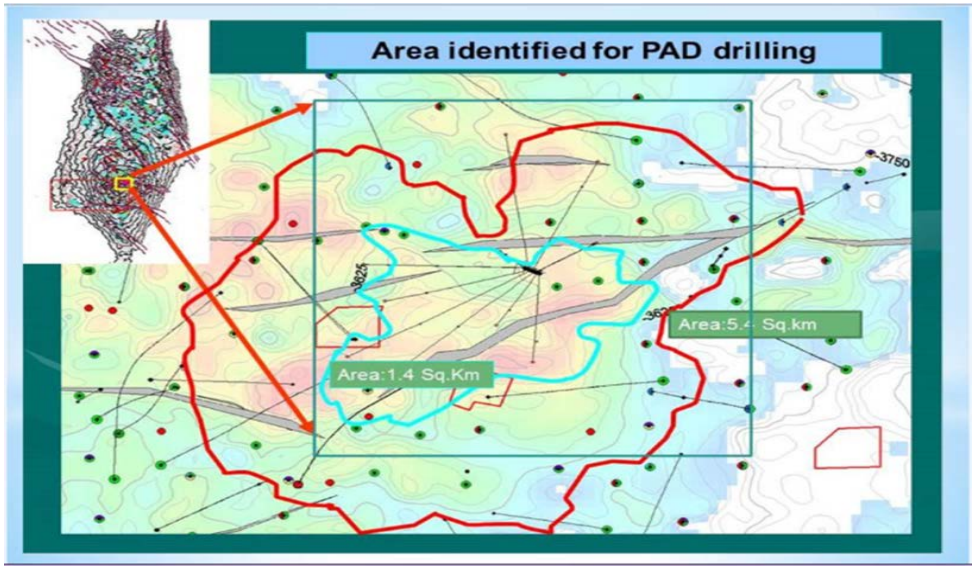
While the homogeneous sand units are uniformly drained, whereas heterogeneities in the reservoir tend to leave bypassed oil behind. Seismic data helps limitedly in capturing the reservoir heterogeneities, but faults are imaged very well.

A full field dynamic model had limited success owing to the massive size of the field, Sector models are however more helpful for planning infill wells. With over 2000 wells in the field, a reasonably good correlation between wells can be established.

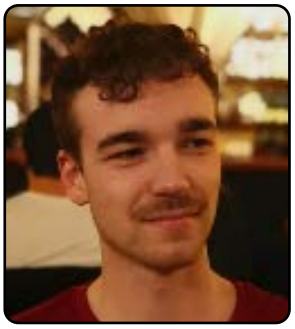


(Figure 3)

Conclusion: This data coupled with the reservoir characteristics and production performance in offset wells helps predict production potential and deliverability of wells in the unswept areas of the reservoir. The entrapment of oil in the flank areas in isolated pools is a result of sealing faults, attic oil from structural undulations, hydrodynamic fluid contacts and anisotropy in permeability derived from depositional trends. The drainage area, the remaining oil column and the rock, type are deciding factors for the well type. The present paper attempts to outline the factors influencing selection of infill wells in the field.



(Figure 4)



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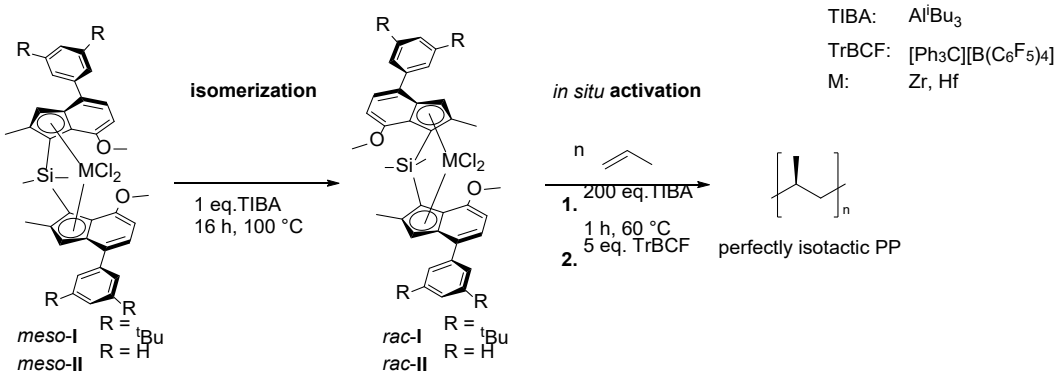
Perfectly isotactic polypropylene upon in situ activation of ultrarigid meso metallocenes

In 1984, Ewen disclosed the mechanism of stereocontrol exhibited by group IV metallocene catalysts in propylene polymerization. While the racemic (rac) isomers of such complexes yield isotactic Polypropylene (iPP), the meso isomers were shown to yield atactic Polypropylene (aPP). Generally, both metallocene isomers accumulate upon catalyst syntheses and since aPP finds far less applications, the rac species need to be separated from the meso ones in a rather tedious manner. While there exist isomerization methods to convert meso metallocene complexes into their corresponding rac analogues, such procedures add one additional step to the catalyst syntheses and do not lead to complete isomerization in every case.

Recently, we observed an unprecedented isomerization of the hafnocene complex meso-I upon reaction with Triisobutylaluminum (TIBA) at elevated temperatures (Scheme 1). Since TIBA is needed to convert hafnocene complexes into their catalytically active forms, anyway, this process can be considered an in situ isomerization. Such was verified using 1H and 29Si NMR spectroscopy, as well as UV-Vis spectroscopy and we were able to increase the yield of perfectly isotactic PP per employed amount of ligand by up to 400%.

In addition to mentioned published results, we were able to expand the catalyst scope onto far less bulky systems lacking the tBu groups in position 3' and 5' of the aryl groups and onto the corresponding zirconocene complexes, as well. Recent experiments indicate that the methoxy groups at position 7 of the indenyl moieties are necessary for a TIBA-promoted isomerization to occur and studies regarding the mechanism of the isomerization are ongoing.



Scheme 1: Isomerization and subsequent activation of differently substituted metallocene complexes using TIBA to obtain perfectly isotactic PP.

Audience Take Away Notes

- A way to gain a new perspective on a process (homogenous olefin polymerization) that has been established for more than 40 years.
- Interpreting unexpected experimental results and elucidating as well as utilizing the underlying molecular mechanisms.
- The strive to push chemical properties (isotacticity and molecular weight of polypropylene) to their limits to obtain unprecedented material properties .
- Catalyst design on a molecular level to tune material characteristics.

Biography

Tim Lenz studied Chemistry at the Technical University of Munich, where he graduated with a B. Sc. degree in 2020 and an M. Sc. degree in 2022. He started his PhD studies under the supervision of Prof. Bernhard Rieger in the same year. His research focuses on designing new catalysts for the homogeneous polymerization of propylene and elucidating organometallic reaction mechanisms of such.

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Are there the same accident? Quality management for accident investigation

The investigation is an essential process of the accident management system to identify the causal factors contributing to the accidents. The quality investigation reveals the efficacious solutions that solve the problems and prevent the reoccurrences. On the other hand, a poor investigation addresses the incorrect solutions and cause unreliable and unrespectable accident management. The organization shall ensure that every bit of the investigation process is executed consistently in qualitative ways to achieve effective results. The results shall be recorded and utilised within the organization to be learned.

Effective accident investigation is crucial to prevent future accidents and maintain a safe working environment. To ensure success, it is essential to focus on the entire process, including building and assuring the competencies of investigation team members, selecting the appropriate composition of the investigation team, gathering data, conducting causal factor analysis, reviewing reports, implementing solutions, learning from accidents, and managing knowledge. PTTEP conducts quality review sessions to guarantee the quality of investigation reports, selecting 10% of the investigation reports in each operating area. The evaluation criteria are set. And also a review committee which members from different departments to assess accident investigation reports, ensuring the highest quality is maintained. The evaluation results showed that in terms of area improvement, investigators need clarification about root causes, the on-site investigation team is incompetent, and data collection needs to be completed, which finally helps us understand the flaws that render the process ineffective. To continuously improve our investigation process, we schedule group reviews of investigation reports and periodic sessions to review investigation results and discuss any concerns. By following these methods and continuously improving our processes, we can ensure that our accident investigation approach is practical, persuasive, and, most importantly, helps prevent future accidents.

This evaluation aims to identify gaps in the investigation process by analysing accident reports in detail and assessing their influence on the effectiveness of investigation practices. It is imperative to improve the quality of the accident management process, and effective accident investigations are the key to gaining critical insights from accidents and implementing measures to prevent their recurrence. By tracking incident trends over time, we can analyses the program's effectiveness and update and review the company's accident investigation guidelines and training material accordingly. This process will ensure the company strives for the highest level of safety and accident prevention.

Audience Take Away Notes

- The audience will be able to understand the importance and consequences of effective incident investigation, which can prevent reoccurrence in the organization. Quality accident investigation will bring out effective corrective and preventive action.
- The audience can understand how to control the quality of the incident investigation process

according to their organization and standards.
- The practical application of these concepts will help you improve the accident investigation process in your organization and provide better training to your team.

Biography

Waewvalee Pramoon completed her Master of Science in hazardous substances and environmental management from Chulalongkorn University in Thailand in the year 2006. Following this, she gained experience working in the safety and environmental field across various industries such as manufacturing, petrochemicals, aviation, and oil and gas. Currently, she is working as an Operational Safety Engineer at PTT Exploration and Production in Thailand.

Ronachai Fuangfoong completed his BBA from Phranakhon Si Ayutthaya Rajabhat University in Thailand in 1998 with Thailand's accredited safety officer certificate. He worked in HSE on both onshore and offshore oil and gas production installations in Thailand and abroad. Currently, he is employed at PTT Exploration and Production in Thailand as an operational safety engineer.

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Upgrading of biomass-derived platform compound 5-hydroxymethylfurfural to high-value chemicals: An environment-friendly corrosion inhibitor

Biomass represents an important alternative feedstock, being abundant, inexpensive, widely available, and renewable. In the last years, the efficient utilization of the bio-platform molecules prepared form biomass to generate various valuable products has received much attention. 5-Hydroxymethylfurfural (HMF) has been considered as one of the most promising versatile biomass based platform molecules, which is synthesized through the dehydration of hexose and can be easily converted to versatile valuable chemicals, such as polymer monomer, fuel additive, fuel precursor, fine chemical and so on. Nevertheless, specific advances in metal anticorrosion of HMF have not been studied in detail. On the other hand, the traditional inorganic corrosion inhibitors, such as chromates, nitrites, and phosphates, can bring serious environmental pollution and ecological hazards problems due to the disadvantages of high toxicity and difficult degradation. And the organic corrosion inhibitors were limited by the harsh synthesis methods, high cost and by-products. Therefore, it is urgent to develop a kind of environment-friendly, conveniently prepared and efficient corrosion inhibitors, so that to meet the demand of environmental protection and sustainable development. Herein, we elaborately designed and synthesized a bio-based corrosion inhibitor, which was generated from 5-HMF. The weight loss experiments, electrochemical experiments, SEM analysis, and quantum chemical calculation suggested that this inhibitor is an efficient mixed-type corrosion inhibitor in 1M HCl solutions and the adsorption of this molecule on the mild steel sample surface is mainly a chemisorption progress. Notably, the inhibition efficiency of this bio-based inhibitor was enhanced at high temperature, and the in vivo experiment by a mouse model indicated the corrosion inhibitor shows low toxicity and high biological compatibility.

Audience Takeaway Notes

- An environment-friendly corrosion inhibitor was synthesised from the bio-based platform compound 5-hydroxymethylfurfural.
- The various properties of this bio-based corrosion inhibitor were studied through the weight loss experiments, electrochemical experiments, SEM analysis, and quantum chemical calculation.
- The in vivo experiment by a mouse model indicated the corrosion inhibitor is low toxic and shows high biological compatibility.

Biography

Dr. Li studied Chemistry at the Zhengzhou University, China and graduated in 2008. She then joined the research group of Prof. Lei Xiaoguang at the National Institute of Biological Science (NIBS), Beijing & Tianjin University, Tianjin, China. She received her PhD degree in 2014 and joined the Tianjin Key Laboratory for Prevention and Control of Occupational and Environmental Hazards, China. She was recognized as an Associate Professor in 2019. Her specific research interests include the following: Development of new catalytic reactions for the efficient construction of substituted cyclohexanes, total synthesis of structurally complex and bioactive natural products, exploring the mechanism and target of action of anti-hypoxia active natural small molecules.

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