Abstract Proceedings

of

International Conference on

TECHNOLOGIES AND INNOVATIONS FOR SUSTAINABLE DEVELOPMENT

(TISD-2023)

OCTOBER 27-29-2023

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Editor-in-Chief

Prof. Anjana Pandey

Conference Chairperson & Convener

(TISD-2023)

Organized By:

Central Library

Motilal Nehru National Institute of Technology Allahabad (MNNITA)

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International Conference

on

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(TISD-2023)

27th-29th October, 2023

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सत्यमेव जयते

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MESSAGE

The concept of `biotechnology' encompasses a wide range of procedures for modifying living organisms for the benefit of human kind. Biotechnology has wide range of applications in human health, Industries and environment. I am glad to announce that the Central Library, MNNIT Allahabad is organizing an International conference on Technologies and Innovations for Sustainable Development (TISD-2023) at Allahabad from October 27-29, 2023.

I am sure that event will draw gathering of academicians, industrialist, researcher and students from diverse fields of biotechnology. The conference will provide a dais to exchange scientific knowledge and share ideas on latest innovations and technology-based solution related to various aspects of sustainability encompassing health, environment and industry.

I appreciate the efforts of the organizers for drawing attention of experts in the thematic of the conference from all over the world. I congratulate the organizers for conceptualizing the event and making it a reality. I am sure that this unique opportunity provided by this conference will be gainfully utilized by all participants, which in long run will strengthen the field of biotechnology in India and internationally.

I extend my best wishes for the success of this conference and believe that the outcome would help in moving forward to deal with emerging problems in the thematic areas of this conference at a global level.

(**Rajesh S Gokhale**)

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Message

Prof. Rama Shanker Verma
Conference Patron

It is a matter of great honour and pleasure for me to write this message to be included in the souvenir being published on the occasion of the International Conference on "Technologies and Innovations for Sustainable Development (TISD – 2023)" being organized by Central Library of the Institute.

Managing sustained growth and sustainability are the burning issues and challenges. All of us in the industry, academic and in society, are concerned about it. Organizing conferences at national and international level and discussing idea towards managing and developing sustainability model would be useful to stakeholders. Technological advancement always play a vital role in achieving sustainable development goals by enabling innovative solutions addressing economic, social, and environmental challenges.

I believe that this interdisciplinary conference will give opportunities to academicians, scientists, professionals and researchers of various disciplines from all over the world to share and express their views and discuss the ongoing challenges. The conference, TISD – 2023 has been crafted to address these challenges. We are fortunate to have leading academicians and scientists to share their experience and perspectives to sustainable developments during the conference.

This conference will addresses interdisciplinary approach towards sustainable development and understanding climate change/pattern. I would like to express my appreciation to the organizing committee for their efforts to materialize this conference. I do hope all the participants will have a fruitful and beneficial experience.

I take this opportunity to welcome all the speakers and delegates of the conference. On behalf of whole TISD – 2023 team, I sincerely thank all the authors, sponsors and keynote speakers for their support and co-operation in this conference.

Finally, I congratulate whole TISD – 2023 team for their efforts in organizing this conference and wish the conference grand success.

Prof. Rama Shanker Verma
Director, MNNIT Allahabad, Prayagraj

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Message

Prof. Anjana Pandey
Chairperson and Convener

It is my privilege and pleasure to welcome you all to the International Conference on "Technologies and Innovations for Sustainable Development (TISD – 2023)", being take place from October 27th to 29th, 2023. As the Conference Chairperson, I am thrilled to extend my warmest greetings to everyone who will be joining us for this significant event.

This conference is a celebration of the collective efforts, ideas, and innovations in executions that are driving our world towards a more sustainable and equitable future. In a rapidly changing global landscape, it is imperative that we come together to exchange our knowledge, discuss pressing issues, and harness the power of technology and innovation to address the emerging challenges of our time.

We have an exciting lineup of keynote speakers, distinguished panelists, and research presentations that promise to enlighten and inspire us. Our conference will serve as a platform for interdisciplinary dialogue and collaboration among researchers, academicians, industry leaders, policymakers, and students from around the world. Together, we will explore innovative solutions that can drive positive change in areas such as environmental conservation, renewable energy, healthcare, education, social justice and promote sustainable development in all the domains.

I encourage you all to actively participate in the sessions, engage in lively discussions, and forge new connections with like-minded individuals who share their passion for sustainable development. It is through these interactions that we can catalyze meaningful changes and create a lasting impact on our research communities globally. I would like to express my gratitude to the organizing committee, our sponsors, and all those who have worked tirelessly to turn this conference into a reality. Your dedication and commitment have been instrumental in ensuring the success of this event. In conclusion, I am confident that the International Conference on "Technologies and Innovations for Sustainable Development" will be an enriching and memorable experience for all of us. Together, let us chart a course towards a more sustainable, inclusive, and prosperous future.

Thank you for your participation, and I look forward to meeting you all in person or virtually as we embark on this exciting journey of knowledge sharing and collaboration.

Prof. Anjana Pandey
Chairperson and Convener (TISD – 2023)

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(TISD-2023)
27th-29th October, 2023
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KEYNOTE TALK

ROLE OF TECHNOLOGIES AND INNOVATIONS FOR SUSTAINABLE DEVELOPMENT

Prof. Rama Shanker Dubey
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KNL- (Chief Guest)

Sustainable technology, a rapidly evolving field, seeks to revolutionize the way we harness and use resources to meet our needs while minimizing environmental impact. Its primary goal is to develop and deploy innovative solutions that enhance the quality of life for present and future generations without depleting natural resources or causing harm to the planet. Significant for society on multiple fronts, sustainable technology addresses critical challenges. Firstly, it offers a pathway to combat climate change by reducing carbon emissions through energy- efficient systems and renewable energy sources. Secondly, it mitigates resource scarcity by promoting the efficient use and recycling of materials. Furthermore, it enhances human well-being by providing clean water, sanitation, and healthcare solutions to underserved communities. Sustainable technology is also indispensable for economic growth, as it drives innovation, creates green jobs, and fosters resilience against environmental disruptions. Furthermore, it empowers individuals and communities to become more self-sufficient and less reliant on finite resources, promoting a sense of responsibility and stewardship for the environment. In essence, the significance of sustainable technology cannot be overstated. It not only addresses pressing environmental concerns but also offers the promise of a more equitable, prosperous, and harmonious future for all of humanity.

POTENTIAL OF USING MICROORGANISMS IN BIOREACTORS FOR H_2 PRODUCTION

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KNL-01

Keywords: *Sustainability; Biohydrogen; Bioreactors/photobioreactors; Water-gas shift reaction;Solar energy*

Many microorganisms produce H_2 either from organic compounds or from H_2O.It is possible to design bioreactors for large-scale H_2 production using these microorganisms. Two groups of bioreactors can be described based on the nature of a H_2-evolving reaction: bioreactors based on dark H_2 production by fermentative or purple bacteria and photobioreactors with H_2photoproduction by cyanobacteria, purple bacteria or green algae. Large-scale H_2production based on bacterial fermentation in bioreactors is most achievable in the short term.We used glycerol as a substrate for fermentative H_2production by the bacterium *Enterobacter aerogenes* in bioreactors. Traditional fermenters and hollow-fiber bioreactors were used for H_2production through bacterial fermentation. Another possibility for the practical application of bacterial H_2 production in the short term is with a bacterial "water-gas shift reaction". Some bacteria can shift H_2O (and CO) into H_2(and CO_2) in darkness. In our experiments, two types of bioreactors (hollow-fiber and bubble-train bioreactors) were used for H_2 production via "water-gas shift reaction" by the purple bacterium *Rubrivivax gelatinosus*. Hydrogen produced by bacteria through glycerol fermentation or with "water-gas shift reactions" is sufficiently clean for injection into H_2fuel cells. In photobioreactors, H_2 production is coupled with photosynthesis. It is possible to use solar energy for the production of H_2 from water, which is very attractive for practical applications. We successfully operated different laboratory-scale photobioreactors (hollow-fiber and PVC photobioreactors) for H_2 production using the cyanobacterium *Anabaena variabilis* for several months. Long-term research efforts are needed to introduce practical large-scale photobioreactors systems.

QUANTITATIVE UPTAKE AND FATE OF NANOPARTICLES BY/IN CELLS - AN IN VITRO STUDY

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KNL-02

Since around two decades, colloidal nanoparticles (NPs) are being developed as envisaged tools for in vivo diagnosis and treatment. Despite massive efforts, the amount of NPs used in clinical practice is still relatively low. While much is known about how NPs interact with cells, in vitro and in vivo, we argue that though most principle effects and mechanisms have been unraveled, it is the quantitative details that are missing. More systematic and quantitative data about the cellular uptake and fate of NPs should be very beneficial for better designing NPs towards their proposed applications.

WATER TREATMENT TECHNOLOGIES FOR SUSTAINABLE WATER MANAGEMENT

Prof. Stephen Gray

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KNL-03

Global warming is leading to altered climate, and coupled with urbanization water scarcity is becoming increasingly prevalent. Approaches to address water scarcity have centred around water recycling and desalination, and increasingly the desire to extract more fresh water from poor quality water resources is leading to operation at higher water recoveries and a move towards zero liquid discharge processes. Membrane technology is central to these processes due to their ability to produce high quality filtrate from poor quality water sources and their economic competitiveness. Research has underpinned the growth of membrane use within the water industry, and has led to increased productivity, reduced energy requirements and lower costs. Membrane technology is now a conventional technology for surface water treatment, desalination and biological treatment of industrial wastewaters. Despite their success, significant research into membranes is still being conducted. So is there any need for additional research and can membrane technology be further improved? A brief history of membrane applications highlighting the role of research and development will be presented, and opportunities for further membrane improvements and applications identified.

BUSINESS SUSTAINABILITY FOR ENERGY ENTERPRISES IN GREEN HYDROGEN INDUSTRY

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KNL-4

The title of this talk is mainly in the context to Norway.

The increasing need for environmentally friendly solutions is compelling energy companies to embrace green technologies and fuels, so as to align them with their sustainability objectives. However, these companies face a dilemma due to the strong presence of the oil and gas industry and electric vehicles in Norway. This talk highlights the significance of considering multiple factors, including market opportunities, national development strategies, policies and regulations, political support, infrastructure, and social acceptance, within the hydrogen sector. Political support and infrastructure development are identified as key drivers for the adoption of hydrogen technology in Norway, with the potential to replace the natural gas trade and contribute to a sustainable economy.

Notably, hydrogen demonstrates feasibility in sectors such as maritime, aviation, industry, and long-haul transportation, whereas technologies like electric cars and heat pumps are more pragmatic alternatives for short-haul transportation and home heating, respectively.

ANTIBIOTIC STEWARDSHIP AND SUSTAINABLE DEVELOPMENTAL GOALS

Prof. Prashant Mishra, PhD
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KNL-05

Antimicrobial resistance has been declared as global health challenge that requires immediate action to achieve sustainable developmental goals. While discovery of antibiotics has provided remarkable control in mortality due infectious diseases, probably it has become one of the most abundant drugs being prescribed. Increasing popularity and indiscriminate use of broad-spectrum antibiotics in human healthcare, livestock, and aquaculture, has led to antibiotics resistance and pollution in the environment, food, water, and other resources. This has led to the emergence and increase in antibiotic resistant bacteria harbouring antibiotic resistant genes, which is difficult to treat. To contain antibiotic resistance, early and quick detection of bacteria for appropriate prescription, development of alternatives to conventional antibiotics, combination therapy and inhibiting or capturing antimicrobial resistant factors has been advocated to reduce the overall use of antibiotics without affecting health outcomes.

For rapid detection and discrimnation of bacteria, biosensors have tremendous potential where tests are not limited in the hands of highly trained personnels and specialized hospitals but can be conducted using point-of-care devices. This has led to the development of various nanomaterial based platform technologies for electrical, mechanical and optical biosensors. We will discuss electical (Impedance and FET based) and optical (SERS based) sensors for bacterial detection. Vancomycin functionalized WO_3 thin film based impedance sensor for efficient capture and highly selective detection of Gram-positive bacteria was developed with limit of detection 10^2 cfu/ml with linear dynamic range 10^2-10^7 under physiological conditions. Further, MoS_2/TiO_2 hybrid nanostructure-based field effect transistor has been fabricated for highly sensitive, selective and rapid detection of Gram-positive bacteria with response time 22.19 sec at low concentration of 10^2 cfu/ml under physiological conditions. Using a simple and facile method a smartphone based silver nanorods (AgNRs) array sensors were fabricated using glancing angle deposition method for detection of live and dead bacteria as well as antibiotic resistant bacteria. The colorimetric and water wettability features were tested which showed drastic changes. These

changes were detected using in house developed mobile app 'colorimetric detector'. Currently, we are developing various surface molecularly imprinted polymers for bacterial detection.

In recent years, antibiotics have faced serious challenges due to the rise of multiple drug-resistant (MDR) bacteria which has posed emerging threat to the human race. The majority of nosocomial infections with a continuous increase in antimicrobial resistance are caused by the ESKAPE bacteria. It has been observed that bacteria develops resistance to various antibiotics and metallic nanoparticles by different mechanisms, hence combination of antibiotic with nanoparticles is likely to provide better efficacy and lower chance of developing antibiotic resistance. Herein, various nanoformulations having bioactive compound along with metallic nanoparticles as antibacterials will be discussed. In addition, photodynamic antibacterial therapy and strategies to use broad-spectrum inhibitors against class A, B, and C type beta-lactamases to block the hydrolysis against antibiotics will be discussed.

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TAILORED SUSTAINABLE PLASTICSFOR DAY TO DAY APPLICATIONS

Prof. Vimal Katiyar

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KNL-06

This presentation highlights the use of available bio-resources for value added sustainable polymeric products for Engineering, Commodity and Biomadical Applications. Biopolymers can be extracted from renewable feedstock such as plants, marine animals, insects, etc. It is noteworthy to mention that so far biopolymers extracted from these sources have limited applications in large scale plastic production. Among the available bio-based plastics, polylactic acid (PLA), poly (caprolactone), Polyhydroxyalkanoates, have made its own place due to its biodegradability and have a potential to replace some of the conventional fossil based plastics. It is noteworthy to mention that properties such as melting point, stiffness, heat stability temperature and gas barrier properties limit it suse in high temperature commodity and engineering applications. In relation with PLA, such limitations can be overcome by developing new class of high molecular weight stereo complex PLA (sc-PLA).In this context, we have synthesized sc-PLA and its sc-PLA-bio nanocomposites by using different biobased nanofillers which includes cellulose nanocrystals, silk nanocrystals, modified chitosan, etc. The formation of stereo complex crystallites is confirmed by the XRD analysis. The melting point of the composite is increased even higher than 225°Cwhich suggests the formation of stereocomplex crystallites and the Heat Deflection temperature is enhanced upto~140°C at optimum bionanofiller loading. Due to the presence of various bio nanofillers, ultimate tensile strengthisenhanced significantly. Based on the studies, itis concluded that bio nanofillers are good candidates for enhancing the stereo complexation in the PLA. In this talk, fabrication strategies for synthesis of stereo complex-PLA-copolymers and it's bio nanocomposites and mofdifcation of their properties along with possible applications will be discussed. This talk will also focus on fabrication of bionano-fillers, edible food packaging, processing of bio nanocomposites caste films, injection molded products and 3D printing for biomedical and also its uses in energy applications. This presentation will also be focused towards utilization of other bio-based plastics and their formulations in the area of agriculture, food packaging, energy harvesting, biocatalysis, water purification, orthopedics, self-cleaning Fabrics.

HEALTH AND ENVIRONMENTALLY SUSTAINABLE SYSTEMS

Prof. Kavita Shah

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KNL-07

In an era of ever-increasing environmental challenges and public health concerns, a need for comprehensive sustainable system is necessary. Global threats, as climate change, loss of biodiversity, pollution, etc. makes it imperative to safeguard both the planet and the well-being of its inhabitants. Crucially, sustainability systems require emphasis on environmental stewardship and the role of education and community engagement to foster sustainable practices. Deviations from traditional/modern sustainable systems with time in order to procure more food and feed has caused several deficiencies in the environment, soil, plants, animals, and human population. Therefore, there is a need to employ a holistic framework, encompassing ecological, social, and economic dimensions. Currently, public health is set for clean air and water initiatives, sustainable agriculture, and urban planning that prioritizes green spaces and active transportation. Thus sustainable systems should intend to integrate multifaceted strategies that promote ecological resilience while improving public health. Innovations and policies driven by collaborative approaches between governments, businesses, and civil society to safeguard the environment and public health are therefore encouraged. Re-weaving of the traditional/modern sustainability systems into the fabric of our society, may help in mitigating environmental degradation and support public health resilience, to ensure a more prosperous and harmonious future.

A LOW-TEMPERATURE ORGANIC RANKINE CYCLE (ORC) SYSTEM FOR DECENTRALIZED ELECTRICITY PRODUCTION

Ashish Dubey[1], Prof. S.K. Shukla[1,] * and Dr. Saurabh Pathak[1]

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KNL-08

The present work reveals the performance of three (Model 1) and two (Model 2) concentric spiral coil evaporators. SolidWorks® and Aspen Plus® enabled the simulation of the proposed evaporators. The simulation and RSM analysis have been done for modeling, optimization, and validation for 5 kW ORC system. Also, an additional simulation study has been done on the 10 kW ORC system.

The results showed that the Model 1 evaporator has 15.03% higher effectiveness than the Model 2 evaporator. With a desirability of 0.9765, the optimum conditions of evaporator temperature, evaporator pressure, condensing temperature, and condensing pressure are found to be 93 ºC, 688 kPa, 30 ºC, and 110 kPa, respectively. The measured responses are 2.432 kW and 4.989% for expander output and thermal efficiency, respectively, for the 5 kW ORC system. Further, the simulation analysis of a 10 kW ORC has been discussed for future development of the system. The present study would become a prerequisite for new research and pave the way for the utility of low-temperature energy sources, especially in remote areas.

LEVERAGING DEEP LEARNING TECHNIQUES FOR FOREST CLASSIFICATION WITH LIDAR DATA

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KNL-09

The sustainable management of forests plays a pivotal role in overall development, necessitating effective monitoring and maintenance strategies. Characterizing forests, particularly in terms of spatial distribution and morphological features, is a critical aspect of this endeavor. Traditionally, field visits were employed for this purpose, but more recently, satellite remote sensing has become the primary method. However, both approaches exhibit limitations either in terms of speed or accuracy. The use of terrestrial, mobile, and aerial LiDAR data presents a viable alternative, yet the sheer volume of LiDAR data requires automated processing to derive essential forest parameters. Although some attempts have been made in this direction, existing methods lack robustness for large-scale applications. This talk explores the potential of deep learning methods to address this challenge. The author's research group has been investigating various deep learning approaches, particularly focusing on the generation of plot-level forest inventory using terrestrial data and evaluating the applicability of deep learning architectures for precise forest segmentation. This talk will focus on these aspects.

COMPOUNDS WITH SN-S BONDS AND ITS APPLICATIONS

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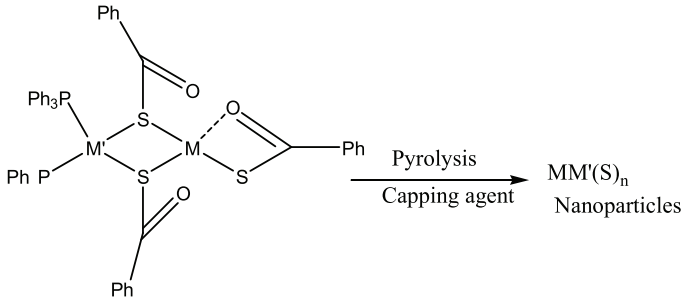
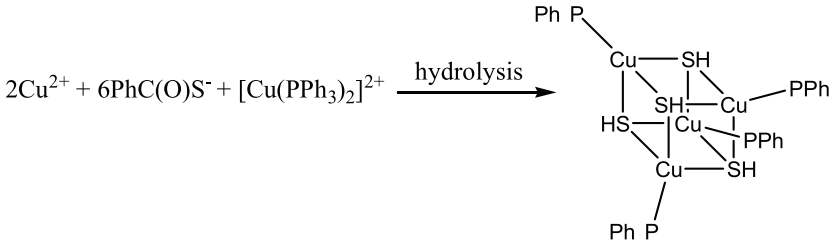
KNL-10

Thiocrboxylate ion, $RSC(O)S^-$ acts as a versatile ligand as it possesses both soft and hard donor sites. Although, it forms complexes with all types of metals it has remained relatively less explored as compared to other sulfur ligands such as thiocarbamates and xanthates. During the past several years, we have synthesized a number of transition and main group metal complexes using thiocarboxyalte ligands. The complexes not only displayed unparalleled structural variations but also underwent interesting reactions. Hydrolysis of various thiocarboxylate complexes yielded corresponding oligonuclear metal clusters (oxides/hydroxides/sulfides/ hydrosulfidesetc). Pyrolysis of these compounds provided mono/bimetallic chalcogenides thus, providing a simple low-energy pathway to prepare semiconducting nanomaterials with suitable band gaps. Some of the complexes exhibit excellent catalytic efficiency towards selected organic transformations. Some of these results will be presented during the talk.





SUSTAINABLE TECHNOLOGY FOR ADVANCED MATERIALS

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KNL-11

High performance polymers development continues to attract significant attention both in academia and industry due to diverse commercial potential. Further, polymer materials with varied functional properties are modified through blends and composites for enhanced performance. Unique functional, thermal and mechanical characteristics in addition to ease of processing of polymers and its composites have opened up newer opportunities for product applications in packaging, agriculture, energy, automobiles, infrastructure, retail, aerospace, defence and other growth sectors. The present talk will focus on our scientific and technological studies for high performance materials development such as polyolefins, elastomers and its composites. Furthermore, sustainability aspects including circular economy and development of biodegradable / bio-compostable and bio-based polymers will also be covered.

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SESSION-I

GREEN TECHNOLOGIES AND INNOVATIONS FOR SUSTAINABLE FUTURE

SIMULTANEOUS ELECTROCHEMICAL SENSING OF ORGANIC DYES FROM WASTEWATER EFFLUENT: A SUSTAINABLE APPROACH

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1.1/1 (I)

Keywords: *Industrial dyes, Electrochemical sensing, Nickel oxide nanoparticles, Differential Pulse Voltammetry (DPV), Cyclic voltammetry.*

Organic dyes are primarily used in different industries, viz., textiles, paper, cosmetics etc. The coloured wastewater released from these industries threatens other life forms by accumulating in the food chain. Different remediation strategies involving complex processes are, in practice, carried out during the water recycling process. Therefore, there is a need to develop a simultaneous detection method for the dyes in treated water because few exhibit carcinogenic properties, even at deficient concentrations. In this study, we have developed a simultaneous electrochemical detection method for sensing three organic dyes viz. methyl red (MR), methylene blue (MB) and nitroblue tetrazolium (NBT) by using the Nickel oxide (NiO) nanoparticles modified Indium tin oxide (ITO) glass electrode sensor. The electrochemical performance of the prepared sensor was investigated by cyclic voltammetry (CV) and differential pulse voltammetry (DPV). The limit of detection (LOD) values of MR, MB and NBT were found to be 37.1 nM, 15.67 nM and 12.2 nM, respectively. Thus emphasizing that the developed sensor can be used to detect these dyes in industrial wastewater effluent.

BIOREFINING OF LIGNOCELLULOSIC BIOMASS FOR 2G ETHANOL AND OTHER RENEWABLE CHEMICALS

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1.2/2 (I)

Keywords: *Sugarcane bagasse, 2G ethanol, thermotolerant yeast, SSCF, SHF.*

Integrated biorefinery is a sustainable approach for economic, environmental and socially favorable management of wastes along with the generation of renewable and cleaner fuels as well as chemicals/ food/ materials. The strategy is to develop a sustainable integrated biorefinery to achieve maximum yield, productivity and quality of the products; minimize the energy consumption and adverse effect on environment; and competent to broad range of types, seasonal availability and quality of the feedstock. In the present study of integrated biorefinery, one kg of raw sugarcane bagasse (SCB) followed by dilute H_2SO_4 pretreatment (2.18% (v/v) H_2SO_4, 14.35% (w/v) solid loading and 29.49 min at 121 ^oC) resulted into 100.83 ±0.8g of ethanol; 25.12 ±0.09 L biogas; 92.81 ±1.8 g of residual biomass as a significant biofertilizer and 85.06 ±1.8 g of xylitol. On the other hand, one kg of raw SCB pretreated by liquid ammonia (15.64% (v/v) NH_4OH and 10.51% (w/v) solid loading at 84.9 ^oC temperature for 23.95 h) resulted into 217.4 ±1.6 g of ethanol; 18.5 ±0.06 L of biogas; 123.56 ±1.2 g of residual biomass as a biofertilizer; 651.34 ±0.8 g vanillin; 38.55 ±0.9 g syringic acid and 15.6 ±1.0 g syringaldehyde. Total energy input of overall biorefinery of SCB followed by dilute H_2SO_4 pretreatment calculated to be 18,520.29 kJ/kg, whereas total energy output of the whole process was 5,381.09 kJ/kg, which was 29% of total energy given to the system. On the other hand, total output of energy for overall biorefinery of NH_4OH pretreated was 10,979.26kJ/kg (60.76%) out of energy input of 18,068.02 kJ/kg. Integrated biorefinery of SCB designed in this study has proved to be economically as well as environmentally sustainable. This kind of integrated biorefinery of biomass leads to the cleaner production of multiple products such as sugars, biofuels, industrial chemicals, and sustainable management of largely produced wastes rather than uncontrolled burning or degradation.

CATALYTIC CO-PYROLYSIS OF WASTE MOTOR OIL AND WASTE THERMOCOL: STUDY THE FUEL CHARACTERISTICS AND COMPOSITION OF PYROLYTIC OIL

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1.3/3 (I)

Keywords*: Waste Engine oil; Waste polystyrene; Co-pyrolysis; Catalytic co-pyrolysis; calorific value*

In this study, Waste Thermocol (WT)and Waste Motor oil (WMO) were co-pyrolyzedin the absence and presence of catalyst at 550 °C with a heating rate of 25 ^{o}C min^{-1}, and under N_2 flow rate of 25 mL min^{-1}. For the co-pyrolysis, WT was mixed with a fixed quantity of WMO (40g) at different weight percentages varying from 10% to 100% to observe the variation in the composition and fuel properties of the pyrolytic oil. The optimum blending (WMOwith WT) condition (20% by weight) was adopted to produce higher calorific value (CV) pyrolytic oil. Further, at the optimum blending condition, catalytic co-pyrolysis was followed through an ex-situ process in the presence of Ni-Al catalysts at 2%, 5%, 10%, 15%, and 20% by weight. The catalytic co-pyrolysis resulted in higher CV pyrolytic oil at 15% Ni-Al catalyst. It was observed that co-pyrolysis at 20% WT resulted in better CV (44.77 MJ K^{-1}) compared to WMO pyrolytic oil, whereas the use of 15% Ni-Al catalyst enhanced it to 49.04 MJ kg^{-1}. Similarly, the other fuel properties of pyrolytic oil such as density, viscosity, flashpoint, and carbon residue were better in the catalytic co-pyrolysis process. The variations in the composition of pyrolytic oil resulted in a higher yield of aromatics (85.21%) in 20% blending and cyclic alkene (37.70%) in the presence of 15% Ni-Al catalyst. A significant effect of catalyst was also noticed for the yield of Alkane, Alkene, Cyclo-alkene, and Ester in the pyrolytic oil. Compared to WMO pyrolytic oil, 20% WMO+WT pyrolytic oil, and catalytic co-pyrolytic oil with 15% Ni-Al, the yield of Alkane, Ester, and Alcohol was higher. The blending and catalyst effect on the reduction of heavy metals in the pyrolytic oil compared to the WMO was also observed. The concentrations of Ba, Zn, and Mn were reduced in the pyrolytic oil by using a catalyst. Hence, it can be concluded that catalytic co-pyrolysis of WMO with WT can be a good option to produce pyrolytic oil which can be used as an alternative fuel.

GREEN POLYMERS FOR WASTEWATER TREATMENT

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1.4/4 (I)

Keywords: *wastewater; coagulation; flocculation; biodegradable flocculant*

There is grave importance of wastewater treatment in chemical industries. The dyes and textile industry wastewater consists of various complex organic and inorganic compounds, so that is difficult to treat. there is a wide variety of treatments invented by researchers. The treatment methods employed depend on the specific types of dyes and intermediates present in the wastewater and the local regulatory requirements. Coagulation - flocculation is one of the basic methods, but the most effective one. In this work, we treat the dye intermediate industry wastewater, with variety of coagulants and flocculants. The majority of the flocculants available in the market are acrylic acid-based on-biodegradable polymers. The wastewater was treated with single as well as a combination of coagulants. The results were studied and some combinations were found to be the most effective. Biodegradable polymer-based flocculants developed in our laboratory were also used.

A SUSTAINABLE ROUTE FOR THE PRODUCTION OF RENEWABLE HYDROGEN FROM AGRICULTURAL RESIDUE

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1.5/5 (I)

Keywords: *Steam reforming; Hydrogen production, Perovskite catalyst, Agricultural biomass.*

The transportation industry, primarily reliant on fossil fuels, stands as a significant contributor to fuel consumption. As global energy demands surge and fossil fuel consumption escalates, there is a corresponding increase in the concentration of pollutants and greenhouse gases in the atmosphere. Hydrogen emerges as a recognized clean energy source and a superior substitute for fossil fuels. This potential is attributed to its various characteristics, including its energy density, high calorific value, cost-effectiveness, and the multitude of production methods available. H2 could eventually supplant the use of fossil fuels in internal combustion engines entirely. The current hydrogen production process involves using fossil fuels, particularly natural gas, but catalytic steam reforming of bio-oil derived from agricultural residue could be a promising alternative. This approach offers a sustainable route to reduce the environmental impact of agricultural waste by producing hydrogen, a fuel with a higher calorific value than petroleum products and no pollution emissions. Our research focuses the immense potential of catalytic steam reforming of agricultural residue-derived bio-oil as a cleaner, sustainable method for hydrogen production. By addressing pressing environmental concerns, providing cleaner energy alternatives, revolutionizing agricultural practices, and offering a viable alternative to natural gas in industrial processes, this study shapes a future that harmonizes ecological responsibility with prosperity. In this talk, I will delve into the role of hydrogen as a future energy carrier. Beginning with a brief overview of the current hydrogen production methods, I will emphasize the significance of transitioning to alternative feedstocks, particularly biomass, to reduce reliance on fossil fuels. My discussion will primarily center on various biomass-to-hydrogen conversion routes, with a particular focus on the promising pyrolysis-steam reforming route. Furthermore, I will provide insights from our lab's research and share notable results, providing a glimpse into the potential of this innovative route.

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IMPLEMENTATION OF TRIPLICATE FUEL BLENDS TO ENHANCE DIESEL ENGINE CHARACTERISTICS

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1.6/1(O)

Keywords: *Diesel Engine, Performance, Emission, Particulate, Ethers, Ethanol*

Experimental investigation are carried out to show the effect of triplicate fuel blends of diesel, alcohol and ethers on the performance and emission characteristics of a Bharat Stage-IV commercial diesel engine. The engine is coupled with an eddy current dynamometer to evenly vary engine speed and engine load from 1000 rpm to 2200rpm and 0 Nm to 25 Nm engine load respectively. The results are presented using color coded maps. Prior to actual engine testing, a stability analysis was carried out which shows that diesel+10% ethanol fuel blend is the most stable fuel blend that remains stable for the span needed to conduct experiments. Further, 2.5 and 5% diethyl ether is added to diesel+10% ethanol to get comparative performance and emission characteristics of a diesel engine vis-à-vis pure diesel. Performance maps show that at reference point (1600 rpm and 15 N-m load), the brake-specific fuel consumption (bsfc) for diesel+10% ethanol is 10.5% greater than pure diesel. Further, adding 2.5 and 5%diethyl ethers in diesel+10% ethanol lowers the bsfc value of triplicate fuel by 2 and 5.7 % respectively. The Brake thermal efficiency (bte) of various test fuels shows the inverse nature to that of bsfc. Emission maps shows that both particulate matter and oxide of nitrogen decreases up to 8.4 and 50 % respectively, when 10% ethanol is added to diesel fuel. Moreover, the addition of 5% diethyl ethers to the diesel+10% ethanol further decreases the PM and NOX emissions by 10.4% and 28.89 % respectively with respect to dual blend of diesel+10% ethanol.

STUDY THE COMPOSITION AND FUEL CHARACTERISTICS OF ZnO BASED CATALYTIC PYROLYSIS OIL AND GASOLINE BLENDED FUEL

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1.7/2(O)

Keywords: *WEO; catalytic pyrolysis; blending; GC-MS; FTIR*

In the present study, Thermal pyrolysis of Waste Engine Oil (WEO) was carried out within 450 ^{o}C to 575 ^{o}C in a semi batch reactor. The optimum (76.73 %) pyrolytic oil (PO) yield was obtained at 550 °C temperature. The ex-situ catalytic pyrolysis experiments were performed at 550 °C by varying the catalyst wt. % of ZnO. The influence of catalyst on fuel characteristics and yield were determined and compared with thermal PO. The optimum amount of catalyst was determined based on the calorific value of the catalytic pyrolytic oil. The 20% ZnO catalytic pyrolytic oil was found to be the highest calorific value (47.36 MJ kg^{-1}) having oil yield of 82.09% on weight basis. Further, the PO formed from catalytic pyrolysis (CP) of WEO was blended with gasoline by varying the volumes %. The result confirmed that the optimum calorific value of the blended sample was 47.88 MJ kg^{-1} for 30% blending with gasoline. Thus the GC-MS and FTIR analysis was done to study the compositional analysis of the optimum (30%) blended sample. The GC-MS composition of 30ZnOG pyrolytic oil indicated the occurrence of Gasoline (C4-C12) was 80.48%.

A THEORETICAL STUDY ON CORRELATION BETWEEN GREEN MANUFACTURING TECHNOLOGIES

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1.8/3(O)

Keywords: *Green technologies; Correlation; Natural resource based view; Interconnectedness; Path dependency; Embeddedness.*

Though manufacturing sector is contributing towards global economy, the implementation of manufacturing processes has serious adverse impacts on the environment, leading to catastrophes involving climate change, global warming, etc. Manufacturing industries around the world are embracing green manufacturing practices to combat such issues. These practices use new cutting-edge methods known as green technologies (GTs) to lessen the negative ecological impacts of production activities. There is very limited research which studied the correlation between GTs in manufacturing industries by broadly categorizing them, and it has also not been supported by substantial management theories. The present work aims to fill this gap. This paper proposes a theoretical study which makes three broader classifications of GTs and maps them as per the natural resource based view (NRBV)theory, in line with the strategic capabilities, i.e. pollution prevention, product stewardship and sustainable development. The correlation between GT categories is determined by the concept of interconnectedness of NRBV theory, and proposed that the GTs follows a sequential pattern of capability development along with a parallel process of resource accumulation, i.e. path dependency and embeddedness. This study will assist the managers in selection of an appropriate GT, based up on the existing capability of firm and offers valuable insights to the body of knowledge by pointing the way for future study in the field.

A FACILE HYDROTHERMAL METHOD FOR SYNTHESIZING $\mathbf{V_2O_5}$ NANOSHEET TAILORED FOR HIGH- PERFORMANCE SUPERCAPACITOR APPLICATIONS

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1.9/4(O)

Keywords: *V_2O_5 ,Supercapacitor, Hydrothermal method, Electrode, Electrochemical properties*

Currently, vanadium pentoxide ($\mathbf{V_2O_5}$) is considered a promising material for supercapacitors owing to its low cost, low toxicity, wide voltage range, high capacitance, and multiple oxidation states. This study reports a cost-effective, scalable, and uncomplicated synthesis method to synthesize$\mathbf{V_2O_5}$powder using the hydrothermal method. Firstly, the structure, purity, and phase composition of the synthesized material were investigated using XRD, FESEM, UV-visible, and FTIR spectroscopy. The results confirmed the formation of the synthesized material. Subsequently, followed by a detailed investigation of the electrochemical performance of the $\mathbf{V_2O_5}$**@Ni** foam electrode. The resultant $\mathbf{V_2O_5}$**@Ni** electrode shows a high specific capacitance of 275 F/g at a current density of 1 A/g in 1M Na_2So_4 aqueous electrolyte with three electrode systems. These findings underscore the promising potential of hydrothermally synthesized material $\mathbf{V_2O_5}$foradvanced energy storage, especially within the realm of supercapacitor applications.

DESIGN AND DEVELOPMENT OF PSA SYSTEM FOR ULTRA PURIFICATION OF GREEN HYDROGEN

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1.10/1(P)

Keywords: *Green Hydrogen; Pressure Swing Adsorption; Electrolysis; Adsorbents.*

To ensure high-purity standards for hydrogen used in fuel cell vehicles, the widely employed method of Pressure Swing Adsorption (PSA) effectively removes impurities from hydrogen streams. This paper focuses on the design ofa PSA cycle for hydrogen purification using a system consisting of two beds packed with 4Å Molecular Sieve. The hydrogen feed stream considered in this study contains water, the primary impurity resulting from the electrolysis process. The design of a PSA system involves three crucial steps to achieve optimal performance and efficiency. Firstly, the selection of the adsorbent material and particle size is based on factors like selectivity, capacity, and regenerative ability. Secondly, the superficial velocity of the gas flowing through the bed is determined, considering aspects such as mass transfer kinetics and pressure drop limitations. Finally, the bed length is chosen, considering factors such as desired efficiency, breakthrough time, and bed capacity. The model's results are compared with industrial data obtained from an oxygen PSA system to validate their accuracy. Deviations from the industrial values may arise due to differences in adsorbent usage, superficial velocity, packing density of the adsorbent, assumptions of adiabatic and ideal gas behavior, and unknown operating conditions. In the present case, the pressure drop across the bed is assumed to be zero. By applying the PSA design principles and evaluating the model's outputs, this study aims to contribute to the advancement of hydrogen purification for fuel cell vehicle applications.

ASSESSING ENVIRONMENTAL CARRYING CAPACITY FOR SUSTAINABLE DEVELOPMENT: A CASE STUDY OF NAGPUR CITY, INDIA

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1.11/2(P)

Keywords: *Remote sensing; ArcGIS; Carrying Capacity; Sustainable Development*

As the foundation for sustainable development, a resource as well as the environment's carrying capacity are becoming ever more important. One of the most significant methods for assessing regional environmental consequences is the assessment of environmental carrying capacity. The purpose of the current research is to quantify the environmental carrying capacity, which help to prevent overdevelopment & ensure that resources are managed sustainably. Using remote sensing data, the maps are prepared for Nagpur city, the third-largest city after Mumbai and Pune in Maharashtra state and the 13th largest urban agglomeration in India. Maps prepared are used to find out the initial values being used for determining the Environmental carrying capacity. The assimilative carrying capacity for the Nagpur region has been evaluated based on urban sprawl and emissions on water, land and air using steps starts from assessing and visualizing the pollution levels, land use, and natural resources, using remote sensing data. Estimated values are normalized using the Z-Score data smoothing approach that is based on the mean and standard deviation & to compare the different attributes as per their importance, Analytical Hierarchy Process (AHP) based approach to apply proper weightage. It has emerged that the percentage of vegetation covering 2020 is 9.57%, which is less than 33% with index of 3.66, substantially lower than desirable. This work would contribute through assisting policymakers make well-informed decisions concerning resource allocation, land use, and pollution management strategies.

SESSION-II

BIOPROCESSES, LCA AND SUSTAINABILITY

LIFE CYCLE/ENVIRONMENT IMPACT ASSESSMENT STUDIES WITH AN ENGINEERING PERSPECTIVE

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2.1/1 (I)

Life cycle assessment is a tool to quantitatively analyze the life cycle of products or processes within the context of environmental impact. It originated from the Earth Summit of United Nations Conference on Environmental and Development, Rio de Janeiro, Brazil, 3 – 14 June 1992 where one of the objective was to resolve the complex challenges of sustainable development. This lead to the formation of new technical committee by International Organization of Standardization ISO and Life Cycle Assessment – ISO 14040 is one such committee.

These LCA based developments demonstrate that there is No Single Method that is applicable and various methodologies needs to be developed. Sometimes these discrepancies cannot be explained. The LCIA methods are developed on the basis of Mid-Point and End - Point Methods for the LCIA. A number of methods for LCIA include the emissions of hazardous substances and extraction of natural resources. While developing these impact assessment categories, the emphasis in on two approaches:

- The method proposed on the baseline method for characterization method for the Handbook. Refer as Mid Point Approach
- The method advanced at Eco Indicator Method. This will be referred as the End Point Method

One of the Impact assessment method is ReCiPe – 2008 Method comprised of Mid Point and End Point approaches. The Mid Point method includes the 18 Mid Point Categories and 3 End Point Categories which include the damage to human health, damage to eco system and damage to resource depletion.

Hence we have been working on the several aspects of LCA which include Life cycle analysis of RO Systems, LCA of Sewage treatment plant, LCA of recycle lithium ion batteries and LCA of flue gases process. Our own study has discussed on the system boundary, choosing the input and output, carrying the LCA analysis via Umberto Nxt – LCA software and the impact assessment via ReCiPe method.

So the talk will discuss on the LCA as a tool, LCA as an Engineering perspective, as how the LCA inventory and impact methods were discussed and concluding with our own LCA studies on different processes and the analysis of impact assessment methods.

CONSERVATION AND CHARACTERIZATION OF NOSTOCALES CYANOBACTERIA FROM INDO- BURMA BIODIVERSITY HOTSPOT TOWARDS AGRICULTURAL AND BIOTECHNOLOGICAL POTENTIALS

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4.2/2(I)

Keywords: *Nostocales cyanobacteria, Indo-Burma biodiversity, PCR, molecular characterization*

The present study deals with Nostocales cyanobacteria of north eastern region of India which comprises the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The region is one of the 12 mega-biodiversity rich zones of the world and forms a distinctive part of the Indo-Burma biodiversity hotspots that ranks 8th among the 34 biodiversity hotspots of the world. Cyanobacteria as a whole and Nostocales forms in particular thrive exuberantly in the natural habitats of north eastern region of India which falls under the Himalayan region of Indo-Burma biodiversity hotspots. Despite its abundant occurrence in the north eastern region of India, few studies have been done so far as most of the previous studies were concentrated on state or region specific. Therefore, the present study was aimed to explore, isolate and identify by classical and modern PCR based molecular methods and characterization of the Nostocales cyanobacteria of the north eastern region of India. With the establishment of correct identification of the potent strains through molecular approaches, application as eco-friendly biofertilizer in various cultivable lands can help in increasing the productivity without polluting the soil environment which is a burning problem of the present scenario.

CHALLENGES AND PROSPECTS OF MICROBIOLOGY IN OIL AND GAS INDUSTRY

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2.3/3 (I)

Keywords: *Enhanced oil recovery, Nitrate injection, Oil reservoir, Souring and Polymer flooding*

The importance of fossil fuel for the development of the society and its environmental consequences are very well documented. Nevertheless renewables have got significant attention for energy production, but they are still in developing stage. Hence making the oil and gas production cleaner and greener is the recent focus of oil industry. Although microbiology has traditionally played only a minor role in fossil-fuel extraction, two novel technologies have potential to contribute immensely in the process.

Frist technology is to control souring in the oil fields. Souring is production of high levels of sulfide from the oil well due to reduction of sulfate to sulfide by Sulfate reducing bacteria (SRB). Nitrate injection can control reservoir souring by number of microbiological phenomena like bio competitive exclusion and sulfide oxidation etc. To overcome this problem in western Rajasthan oil fields, we have recently developed a green technology using a combination nitrate and Benzalkonium chloride (BAC). Our laboratory tests in oil field simulating bioreactors showed that co-injection of nitrate with BAC can completely control production of sulfide in the field and make produced water reusable for injection in the field.

Second, microbial enhanced oil recovery (MEOR) processes are becoming increasingly important for production of crude from marginal wells. Different enhanced oil recovery processes are widely applied nowadays such as polymer flooding to solve the problem of water channeling during secondary flooding. There are a number of polymers and copolymers that have been developed and used in field studies for improving oil recovery, but are sensitive to changes in the reservoir environment. Therefore in the present study changes in rheological properties of different polymer solutions and the potential of using natural polymers for altering wettability of reservoir rocks were evaluated under reservoir conditions. The intrinsic viscosity values of all the samples, except for a novel naturally derived polymer (~21 gm/dl at 65ºC) showed significant reduction in their viscosities when subjected under reservoir conditions. Contact angle measurements were performed on oil wet reservoir rocks (both carbonate and sandstone) treated with different polymers to evaluate wettability alteration behavior. The change in the contact angle was maximally noted in the case of novel natural polymer which was found to be 81º near to that of Triton-X-100, a surfactant (79º) taken as control. Qualitative wettability studies (floatation based and two phase separation tests) had also shown similar tendency of novel natural polymer solutions to alter wettability of oil wet surfaces towards water wet. FTIR of the oil wet powdered rock samples treated with polymer solutions were performed and the absorption spectra revealed reduction in peaks of methyl and methylene indicating altering wettability for both carbonate and sandstone rock samples. This changes indicates a stable nature of novel natural polymer, making it a more suitable to be used as a biopolymer for EOR polymer.

EXPERIMENTAL INVESTIGATION OF POST-COMBUSTION CO_2 CAPTURE BY AQUEOUS AMINE BLEND OF 2-(2-AMINOETHYLAMINO)ETHANOL AND 2-DIMETHYLAMINOETHANOL

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2.4/1(O)

Keywords: *2-(2-Aminoethylamino) ethanol; 2-Dimethylaminoethanol; Amine blend; CO_2 capture, Net-Zero; Equilibrium CO_2 loading.*

Due to the rapidly growing population across the globe, CO_2 emission is increasing drastically due to various human activities. Therefore, every country is aiming to get net-zero CO_2 emissions by implementing appropriate initiatives. In this chain, an amine mixture composed of 2-(2-Aminoethylamino)ethanol (AEEA) and 2-Dimethylaminoethanol was prepared to capture CO_2 by conducting CO_2 absorption and desorption investigation on the laboratory. CO_2 absorption operating parameters: Temperature (T): 298.15 - 333.15 K, CO_2 partial pressure (P_{CO2}): 10.13 - 25.33 kPa, AEEA mole fraction (m_{AEEA}: 0.05 - 0.20 and concentration of solution (C): 1 - 3 mol/L. At equilibrium scenario the loading of CO_2 was the major research finding of the CO_2 absorption experiments that was calculated with the help of a bubble column reactor, and the solution was titrated through Chittick apparatus. The highest equilibrium CO_2 loading 1.0464 $\frac{\text{mol of CO2}}{\text{mol amine}}$ was found at T = 298.15 K, P_{CO2} = 25.33 kPa, m_{AEEA} = 0.20, and C = 1 mol/L. An empirical modelling was designed to correctly prove experimental findings, and fabulous % AARD of 3.15 was achieved. The CO_2 desorption experiments performed at 393.15 K temperature and 25.33 kPa partial pressure. Cyclic capacity of the aqueous amine blend showed 61 % lower cyclic capacity than 30 wt% conventional monoethanolamine. In this sequence, the heat of absorption of the chosen blend by determined by using theoretical correlation, and it was calculated to be -72.24 kJ/mol. Based on experimental investigations, the selected amine blend outperformed in terms of CO_2 capture.

APPLICATION OF ENZYMES IN TEXTILE WET PROCESSING INDUSTRY FOR ITS SUSTAINABLE DEVELOPMENT

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2.5/2(O)

Keywords: *Enzymes; Bio-retting; Bio-desizing; Bio-scouring; Bio-bleaching; Bio-polishing*

Environmental concerns related to textile industry have attained attention from all around the world as it is generating large amounts of environmental pollution and effluents having various toxic agents and chemicals. With the increasing awareness of environmental pollution and the extensive consideration of mankind health and chemical processes used in textile industries are being replaced by bio-processing. Bio-processing of textiles has become a preferred choice to overcome the effects of chemical treatment because of being less harmful to environment as well as textiles. Usages of enzymes in textile industry can be the best possible example of bio-processing. Use of enzymatic treatments in textile industries is very promising approach as they are eco-friendly, produce high-quality products, and lead to the reduction of energy, water, and time. This review highlights about the various bio-processing techniques used in the textile industry such as bio-retting, bio-desizing, bio-scouring, bio-bleaching, bio-polishing, bio-stoning, degumming of silk, shrink-proofing for wool and many more.

BIO-STONING- APPLICATION OF CELLULASE ENZYME TO ENHANCE THE APPEARANCE OF DENIM GARMENT

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2.6/3(O)

Keywords: *Bio-stoning; Cellulase enzyme; Denim fabric; Pumice-stone; Stone-washing; Sustainability*

Conventional textile wet processing is characterized by a high concentration of chemicals and temperatures, which can have considerable negative effects on the environment and energy consumption. To address the environmental concerns, some textile industry is shifting towards biological methods to replace the use of conventional wet processing. The stonewash look on denim is achieved by removing the indigo dye from surface by using pumice stone in the washing drum to abrade the garment. Denim is heavy grade cotton. In this, dye is mainly adsorbed on the surface of the fibre. This traditional stone-washed finish on cellulosic fabric virtually damaged the machinery and caused pollution in waste water. Enzymes are a sustainable alternative to the harsh toxic chemicals in the textile industry. Cellulase enzyme has been introduced in the finishing of denim and other cellulosic garments to replace pumice stones and to achieve a washed-out appearance similar to that provided by pumice stones, the process is called bio-stoning. Both water consumption and waste generation during denim washing is minimized by the use of enzyme. As enzymes operate in moderate conditions of temperature and pH, energy consumption is also reduced slightly. Bio-stoning with enzyme is eco-friendly and well choice for imparting softness, smoothness, and various types of faded effect to denim fabrics. It is a best way to gives value addition to final products in the textile industry.

INFLUENCE OF DIFFERENT IMMOBILISATION SUPPORT MATERIAL ON THE ENZYMATIC SYNTHESIS OF3,4-DIHYDROXYPHENYLACETIC ACID ESTERS

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2.7/4(O)

Keywords: *Lipophilisation; 3,4-dihydroxyphenylacetic acid esters; lipase; immobilisation supports*

Lipophilised phenolic acids offer excellent antioxidative properties along with improved solubility in lipid systems. n-3 Polyunsaturated fatty acid (PUFA) rich fish oils which are highly susceptible to oxidation can benefit from the use of such modified amphiphilic phenolic antioxidants. The current study aims to synthesize such long-chain acyl esters of 3,4-dihydroxyphenylacetic acid using lipases, immobilized on different support materials. Ester synthesis using 4-12 carbon chain alcohols was carried out in solvent-based and solvent-free enzymatic methods. Solvent-free conditions were successful for the synthesis of butyl, hexyl, and octyl esters while decyl and dodecyl esters were not obtained in good yields. The effect of the immobilization technique and support material used exhibits significant differences in the esterification rates as lipase attached through interfacial activation was not able to yield esters with expected productivity.

OPTIMIZATION OF CR (VI) REMOVAL EFFICIENCY OF WASTE TIRE ADSORBENT FROM AQUEOUS SOLUTION BY RESPONSE SURFACE METHODOLOGY

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2.8/5(O)

Keywords: *RSM, WTA, SEM, FTIR, ANOVA*

The aim of the present study is to optimize the adsorption parameters with the help of response surface methodology for increasing the Cr (VI) removal efficiency of Waste Tire Absorbent (WAT). The effect of four independent adsorption parameter such as Adsorbent dose (4–8g/l), Cr (VI) concentration (60–100 mg/l), duration (60–300 min), and temperature (30–50 ^{o}C), was investigated. Second-order polynomial regression model for fitting experimental data was suggested by ANOVA, and the coefficient of determination (R^2 = 0.979) of the suggested model showed a good correlation between the predicted and experimental responses. The optimal conditions for removing Cr (VI) were found to be 5.4 g of adsorbed dose, 60.09 mg/l of Cr (VI) concentration, 30 °C temperature, and 140.15 minutes of adsorption time. The maximum removal efficiency of Cr (VI) using WTA was 62.22% at the optimum condition. The surface morphology, function group and element proportion of WTA were obtained using SEM, FTIR and XRF.

LIFE CYCLE ASSESSMENT AND TECHNO-ECONOMIC ANALYSIS OF A BROWN BIOREFINERY

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2.9/6(O)

Keywords: *Biorefinery; Life Cycle Assessment; Techno-economic Analysis; Sustainability*

The agricultural waste generation stands at a staggering 500 million tonnes per annum in India. Dry lignocellulosic biomass (C/N ratio > 50), referred to as brown waste in this study, is typically subjected to open air burning thereby contributing significantly towards environmental pollution. Statistics indicate that rice and wheat straw together constitute up to 60% of the total biomass burnt annually. Numerous studies indicate the potential of biomass wastes for creation of commercially viable product based models. In this study, the authors have deliberated on the environmental impact assessment and techno-economic feasibility of indigenously designed brown waste biorefinery models that work on the sequential valorization of brown post-harvest agricultural residue. The study discusses the design of the process from a life cycle perspective and undertakes a detailed inventory of the process to track the material as well as energy flows in and out of the system. A system with rice straw is chosen as a model biomass waste and its utilization is deliberated from a biorefinery standpoint. Solid-state fermentation (SSF) process is employed for the production of a novel enzymatic cocktail, which then finds its application in increasing the efficiency of composting process. Utilization of solid residue post enzyme extraction is also covered in the scope of the study and process economics are diligently examined. It is observed that the entire process produces an overall GWP of 96 kg CO_2 equivalents. Along with proposals to further make the process greener, the study also emphasizes on the commercial feasibility of the entire system by performing a thorough techno-economic assessment. The study presents a holistic model of a brown biorefinery case study with scope of the enumeration of generalized guidelines for its expansion into more complex systems.

UNVEILING THE POTENTIAL OF BG11 MEDIUM: A BBD-BASED APPROACH FOR SYNECHOCOCCUS SPP. EPS, BIOMASS AND PIGMENT (CHLOROPHYLL-A, CHLOROPHYLL-B, CAROTENOIDS) ENHANCEMENT

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2.10/1(P)

Synechococcus spp. are known to produce exopolysaccharides (EPS), and this study focused on optimizing the conditions for EPS production using response surface methodology (RSM). Specifically, the researchers aimed to enhance EPS production by optimizing the composition of the BG-11 medium, a common growth medium for cyanobacteria.

To achieve this, various factors influencing EPS production were considered. The optimized conditions included a log phase algal culture, an inoculum size of 10%, and an incubation temperature of 28±5°C. These parameters were determined through a combination of RSM and single-factor experiments. The results of the study were quite promising. Under the optimized conditions, the researchers achieved a maximum EPS yield of approximately 36.91 µg/mL, a biomass yield of 520.71 µg/mL, and a total pigment yield of 2.10 µg/mL. These findings suggest that the EPS produced by *Synechococcus spp.* holds significant potential for industrial applications.

In summary, this research successfully optimized the production of exopolysaccharides by *Synechococcus spp.* by fine-tuning the composition of the BG-11 medium and adjusting culture conditions. The impressive yields obtained under these optimized conditions make *Synechococcus spp.* exopolysaccharides a promising candidate for various industrial applications.

ALGAE-BASED BIO-OIL PRODUCTION: A BIBLIOMETRIC ANALYSIS

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2.11/2(P)

Keywords. *Microalgae, Bio oil, Bibliometric analysis, Biomass*

The pressing global energy challenges have spurred extensive research into biofuel production. There has been an exponential increase in research focussed on exploring sources, production pattern, harvesting and fuel efficiency to generate a competitive alternative to conventional fuels. This necessitates addressing cost-related obstacles and devising viable industrial-scale solutions. To analyse the scientific output in this area bibliometric indicators, leveraging tools like VOSviewer 1.6.19 and Biblioshiny for network visualization and analysis were used. Drawing on the Scopus database spanning from 2004 to 2023, a meticulous keyword strategy effectively segregated relevant papers. With a total of 809 documents, the research field exhibits an annual publication growth rate of 15.9%. Notably, 106 articles were published in 2022 alone. Employing comprehensive bibliometric analysis, this study illuminates evolving scientometrictrends wherein research is focussed on research trend, impact for publication annually, Distribution of publication by countries, productive institutes, author co-author relationship, influential journals areas in ascending order of significance. The objective of the work is to furnish researchers with prospective unevaluated research themes, cohesively evaluated high-calibre scientific literature, and appropriate journals to disseminate algae-based bio-oil research.

SESSION-III

ROLE OF MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE FUTURE

ML BASED IDENTIFICATION OF DIAGNOSTIC MARKERS FOR COLORECTAL CANCER FROM RNA SEQ DATA

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3.1/1(I)

Colorectal cancer (CRC) is a common cause of cancer-related deaths worldwide. Availability of gene expression data from RNA seq experiments provides an excellent chance to identify most relevant genes responsible for a disease. RNA seq data from normal and disease samples can be compared to infer the correlation. Identifying statistically significant differential expressions from thousands of genes and further classifying the data on the basis of markers is the objective of many studies. Additionally, with the help of machine learning methods a trained model can classify the disease and normal conditions by using selected genes as markers. This approach is very helpful in identification of novel diagnostic markers from RNA seq data, especially in those cases where multiple genes may be involved in development and progression of the disease.

MATHEMATICAL ANALYSIS OF SUSTAINABLE GROWTH BY INNOVATION AND ITS ADOPTABILITY

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3.2/2(I)

Keywords: *Innovation; Growth Rate; Sustainability; Resources Consumption; Desirability; Adoptability.*

Innovation is a driving factor for growth of the company as well as competitiveness in the market. To create business value and sustainability in growth, the innovation need adoptability within the company and acceptance to the customer. Only business activity to received growth by innovation is not sufficient, it need to be backed by resource charging. The present research paper made a mathematical modelling of time duration to receive double-digit growth rate and its correlation with finishing of available resources. The desirability of company stakeholders, marketing strategies, customer requirements and technology adoptability are major factor which defined sustainable growth by technological innovation. The paper mentioned the mathematical equation for innovation index using innovation adoption, time delay, customer requirement and technology absorption within the company and influence on the customer.

FAULT DIAGNOSIS OF HELICAL GEARBOX USING RANDOM FOREST AND ARTIFICIAL NEURAL NETWORKS

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3.3/3(I)

Keywords - *Fault Diagnosis, Random forest, Artificial Neural Networks, Helical Gearbox.*

Fault diagnosis of rotating machinery systems is essential for industries due to the need for increased productivity along with improved machine conditions during operation. Several artificial intelligence techniques have been used in the literature for the fault diagnosis of gear systems based on features extracted from vibration signals. In the present work, the fault diagnosis of the Helical gearbox using Random Forest (RF) and Artificial Neural Networks (ANN) is proposed. The dataset for the fault diagnosis consists of vibration signals from the helical gearbox comprising healthy gears and gears with chipped and worn teeth. These vibration signals are used to determine the several condition parameters in the time domain. These parameters are further utilised by RF and ANN classifiers for the effective fault diagnosis of the helical gearbox. The performance measures are compared for both classifiers, and results show that the RF classifier performs better and more accurately than the ANN classifier for diagnosing the helical gearbox.

MULTI-OBJECTIVE OPTIMIZATION OF WIRELESS NETWORK PARAMETERS USING FUZZY LOGIC.

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3.4/4(I)

Keywords: *Wireless Networks, Multi-objective Optimization, Fuzzy Logic, Resource Allocation, Parameter Tuning.*

Wireless networks are subject to multiple conflicting objectives, including maximizing throughput, minimizing delay, and ensuring energy efficiency. Achieving an optimal balance among these objectives presents a challenge due to the uncertain and imprecise nature of network parameters. Within the scope of this study, we present a unique strategy for the multi-objective optimization of the parameters of wireless networks by utilizing fuzzy logic. The approach leverages fuzzy sets and linguistic variables to handle uncertainties and vagueness in network conditions. Fuzzy inference rules are defined to make dynamic decisions on resource allocation and parameter tuning. Simulations are used to test the performance of the suggested methodology, and the results are compared to the results of more standard optimization approaches. The results demonstrate that the fuzzy logic-based approach outperforms traditional techniques in achieving a more balanced and robust optimization of wireless network parameters.

DATA BASED DIAGNOSIS OF SOFC PERFORMANCE USING MACHINE LEARNING APPROACH

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3.5/1(O)

Keywords: *SOFC, Machine Learning, Regression, Fault Diagnosis, Learning Curve*

Solid oxide fuel cells (SOFCs) have become a promising technology for the conversion of clean and effective energy. Due to the intricacy of the electrochemical processes and the existence of numerous failure scenarios, diagnosing SOFCs is still a difficult operation. For SOFCs to function at their best and last as long as possible, diagnosis is essential. The use of machine learning (ML) approaches for data-based diagnosis of SOFCs has gained popularity in recent years. In addition, ML-based predictive algorithms have been created to forecast the remaining useful life of SOFC components, allowing proactive maintenance planning and raising system reliability. The dependability, effectiveness, and maintenance of SOFC systems can all be enhanced using data-based diagnostics of SOFCs utilising machine learning. In this work an attempt has been made to build a regressor which predicts the operating voltage of the SOFCs. The final voltage is predicted by using various regressors including ensemble learning algorithms. The best performing algorithm will be used to predict the voltage of SOFCs. The same is validated against experimental results to compare the performance of ML model.

INFLUENCE OF DEEP REINFORCEMENT LEARNING TECHNIQUES IN VEHICULAR NETWORKS

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3.6/2(O)

Keywords: *Reinforcement learning, deep reinforcement learning, Intelligent, Vehicular networks, V2V communication, transportation systems.*

Vehicle networks have become a prominent research topic because of their distinctive characteristics and uses, such as consistency, effective traffic control, road security, and infotainment. The network entities must make judgments on how to exploit network operation under ambiguous conditions. A challenging environment is produced by the expanding usage of wireless technology in a highly mobile environment. To improve communication dependability in this environment, intelligent technologies must be used to solve the routing issue and construct a more durable communication system. An excellent solution to this problem is reinforcement learning (RL). You can achieve your goal by using Re-enforcement Learning(RL), which can effectively handle challenges with decision-making. Yet, the state and action spaces in large-scale wireless networks are huge and complex. As a result, it's possible that RL won't be able to decide on the best course of action in time. Deep Reinforcement Learning (DRL), a hybrid of RL andDL, was created as a solution to this issue. We begin by introducing vehicular networks and giving a brief overview of the concepts of RL and DRL in this analysis. Then, to address fresh issues in 6G vehicle networks, we discuss RL and, in particular, DRL approaches. Finally, we list a few concerns that still need to be studied further

ANALYZING THE REAL TIME IMPACT OF USING IOT IN SMART HOME

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3.7/3(O)

Keywords: *Smart home devices, Energy management, Security, Sensors, Cloud computing, Smart appliances, Voice assistants.*

Our homes are becoming smarter and more productive through Internet connectivity, which is changing how we interact with our environment and conserve electricity. We'll discuss the benefits of using the Internet in smart homes and ways to improve security and energy efficiency, and look at the challenges of integrating IoT devices and protocols. Smart homes use appliances and devices connected via the Internet to automate and enhance household tasks. The privateness and protection dangers of the usage of IoT in smart homes are discussed, as well as methods to mitigate them. Benefits, challenges, and applications of this era are discussed. Integrating IoT into smart homes has the potential to transform people's lifestyles and make their homes more comfortable, convenient and sustainable.

PREDICTION OF PM2.5 LEVELS USING ANN AND MLR MACHINE LEARNING MODELS FOR LUCKNOW IN INDIA

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3.8/4(O)

Keywords: *Air quality index, Particulate matter, $PM_{2.5}$, prediction, Artificial Neural Network, MultiLinear Regression, Air pollutants.*

Over the past few decades, air pollution has been a major issue throughout the world due to increased industrial economic activities, and it is likely to remain for the decades to come in particularly for the countries like India and China. Therefore, it is essential to control the air pollution to save human lives with a balance of industrial activities Therefore in current work the major focus is to to quantify the impact of airborne pollutants on individuals in metropolitan cities, which shall predict the air quality index (AQI). The air quality index (AQI) is a measure of air quality that characterizes the quality of the air at a fixed location based on the overall impact of levels of significant air pollutants. In this study, the Multiple Linear Regression (MLR) and Artificial Neural Network (ANN) models are created to predict the Air Quality Index in the city of Lucknow, Uttar Pradesh, India. The main objective is to compare and contrast the progress time, error operations, correlation factor, number of epochs, and predictive accuracy of three different neural network functions: Tansig-Tansig, Tansig-Purelin, and Purelin-Purelin, as well as the adaptation functions learngd and learngdm. Neural network training functions on the air pollution data set allow officials to estimate AQI in metropolitan areas through strategic decisions. The data from the central public school area monitoring station from 2017 to 2021 is used for the analysis using MATLAB. Six pollutants (PM2.5, SO2,NOx, CO, O3, and NH3) are examined in order to determine the AQI. Statistical analysis is performed on both ANNand MLR models. ANN is found to be capturing the air pollution behavior reasonably accurate for AQI forecasting.

ASSESSMENT OF POSITIVE AND NEGATIVE IMPACTS OF ARTIFICIAL INTELLIGENCE (AI) ON SUSTAINABLE DEVELOPMENT GOALS (SDGS)

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3.9/5(O)

Keywords: *Sustainable Development, Artificial Intelligence, Sustainable Development Goals, 17 SDGs*

The global community is approaching a new era known as Era of Sustainable Development, during this time the most difficult issues, such as continuing extreme hunger, loneliness, income disparity, poor governance, and degradation of the environment must be addressed via cooperation and contribution from all the countries of the world. A frame of reference for analysing sustainable development through the four pillars of economic development, social development, environmental protection, and good governance was suggested at the UN World Summit on Sustainable Development (WSSD) in Johannesburg in 2002.These four elements, while being separate and mutually beneficial components, are all crucial to global sustainable development. In all facets of sustainable development, AI may have an impact on the 17 goals and 169 targets of the Sustainable Development Goals (SDGs), which all 191 UN Member States have committed to strive to fulfill by the year 2030.But because AI is such a new, dynamic, and quickly developing phenomena, its effects on the job of promoting the SDGs are only now becoming apparent and have not yet been well researched. For environmental planning, decision making, and management to prevent additional clearance, AI approaches can help identify trends in desertification over wide geographic areas. They can also assist in reversing trends by identifying the key drivers. Numerous stakeholders from different countries, cultures, and industrial sectors will be involved in the effort to achieve sustainable development through AI, which has a wide range of applications that have the potential to transform it. The objectives of this paper are (1) to categorise the Sustainable Development Goals (SDGs) into four categories, viz. social, economic, environmental and good governance, (2) to identify and elaborate the elements of AI which can be integrated into 17 SDGs, and (3) to examine the positive and negative impacts of AI on 17 SDGs.

EFFECT OF OPERATING PARAMETERS ON CONDITION MONITORING OF ROTOR-BEARING SYSTEM USING DEEP LEARNING

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3.10/1(P)

Keywords: *Condition monitoring, Deep learning, Convolution neural networks, Signal processing.*

Bearings are an integral part of rotary machines. Bearing defects can lead to increased friction, heat generation, and vibration and may also result in rotor system failure. Condition monitoring of bearings can help identify these defects early and take suitable actions. Vibrations in rotor-bearing systems are commonly used to form the basis for monitoring bearing conditions. Several artificial intelligence techniques have been used in the literature for the condition monitoring of bearings based on features extracted from vibration signals. However, variations in the operating parameters can affect the accuracy of condition monitoring. Therefore, in the present work, a convolutional neural networks-based deep learning model has been used to diagnose the effect of operating parameters on the condition monitoring of bearing. An experimental test rig is used to obtain the vibration signals for healthy bearings and bearings consisting of inner-race, outer-race and ball faults, along with load and rotor speed variations. Short-time Fourier transform and Continuous wavelet transform-based signal processing are used to generate the image representations of the vibration signals. These images are used as inputs to the deep learning model to diagnose the bearing fault. The results show the excellent performance of the applied deep learning model in accurately diagnosing the bearing faults, and the satisfactory performance is maintained even with variations in operating parameters. Keywords: Condition monitoring, Deep learning, Convolution neural networks, Signal processing.

WHATSAPP CHAT EVALUATOR: CHAT INSIGHTFUL ANALYSIS

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3.11/2(P)

Keywords- *WhatsApp chat data, Pandas, Python, NumPy, Seaborn, matplotlib, Streamlit, NLP.*

Abstract - WhatsApp is widely used application for general communication in today's world, and the WhatsApp Chat Analyzer is a web-based application deployed on Heroku that provides analysis of WhatsApp groups. The application uses a combination of various Python libraries, including matplotlib, Streamlit, seaborn, re, pandas, and NLP concepts to analyze and visualize WhatsApp chats. By importing the chat file from the user, the analyzer can generate visualizations that provide an in-depth analysis of the chat data. The advantage of this tool is that it provides an easy-to-use and accessible solution for users to gain insights into their WhatsApp group conversations without requiring extensive technical knowledge.

NUMERICAL INVESTIGATION OF SOLAR AIR HEATER WITH THE INFLUENCE OF DIFFERENT ROUNDED CORNERS AND ARTIFICIAL ROUGHNESS IN TRIANGULAR DUCT

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3.12/3(P)

Keywords: *Renewable Energy, Solar air heater, Artificial roughness, Triangular duct, Radius of Curvature.*

A new advancement in solar air heaters is made by introducing artificial roughness on the absorber plate using different dimple intrusions and protrusions and by converting the duct's corners to rounded structures into various models with the aid of computational fluid dynamics (CFD). It is investigated with optimized (X'/e=Z'/e=20) with a constant radius of curvature of 0.4h. A traditional triangular and modified duct with dimple incursions and protrusions are analyzed. It is observed that at maximum Re of 17500, Nu_{avg} is increased by 49.2% compared with conventional duct. By adjusting X/e from 7 to 15, the frictional penalty is raised by 52.12% at maximum Re of 17500, respectively. The velocity of the flowing air is what causes the more significant frictional penalty increments at lower Re. Additionally, the Nusselt number value significantly rises when alternate dimple intrusions and protrusions are used to create fake roughness, demonstrating the strength of our novel invention.

PROPAGATION OF SHOCK WAVES IN A SELF-GRAVITATING NON-IDEAL GAS INFLUENCED BY MAGNETIC FIELD AND MONOCHROMATIC RADIATION VIA LIE GROUP THEORY TECHNIQUES

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3.13/4(P)

Keywords: *Shock wave, Lie group theoretic method, Monochromatic radiation, Self-gravitating gas, Magnetic field, Non-ideal gas.*

The propagation of shock wave in non-ideal self-gravitating gas influenced by magnetic field and monochromatic radiation effect have been investigated utilizing the Lie group theory techniques. The gas has been assumed at rest, with constant density and varying magnetic fields in front of the shock surface. For this problem, we obtained analytical and numerical solutions for the class of infinitesimal generators. The impacts of varying the ambient magnetic field, gravitational parameter, non-idealness parameter, and adiabatic exponent in the flow field behind the shock and moving shock with an exponential shock have been studied in detail. The software package “Mathematica" has been used for numerical computation and obtain the graphs of the reduced flow variables. The whole energy is not constant, and varies with some power of the shock radius in the flow area behind the shock wave.

FIR REGISTRATION AND POLICE VERIFICATION USING BLOCKCHAIN

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3.14/5(P)

Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. Every transaction is encrypted, timestamped, and validated by authorized database user using consensus techniques called minors. Blockchain technology provides enhanced security, integrity, greater transparency which makes Blockchain as a trending technology Blockchain is already used in many of the fields like Supply Chain Management, Money Transfer, Healthcare, Personal Identity Security, etc. one of those applications is in FIR registrations, To submit a First Information Report (FIR), residents typically need to go to a local police station. But he/she may not always be able to go to the police station and also there is a possibility that investigations could be affected behind the scenes, and that the evidence, forensic analyses, and investigative case files could be tampered or damaged and also these centralized systems are vulnerable to fraud and cyberattacks. In present time, there are several FIR registration systems are available using Blockchain, but police verification is equally important, which can also be achievable by blockchains, therefore, we propose a system that enables participation and provision of essential services, such as filing FIR and verifying identity information of citizens from law enforcement agencies. The proposed work will enable the police department to conduct police verification and investigations more quickly and securely also the recordkeeping for police department will be immutable and tamper free.

A STUDY AND IMPLEMENTATION OF YOLO FOR OBJECT DETECTION

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3.15/6(P)

YOLO is a method of object detection. It proposed that aims to track social distancing among people by calculating the physical distance among every pair of pedestrians. Based on this calculated distance, the model classifies them as violator that in turn helps to mitigate the impact of the pandemic in the area of interest. The proposed model uses a deep learning object detection algorithm, YOLOv3 that helps in detecting the pedestrians and the detection results helps to evaluate the distance between the pedestrians. The distance between any pair of pedestrians in the display is estimated by using Euclidean distance and the pair which is non-compliant with the set parameters is indicated with a red frame and the pair who is on the verge of violating the parameters of social distancing is indicated with a yellow frame and the pair which is well within the set parameters of the same is indicated with a green frame. The proposed model was corroborated on a pre-recorded video. The result exhibits that the model can be used for monitoring whether the social distancing is being followed or not. The model can be further developed for real time monitoring of the pedestrians by providing camera URL.

SESSION-IV

WATER, AIR, SOIL AND GEOSPATIAL TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT

CONVERSION OF FRUIT AND VEGETABLE WASTE IN TO BIOGAS

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4.1/1(I)

Keywords: *Anaerobic digestion; Biogas; Fruit and vegetable waste; Co-digestion*

Fruits and vegetables are cultivated and consumed on a wide scale worldwide, with India ranking as the second-largest producer of these commodities. A significant portion of fruits and vegetables goes to waste during various stages, including harvesting, transportation, storage, marketing, and processing. This waste accounts for roughly 40% of the total generation of municipal solid waste (MSW). The disposal of fruit and vegetable waste (FVW) on the outskirts of cities places additional strain on sanitary landfills and has detrimental environmental consequences. Utilizing landfills is not a practical option due to land scarcity and the numerous associated disadvantages, including the emission of greenhouse gases (GHG) and groundwater contamination. Hence, this method is strongly discouraged, emphasizing the need to explore a viable solution capable of addressing the present challenges related to waste management and the energy crisis. Anaerobic digestion (AD) seems to be a promising and eco-friendly technology for decreasing waste volume and recovering resources in the form of methane and digestate. The vast quantity of organic waste generated worldwide has significant potential for producing biogas, with an estimated annual capacity of up to 4,000 million cubic meters, equivalent to an energy potential of 86,000 terajoules per year. Bio-methane production can be achieved either in a single digester or through a two-digester configuration arranged in series, with one dedicated to hydrolysis and the second for bio-methanation. Enhancing methane production can be achieved by incorporating food waste into FVW. This presentation focuses on biogas production from FVW and the importance of maintaining optimal parameters to boost biogas generation.

DELINEATING THE ULTRAFAST-TO-SLOW PHOTODYNAMICS OF THE DEEP BLUE AND HIGHLY EMISSIVE ZNS-PASSIVATED INP QDS

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4.2/2(I)

Keywords: *InP QDs, Surface passivation, Emission enhancement, Charge carriers, Ultrafast dynamics, Deep trap states*

InP-based quantum dots (QDs) are an environment-friendly alternative to their heavy metal-ion-based counterparts. Herein we report a simple procedure for synthesizing blue emissive InP QDs using oleic acid and oleylamine as surface ligands, yielding ultrasmall QDs with average sizes of 1.74 and 1.81 nm, respectively. Consecutive thin coating with ZnS increased the size of these QDs to 4.11 and 4.15 nm, respectively, alongside a significant enhancement of their emission intensities centered at ~410 nm and ~430 nm, respectively. Pure phase synthesis of these deep-blue emissive QDs is confirmed by powder X-ray diffraction (PXRD), X-ray photoelectron spectroscopy (XPS), and transmission electron microscopy (TEM). Armed with femtosecond to millisecond time-resolved spectroscopic techniques, we decipher the energy pathways, reflecting the effect of successive ZnS passivation on the charge carrier (electrons and holes) dynamics in the deep-blue emissive InP, InP/ZnS, and InP/ZnS/ZnS QDs. Successive coating of the InP QDs increases the intraband relaxation times from 200 to 700 fs and the lifetime of the hot electrons from 2 to 8 ps. The lifetime of the cold holes also increases from 1 to 4 ps, and remarkably, the Auger recombination escalates from 15 to 165 ps. The coating also drastically decreases the quenching by the molecular oxygen of the trapped charge carriers at the surfaces of the QDs. Our results provide clues to push further the emission of InP QDs into more energetically spectral regions and to increase the fluorescence quantum yield, targeting the construction of efficient UV-emissive light-emitting devices (LEDs).

Reference:

S. Rakshit, B. Cohen, M. Gutiérrez, A. O El-Ballouli, A. Douhal, *ACS Appl. Mater. Interfaces***2023**, 15 (2), 3099–3111.

EMERGING TECHNOLOGIES TOWARDSDEVELOPMENT OF SUSTAINABLE DIATOM BIOREFINERY

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4.3/3(I)

Keywords: *Algae; Biorefinery; Bioremediation; Diatoms; Value-added products.*

Diatoms with their complex cellular architecture, serve as a source of diverse biotechnological applications. These microalgae are common in freshwater and marine habitats and are essential for primary production and carbon sequestration. They are excellent at utilizing nutrients, providing a sustainable method of treating wastewater concomitantly producing biomass rich in beneficial substances like vitamins, carotenoids, polysaccharides, lipids, omega-3 fatty acids, pigments, and novel bioactive molecules. Thediatom biorefinery holds immense potential for multifaceted applications, such as bioremediation, aquaculture, value-added products, and other applications. Still the major challenge is cultivation and low yield. We have addressed this challenge through sustainable mixotrophic cultivation in two marine diatoms *C. gracilis*and *T. weissflogii.*The results indicate that the high cell density in both the diatoms tested, while carotenoid, chrysolaminarin, and phenol content were not significantly enhanced. But the total lipid percentage increased by 69 % in *C. gracilis* and 98 % in *T. weissflogii*. Further, lipid profiles showed an enhancement in the docosahexaenoic acid (DHA) production of the treated setups of both species (54% in *C. gracilis* and 29% in *T. weissflogii*). Thus, the results indicate that the mixotrophic cultivation of diatoms with sustainable sources enhance the growth and accumulation of the lipid yield. Exploring a more sustainable strategy for resolving challenges associated with diatom yield can aid in facilitating their enhanced industrial applications.

SOLVENT IMPREGNATED RESIN: A POTENTIAL MATERIAL FOR THE SEPARATION OF POLLUTANTS

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4.4/4(I)

Keywords: *Resin; Solvent; Impregnation; Pollutants*

Treatment of different pollutants containing wastewater by the resin impregnated with different solvent is one of the interesting areas. The impregnated resin known as solvent impregnated resin (SIR) finds a wider application in removing several categories of dyes, phenolic compounds, metal ions, carboxylic acids, etc. In this method, pollutants are separated by the process involving adsorption, solvent extraction, and ion exchange. Here, different Sirs were prepared and characterized for the separation of textile dyes and phenolic compounds. Impregnation of solvent (like Aliquat-336, D2EHPA, TOPO, and Cyphos IL-101) in micro-porous resins (like Amberlite XAD-2,Amberlite XAD-4, and Amberlite XAD-7) was done by the wet impregnation method in different loading ratios. The impregnation method follows washing (pre-treatment of original resin), filtration, drying, impregnation, and then further drying of SIR. The evaluation of properties was done by FTIR, FE-SEM, EDS, point of zero charge, etc.

A REVIEW ON XFEM ANALYSIS OF CRACKS IN PIEZOELECTRIC MATERIAL

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4.5/1(O)

Keywords: *Piezoelectric material; Semipermeable BC; Enrichment functions; XFEM*

In the recent trends, development of smart systems have used smart materials like piezoelectric material as sensors, actuators and transducers in the various fields of science and engineering. However, fracture in such materials degrades the performance of the system. Hence analysis of fracture in piezoelectric material is an emerging field for research. But, piezoelectric fracture mechanics is different from elastic fracture mechanics due to the electro-mechanical combine effect. Therefore, a specific and efficient approach is needed to evaluate fracture quantities accurately. The extended finite element method (XFEM) , which has been used to study the crack behavior of piezoelectric materials during the past fifteen years, is now the most widely used computational technique for precisely accessing the fracture parameters. This article presents a survey and current advancement of the XFEM in piezoelectric structures with respect to different loading conditions and crack face boundary conditions (BCs). The main focus of this study is to highlight the issues and improvements in XFEM implementation of the realistic modeling of crack face conditions also known as semipermeable BCs in piezoelectric materials.

DEVELOPMENT AND TESTING OF CARBON-BASED NANOFLUID FOR SOLAR ABSORPTION APPLICATIONS

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4.6/2(O)

Keywords: *nanofluid; biomass; coffee husk; absorption; photothermal conversion; biochar*

Managing agricultural waste effectively is a serious concern, particularly in agrarian economies where poor disposal practices may cause environmental and public health problems. A large amount of coffee husk is derived during the processing of coffee fruit. Pyrolysis of coffee husk is one of the effective methods of valorisation of this agro-residue. This paper discusses the synthesis of a carbon-based nanofluid generated from coffee husk char. The synthesis was done by utilising the left-over solid residue during coffee husk pyrolysis after gaseous product extraction. The biochar prepared at 500 ℃ was soaked in deionised water, followed by sonication, filtration and centrifugation for the synthesis of carbon-based nanofluid. The photothermal ability of the synthesised nanofluid was studied at different solar irradiances (600, 700, 800 900, and 1000 W/m^2), and a maximum temperature difference of 5.9 ℃ was observed at 900 W/m^2. The synthesised fluid was found to have a thermal conductivity of 0.87 W/mK and a pH of 10.26. The morphology and average size of particles in the carbon-based nanofluid were examined using HRTEM, and a zeta potential value of -59.4 mV demonstrated its stability. Energy dispersive X-ray spectroscopy revealed the primary elements as carbon, oxygen, nitrogen, and potassium in the composition. The optical characteristics of the synthesised fluid are determined from the UV-Vis absorption spectroscopy.

PIEZOELECTRIC TILES FOR SUSTAINABLE ENERGY HARVESTING: A REVIEW

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4.7/1(P)

Keywords: *Piezoelectric energy harvesting; Resonance; Internet of things; Self-sustaining devices; Sustainable development goals; affordable and clean energy; Review.*

The exponential growth in energy demand and its transition towards sustainable energy sources have driven the exploration of innovative technologies. Among these, piezoelectric energy harvesting has come to be recognized as a game-changing solution with the potential to dramatically advance applications for sustainable energy. This paper presents a comprehensive and in-depth review of the state-of-the-art developments in piezoelectric energy harvesting, focusing on its applicability within the realm of sustainable energy. The review starts with the brief introduction of energy harvesting, that includes the environmental implications of piezoelectric energy harvesting, emphasizing its compatibility with the United Nations Sustainable Development Goals (UNSDGs), especially GOAL 7. The paper further explains of fundamental of the piezoelectric effect and its modes of operation. It subsequently delves into the design and mechanism of piezoelectric tiles, highlighting the influence of different types of design on energy conversion efficiency. Furthermore, this paper explores the feasibility aspects of piezoelectric tiles, considers the challenges that piezoelectric energy harvesting tiles face, including competition from alternative technologies and the solutions of piezoelectric energy harvesting. In conclusion, this review underscores the importance of piezoelectric energy harvesting as a transformative approach towards sustainable energy. It encapsulates the technology's evolution in tiles-based energy harvesting, challenges, and its alignment with the broader agenda of sustainable development. As the world seeks resilient and ecologically sensitive energy solutions, piezoelectric energy harvesting emerges as a promising avenue driving progress towards a sustainable energy future.

CCUS TECHNOLOGIES AND POLICIES IN INDIA: ROADMAP FOR FUTURE.

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4.8/2(P)

Keywords: *Carbon capture utilization and storage, Carbon recycling, CCUS technology, climate change, CO_2 emissions.*

CCUS is an emerging technology adopted worldwide to combat the rising CO2 emissions, which accounts for more than 38 Gt. Even if the per capita CO2 emission is low, India still ranks third in CO2 emission globally. As of 2021, there are 135 CCS facilities globally, and 27 are fully operational. In developing countries like India, CCUS has been a topic of discussion for decades, but limited research, finance and policy support is available. CO2 has been captured for over 80 years, but this captured CO2 was vented into the atmosphere. The Capturing technologies studied in this report include Pre-combustion, Post-combustion, Oxyfuel Combustion, Direct Air Capture (DAC) and Chemical Looping. The choice of technology to be established depends on factors like the extent of purity required, conditions such as temperature, pressure of CO2, and concentration of impurities. India has an abundant carbon sequestration potential. The evolution of this technology in India is discussed in this report. In 2017, the preliminary installation of India's first unsubsidized industrial scale Carbon Capture plant started. India has a significant amount of storage capacity. The potential storage capacity of various storage pathways in India is estimated to be approximately 550 Gt. Carbon can be utilized to build technology in various paths, including uptake, conversion, and mineralization. Cameron Heprun et al., in their study on CO2 utilization, mentioned different pathways like chemicals, EOR, BECCS, fuels, Microalgae fuels, and building materials for utilizing the captured carbon. Future opportunities and challenges are also discussed in this review. Mission Innovation, ACT call, and set up of the National Centre of Excellence are major policy actions adopted by the Indian government.

CONTAMINATION POTENTIAL OF MUNICIPAL SOLID WASTE LANDFILL LEACHATE IN URBAN AREAS

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4.9/3(P)

Keywords: *Municipal Solid Waste; Contamination; Leachate; Leachate Pollution Index*

Increasing urbanisation and industrialisation is results in drastic growth of population in growing cities which leads to production of heavy amount of municipal solid waste. In the India total quantity of Solid waste generated per day is 160038.9 TPD out of which 14710 TPD waste produced by the state Uttar Pradesh. Management of municipal solid waste is serious concern for developing countries. Improper and nonengineered handling and disposal of MSW causes leakage of toxic fluid which is leached into ground and contaminate the ground water, soil and surrounding environments to the dumping site. In this study assessment of various characteristic of leachate such as pH, TDS, Conductivity, Alkalinity, BOD, COD, Sulphate, Nitrate, Chloride, Chromium, and Iron from Baswar landfill site situated in Prayagraj city is carried out which received a total 600 Tonne MSW per day. A pollution potential index estimated for different parameters like BOD, COD, pH, Chloride, Chromium, TDS, and Iron. LPI index is 26.93 which indicates that the leachate generating from landfill is toxic and will contaminate the environment if discharged without appropriate treatment. The LPI index value can be used to assess the pollution potential of any landfill and to decide the best course of action for reducing or preventing pollution in the areas surrounding the dump sites.

ANTIBACTERIAL POTENTIALS OF THREE DIFFERENT EXTRACTS OF THUJA OCCIDENTALIS L. AGAINST PSEUDOMONAS AERUGINOSA

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4.10/4(P)

Keywords: *Antibacterial potentials, Pseudomonas aeruginosa, UTI, MIC, etc.*

This research aimed to explore the antibacterial properties of Thuja occidentalis L. leaves. We conducted experiments using acetone, ethanol, and ether extracts of these leaves, known for their ethnomedicinal significance. Our investigation focused on their potential to combat medically significant Pseudomonas aeruginosa (MTCC-424), a common urinary tract infection (UTI) culprit. The extracts were evaluated using the Clinical Laboratory Standards Institute's broth micro-dilution method, and we recorded Inhibition Concentration (IC50) and Minimum Inhibition Concentrations (MIC) using SpectramaxPlus384 Molecular Devices. As standard, we use Streptomycin. Results revealed IC50 values of 0.640 mg/ml for acetone extract, 0.332 mg/ml for ethanol extract, and 0.423 mg/ml for ether extract. Notably, the ethanol extract exhibited the highest efficacy with an MIC of 0.554 mg/ml, while the acetone extract displayed the least effectiveness with an MIC of 1.009 mg/ml against Pseudomonas aeruginosa. Additionally, we conducted phytochemical analyses of Thuja occidentalis, uncovering various secondary metabolites contributing to its antimicrobial activity. Consequently, these findings suggest that these plants hold potential as sources for discovering bioactive natural compounds, which could serve as promising leads in pharmaceutical research endeavors.

SESSION-V

SUSTAINABLE AGRICULTURE AND ENVIRONMENT BIOTECHNOLOGY

SAFETY CONCERN OF ACRYLAMIDE IN FOOD AND APPROACHES TO MINIMIZE ITS FORMATION

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5.1/1(I)

Processing of foods brings about important desirable changes however, few changes may be harmful causing health hazards. Acrylamide (AA) is a processing contaminant usually forms during high thermal processing of carbohydrate-rich foods. Indeed, fried, baked, and coffee products are recognized for having elevated levels of AA, typically ranging from approximately 59-5200 µg/kg in fried products, 18-3324 µg/kg in baked goods, and 45-5399 µg/kg in coffee. Baking, frying, grilling are the most prospective heat treatments where temperatures exceeding 120 °Ccausing reactions between free asparagine (a soluble, non-protein amino acid) and reducing sugars (such as glucose, fructose, and maltose). AA is classified as a Group of 2A carcinogen also having neurotoxic and genotoxic propensity indicating that it is likely to be carcinogenic to humans. At elevated doses, this substance can exhibit neurotoxic and developmental hazards. Surveys have indicated high levels of AA in food products in all parts of the world.

In order to mitigate AA content and ensure safety, AA formation in food, a several strategies have been devised. The strategies involve making adjustments to cooking methods, modifying the composition of ingredients, and incorporating various processing technologies. Effective strategy to mitigate AA levels in cooked food involves implementing several measures. These include reducing cooking temperatures, shortening cooking durations, pre frying treatments (like fermentation, soaking, blanching, additives) and adopting alternative thermal processing such as high-pressure processing(HPP), vacuum frying, air frying etc. Researches have shown that by implementing these techniques about 40-90% reduction in AA content may be achieved. In addition, it has been found that choosing raw ingredients that contain lower levels of asparagine, a crucial precursor for acrylamide formation and utilizing enzyme-based treatments have demonstrated efficacy in minimizing the formation of acrylamide. Development of low asparagine varieties of wheat, potatoes or major raw ingredient may also play a crucial role in minimizing AA content in processed products. It is important to note that manufacturers have been diligently engaged in the development of additives and ingredients aimed at reducing AA levels in processed foods. It is crucial to understand that there is no one-size-fits-all solution for addressing AA, as various approaches are being explored to effectively tackle this issue. Therefore, it is necessary to conduct a thorough evaluation on a case-to-case basis. Regulatory bodies across different nations have implemented comprehensive guidelines and regulations to effectively monitor and restrict the levels of acrylamide found in food products.

TEMPERATURE – A CRITICAL ABIOTIC PARADIGM THAT GOVERNS BACTERIAL HETEROGENEITY AND ITS ANTIBIOTIC RESISTANCE IN NATURAL ECOLOGICAL SYSTEM

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5.2/2(I)

Keywords: *Temperature, Mesophiles, Psychrophiles, Thermophiles, Antibiotic resistance*

Temperature is a critical abiotic factor which determines the microbial diversity in several spheres of earth.Based on the microbial preference for their optimal range of temperature, microorganisms are classified in thermophiles, mesophiles and psychrophiles. However, in an environmental niche with gradient temperature i.e., across hot via warm to cold temperate region with other similar abiotic factors like pH and elemental compositions etc., how the microbial diversity changes with respect to temperature is largely unknown. Similarly, the abundance of various types of temperature-dependent bacteria like thermophiles, thermo-tolerant, mesophiles, psychro-tolerant and psychrophilic bacteria in a wide range of thermal gradient having antibiotic resistance and ARGs are also unknown.

Here in this study, we have found that only specific bacteria tolerant to specific temperature grows optimally in their respective micro-environments. However, there were some commonly shared microbial communities among the mesophiles and psychrophiles but they did not contribute to bacterial abundance. Metagenomic analysis shows the prevalence of Proteobacteria, Firmicutes, Bacteroidetes and these phyla showed a linear increase or decrease in their abundance with respect to temperature. Temperature was the governing factor in shaping the bacterial diversity that was statistically significant by regression models in these microenvironments. Other factors such as pH and various elements, possessed insignificant effect on bacterial diversity. The abundance of mesophilic ARGs were predominant in the distinct thermal microenvironments which suggested that the antibiotic resistance was conferred by mesophiles at large and very few psychrophiles might also play a role in it. Presence of gyrase genes showcased the adaptability of the thermophilic bacteria across the thermal gradients. However, the minimal percentage of reverse gyrase also confirmed that the hot regions were devoid of any hyper-thermophilic microbes.

Thermophilic bacteria were found to be devoid of antibiotic resistance. Regression analysis showed the inverse correlation of temperature with antibiotic resistance, i.e., antibiotic resistance decreases with increase in temperature. Antibiotic resistance is maximum at moderate temperatures and usually decreases with the increase and decrease in temperature from the optimum. These studies were carried out in pristine ecosystems with less anthropogenic activities. However, these decisive arguments could be also highlighted by further studying such environments. Furthermore, there is a great scope to perform such studies in contaminated environments that habits such thermal gradients.

CRYOGENIC APPROACH FOR CARBON DIOXIDE SEPARATION AND STORAGE FROM PURE CO2 AND VARIOUS MIXTURES OF 20%CO2–80%CH4, 30%CO2–70%CH4, 40%CO2–60%CH4, AND 50%CO2–50%CH4

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5.3/3(I)

Key words: *Cryogenic, CO2, liquid nitrogen, storage*

In the present work, carbon dioxide liquefaction and solidification from various mixtures (CO2, 20%CO2– 80%CH4, 30%CO2–70%CH4, 40%CO2–60%CH4, and 50%CO2–50%CH4) are studied theoretically by the computer simulation model. Correlations are developed from heat transfer fundamentals for predicting the performance and effect of temperature, pressure, and amount of cryogenics fluid required for CO2 separation. It is observed that the mass of solid CO2 can be produced by direct sublimation by rejecting heat to liquid nitrogen for both pure and mixed forms of CO2. There is a particular amount of liquid nitrogen required to sublimate the CO2. As the percentage of CO2 decreases in the mixture, the fluid nitrogen requirement increases for complete sublimation. The compression pressure should be lower for the complete liquefaction of CO2 for a particular amount of liquid nitrogen. Increasing the compression pressure will result in low CO¬2 liquefaction and increases compression power and outlet compression temperature. The pressure range should be 6 to 20 bars for complete conversion, and low power is required for all considered mixtures. Finally, the conclusion of the present work shows that before designing the actual physical system for CO2 separation and storage based on the liquid nitrogen, the information on liquid nitrogen required and components performance parameters should be necessarily predicted, and thermodynamic quantities like temperature range and pressure range should be in mind to Pre-design.

THERAPEUTIC POTENTIAL OF NATURAL PRODUCTS AGAINST ANTI-TUBERCULOSIS AND ANTI DEPRESSANT DRUG INDUCED HEPATO-RENAL TOXICITY

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5.4/4(I)

Tuberculosis is a challenging public health issue and needs long term treatment with cocktail of drugs including isoniazid and rifampicin. Similarly for the treatment of anxiety and depression, fluoxetine is a commonly prescribed antidepressant drug used for long-term treatment. Prolonged treatment with the anti-tubercular and antidepressant drugs causes severe hepatic damage. Oral administration of these drugs in rats caused significant alterations in serum and tissue biomarkers. Supplementation of natural products morin hydrate with rifampicin and baicalin with fluoxetine produced salutary effect on oxidative stress-mediated hepatic damage and inflammation. The biochemical markers (total protein, albumin, total bilirubin, alanine transaminase, aspartate transaminase, alkaline phosphatase, superoxide dismutase, catalase, glutathione, glutathione-S-transferase, malondialdehyde and advanced oxidation protein products) and inflammatory markers [tumor necrosis factor-α, interleukin (IL)-6, IL-10 and interferon-γ] were markedly restored to near normal levels after treatment with the natural flavonoid compound baicalin and morin hydrate. Moreover, treatment with morin hydrate/ baicalin/ silymarin also demonstrated normal histopathological architecture in liver slices. Thus, the results revealed that morin hydrate/ baicalin provided protection against rifampicin/fluoxatine-induced hepato-renal injury.

REMOVAL OF RHODAMINE BLUE DYE FROM WATER USING POLANGA SEEDS DERIVED BIOCHARTHROUGH ADSORPTION TECHNIQUES

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5.5/1(O)

***Keywords**: Rhodamine Blue; Polanga seeds; Biochar; Adsorption*

Removal of toxic dyes like Rhodamine Blue is essential because they pollute both aqueous and soil streams. In this study, a novel Polanga seeds biochar from pyrolysis was used as an adsorbent whose sorption properties were characterized by BET, FTIR, and SEM-EDX analysis. The bio-adsorbent was tested for Rhodamine B dye removal through various parameters like solution pH, adsorbent dosage, initial dye concentration, stirring speed, contact time, and solution temperature. The maximum equilibrium adsorption capacity was 169.5 (mg/g) obtained through Langmuir adsorption isotherm studies. The adsorption process followed pseudo 2nd order kinetics. Lastly, the reusability study confirmed that the Polanga seeds biochar can be reused for up to 3 cycles and can be used as an adsorbent for environmental remediation.

VRIKSHKOSH: APPLICATION OF GEOSPATIAL TECHNOLOGIES IN DEVELOPING CURATED MEDICINALPLANT DATABASE

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5.6/2(O)

Keywords: *Plant Geo-Tagging, QR code, Tracking, Plant Species, Biodiversity, Data Collection*

Tracking and monitoring plant species biodiversity is crucial for understanding ecological dynamics, species distribution patterns, and conservation efforts. However, the traditional methods of documenting plant species through manual observation, physical sampling, and compilation are time-consuming, labor-intensive, and limited in scope. To overcome these limitations, geospatial technology, specifically plant geo-tagging, efficiently tracks species biodiversity by attaching QR codes to plants and collecting geospatial data through mobile devices. This method offers a scalable solution for researchers, conservationists, and citizen scientists to contribute to large-scale plant biodiversity studies. In the context of the Medicinal Garden at Chhatrapati ShahuJi Maharaj University in Kanpur, the present work aims to design a web application for geotagged medicinal plants. This user-friendly tool will enable the mapping and documentation of medicinal plant species, facilitating sustainable development practices. By incorporating geotagging technology, the web application strives to enhance biodiversity conservation, community health and well-being, cultural preservation, and sustainable practices. The features and benefits of the web application are highlighted as valuable resources for promoting awareness, conservation efforts, community engagement, and informed decision-making

ARTIFICIAL INTELLIGENCE BASED GEO SPATIOTEMPORAL BIG DATA APPLICATIONS FOR SUSTAINABLE DEVELOPMENT

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5.7/3(O)

Keywords. *Geo Spatiotemporal Big data, Spatiotemporal Applications, Spatiotemporal Big Data Challenges, Spatiotemporal Big Data System Architecture, Artificial Intelligence*

Artificial intelligence simulates human cognitive processes in machines, especially in computers to solve problems and perform various tasks in different domains better than human beings. Spatiotemporal data deals with spatial and temporal aspects of the data. Due to recent technological advancements, location-based services and applications have been an integral part of the daily activities of human beings and that led to the generation and capturing of big data with spatiotemporal stamps. Spatiotemporal big data applications deal with the application of innovative thinking, techniques, algorithms, tools, and frameworks to process spatiotemporal big data. It involves many challenges as well as opportunities to develop innovative solutions to various problems using artificial intelligence techniques. The objective of this article is to conduct a literature survey, discuss and identify opportunities to develop state-of-the-art Geo Spatiotemporal Big Data applications in various domains. The applications can make use of data mining and machine learning including deep learning methods such as supervised and unsupervised learning techniques for discovering knowledge from spatiotemporal big data. As a result, an architecture framework is proposed and machine learning workflow is specified to realize various use-cases for sustainable development. This research paper outlines challenges and future research directions such as integrating Artificial Intelligence, Machine Learning, and Deep Learning models to spatiotemporal big data applications for providing innovative solutions.

SEASONAL AND INTERANNUAL VARIABILITY OF THE SEA SURFACE TEMPERATURE AND SEA SURFACE SALINITY OVER THE ARABIAN SEA

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5.8/4(O)

Sea Surface Salinity (SST) and Sea Surface Salinity (SSS) are important factors in the process of atmosphere-ocean interaction and the hydrological cycle of the ocean system, so it is crucial to select appropriate climate models that can accurately capture the phenomenon of the climate system. The current study examines CMIP6's capability to model seasonal and interannual variability across the Arabian Sea (AS), which stretches from 5°S to 32°N and 33°E to 80°E over the years 1985–2014. We compare the observational data with the historical simulations of 11 CMIP6 models. The SST simulated by the majority of CMIP6 models is seen to generally coincide with the data in terms of seasonal variability. The equatorial warming is overestimated by the BCC-CSM2-MR, CanESM5, and CMCC-CM2-SR5 models during the pre-monsoon season (MAM). The south-west monsoon season (JJA) is marked by a high warm bias in the IITM-ESM, MPI-ESM1-2-LR, and NESM3 models. Near the western AS, they also show a weak Somali Jet simulation due to insufficient representation of the strong Somali Jet. BCC-CSM2-MR, CanESM5, CMCC-CM2-SR5, and MPI-ESM1-2-LR models all exhibit a positive bias in SSS across the western AS during JJA. All the models accurately depict the SST yearly cycle's phase. The models with the highest correlation and lowest RMSE for SST are the CMCC-CM2-SR5, IITM-ESM, and NESM3. These models perform better because they have higher correlation and lower root-mean-square error (RMSE) for SSS than CanESM5, CMCC-CM2-SR5, and IPSL-CM6A-LR. With the aid of such a model, we can more accurately predict the state of the climate, which will be beneficial for sustainable development.

EVALUATION OF LIQUEFACTION POTENTIAL OF SUB – SOIL SUSCEPTIBLE TO LIQUEFACTION USING STANDARD PENETRATION TEST (SPT) DATA

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5.9/5(O)

Keywords: *Sub-Soil; Liquefaction; Liquefaction Potential Index; Liquefaction Severity*

Liquefaction of sub-soil is a phenomenon in which partially saturated or saturated loose cohesionless sub-soils, especially loose fine sand, significantly lose their strength and stiffness in response to applied stress. It occurs usually during earthquake shakings due to the generation of excess pore water pressure, causing it to lose its effective stress and behave like a liquid. Essentially, predicting the liquefaction severity accurately is very important for liquefaction-prone sites under different seismic conditions. All the structures that are constructed on the sub-soil are susceptible to liquefaction and can get damaged during earthquake ground motion, even if the foundations are strong. Since one of the most hazardous events is discussed, certain analysis for sub-soil needs to be performed to understand the behavior of soil and its stability against liquefaction on different sites. There are several simplified methods to determine liquefaction potential based on Standard Penetration Test (SPT), Cone Penetration Test (CPT), and Shear Wave Velocity test. In this paper, simplified liquefaction analysis has been carried out based on (SPT) data of 10 sites of Bahraich District situated in Uttar Pradesh. Liquefaction Potential Index (LPI) has been calculated and level of liquefaction severity is classified as per Iwasaki et. al (1982), Luna and Frost (1998) and MERM (2003). It was observed that some sites had moderate to high severity, while the remaining had high to very high severity. The classification helped in a preliminary understanding of the liquefaction susceptibility of sites chosen for construction.

DRINKING WATER TREATMENT USING SWASTIIK TECHNOLOGY- APPLICATION OF FENNEL OIL FOREFFECTIVE WATER DISINFECTION

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5.10/6(O)

***Keywords**: Cavitation, Disinfection, Natural oil, Process, Water treatment*

Providing safe drinking water is of paramount importance for sustaining life. New technology, SWASTIIK (Safe Water and Sustainable Technology Initiative from Indian Knowledgebase) of CSIR- NCL, that suggests modern hydrodynamic cavitation using natural oils having antimicrobial properties, was evaluated by exploring the potential use of fennel seed oil, a natural resource, for water disinfection for the first time, for effective water disinfection. Studies were carried out using a model organism E. coli. Acoustic cavitation with 0.2% fennel oil resulted in 100%disinfection in just 10 min. For vortex diode as a cavitation device, disinfection efficiency for 0.1% oil was 70% at 0.5bar and 99.6% in 2 min at 1 bar pressure drop respectively. A process intensification using aeration and 1 bar pressure drop gave excellent efficiency with 100% disinfection is just 1 min. The cost of the combined approach was very low at 0.25 Rs/m3, confirming cost effectiveness. The hybrid approach also displayed the highest per-pass disinfection with a high cavitational yield of 236 CFU/mL/J. The oil after the treatment can be easily separated and recycled. Further, the removal of oil was also achieved using adsorption by activated carbon for restoring the original taste and smell of the drinking water.

ENHANCING INDUSTRIAL WASTEWATER TREATMENT THROUGH Fe3O4 NANOPARTICLES-LOADEDACTIVATED CHARCOAL: DESIGN AND OPTIMIZATION FOR SUSTAINABLE DEVELOPMENT

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5.11/7(O)

Keywords: *Fe_3O_4@AC nanocomposite; RSM; COD; Kinetics; LC-MS; Toxicity*

This paper reports investigations in the mineralization of industrial wastewater (COD = 3246 mg/L, TOC = 2500mg/L) using a ternary (ultrasound + Fenton + adsorption) hybrid advanced oxidation process. Fe3O4 decorated activated charcoal (Fe3O4@AC) nanocomposites (surface area = 538.88 m2/g; adsorption capacity = 294.31 mg/g) were synthesized using co-precipitation. The wastewater treatment process was optimized using central composite statistical design. At optimum conditions, viz. pH = 4.2, H2O2 loading = 0.71 M, adsorbent dose = 0.34 g/L, reduction in COD and TOC of wastewater were 94.75% and 89%, respectively. This result is essentially a consequence of synergistic interactions among the adsorption of pollutants onto activated charcoal and surface Fenton reactions induced due to the leaching of Fe2+/Fe3+ ions from the Fe3O4 nanoparticles. Microconvection generated due to sonication assisted faster mass transport (adsorption/desorption) of pollutants betweenFe3O4@AC nanocomposite and the solution. The net result of this synergism was high interactions and reactions among and radicals and pollutants that resulted in the effective mineralization of wastewater The Fe3O4@ACshowed excellent recovery (> 90 wt%) and reusability (> 90% COD removal) in 5 successive cycles of treatment.LC-MS analysis revealed effective (> 50%) degradation of more than 25 significant contaminants (in the form of herbicides and pesticides) after the treatment with ternary hybrid AOP. Similarly, the toxicity analysis test using the seed germination technique revealed a ~ 60% reduction in the toxicity of the wastewater after treatment.

OPTIMIZATION AND DESIGN MODELLING OF CHROMIUM (VI) ADSORPTION USING ULTRASONICATIONMETHOD THROUGH MILD OXIDIZED-UMCNOs BASED ADSORBENT BY RESPONSE SURFACEMETHODOLOGY

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5.12/8(O)

Keywords: *Carbon nanotubes oxides; Hexavalent chromium; Batch adsorption; Response surface methodology; Adsorption Isotherm*

In the present study, plastic pyrolyzed multiwalled carbon nanotubes (MWCNTs) were chemically oxidized to produce carbon nanotube oxides (Mild Oxidized-UMCNOs) for the adsorption of Chromium 6 from a water based solution was carried out using a batch mode approach. Thirty runs of experiments designed by the Design-Expert software were performed for this purpose. The attributes affecting the adsorption procedure, such as pH, preliminary chromium 6 composition, adsorbent quantity, and temperature were optimized using the RSM technique (response surface methodology) by implementing the central composite design (CCD) at a static and optimised contact time of 30 minutes using ultra-sonication. The equilibrium adsorption isotherm and the kinetics were also investigated. The analysis of variance (ANOVA) shown that all of the attributes investigated had a substantial impact on Chromium 6 elimination Capability. The optimization analysis presented that at pH of 6, temperature of 50°C, a preliminary Chromium 6 composition of 2.459 mg/L and an adsorbent amount of 0.495 g, resulted in maximum 82.3% adsorption with a desirability of 1. Freundlich and Langmuir isotherms were employed on the experimental data. The data was drawn based on pseudo 1st order and 2nd order kinetic equations and the best fitted data for the equation was considered as the adsorption kinetics. Outcomes exhibited that Freundlich isotherm and pseudo-2nd-order kinetic equation fits the experimental data well. The Mild Oxidized-UMCNOs derived from the mixed plastic waste was found to be impactful for Chromium 6 adsorption.

SUSTAINABLE TEXTILE FINISH FOR BETTER FUTURE THROUGH MICROENCAPSULATION

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5.13/9(O)

Keywords: *Microencapsulation; Textile finishing; Sustainable; Polymers; Active Compounds.*

Textile finishing refers to the chemical or mechanical processes provided to the fabric to improve its performance and render textile goods fit for their end uses. It is an important process to apply to fabric to make it wearable, but these finishing processes have a large and negative impact on the environment too, as they release large amounts of waste water, chemicals, solid waste, noise, and odour. To overcome these problems, demand for sustainable textile finishes increases day by day, which include plasma treatment, nanotechnology and microencapsulation, and many more. Microencapsulation is an innovative and unique method of textile finishing in which active compounds are packed into a thin coating of polymers. These active compounds can be in solid, liquid, or gaseous form and are protected by their wall material from their surrounding environment. These active compounds escape through the wall by various methods, including dissolving, rupture, diffusion, melting, or dissolution, to provide the specific purpose for which they are applied, which can be fragrance release, dermal functions, antimicrobial functions, mosquito repellent, and so on. This finishing process is beneficial compared to other textile finishes as it is energy-saving, eco-friendly, economical, does not affect the existing textile property, and survives up to several wash cycles.

CuO@Zn-BDC COMPOSITE SYNTHESIZED AND USED AS A PHOTO-CATALYST FOR DEGRADATION OFMETHYLENE BLUE (MB) DYE

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5.14/10(O)

Keywords: *CuO NPs; Zn-BDC MOF; CuO@Zn-BDC composite; methylene blue dye; photo-catalytic activity*

CuO@Zn-BDC composite was synthesized by simple stirring and successfully characterized by Powder X-ray Diffraction (PXRD), Ultraviolet-Visible Spectroscopy (UV-Vis.), Scanning Electron Microscopy - Energy DispersiveX-ray Analysis (SEM-EDX), Thermo-gravimetric Analysis (TGA) and Fourier Transform Infrared Spectroscopy (FT-IR) techniques. In comparison to their parents CuO NPs and Zn-BDC MOF, two metal ions (Cu2+ and Zn2+) in this composite exhibit a synergistic effect and improved characteristics. The average crystallite sizes for characteristic speaks are 23.1nm, 31.8nm and 25.6nm respectively for CuO NPs, Zn-BDC MOF and CuO@Zn-BDC composite and their band gaps are found 1.46eV, 3.86eV and 3.23eV respectively. The results showed that the advantageous interactions between Cu and Zn metals may encourage the development of unsaturated metal sites, hence continually causing electron-hole transfer and thereby improving the photo-catalytic degradation efficiency of MBdye. An aqueous solution of 10 mg/L MB dye was used in the photo-catalytic experiment under UV-light irradiation. Photo-catalysis is an eco-friendly technique that emerged as a potential substitute for the degradation of many organic pollutants.

PHOTOCATALYTIC DEGRADATION OF CONGO RED DYE BY IODINE DOPED TIO2 NANOPARTICLES

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5.15/1(P)

In this study, TiO2 nanoparticles were synthesized using the solution-combustion technique, and iodine was doped at varying mole ratios by employing iodic acid as the precursor. Several characterization techniques were used together important information about the photocatalysts. Fourier transform infrared spectroscopy (FTIR) was used to identify the functional groups. Scanning electron microscopy (SEM) was used to examine the nanoparticles 'morphology. X-ray diffraction (XRD) was employed to determine the crystal structure, revealing that the photocatalysts were in the anatase phase, with a measured crystalline size of 16.87 nm. The band gap energy of the doped photocatalysts was 2.43 eV. The experimental investigation demonstrated promising results in enhancing the performance of TiO2 by introducing iodine. Notably, the efficiency of TiO2 for the photocatalytic degradation of Congo Red dye was significantly enhanced. The degradation of Congo Red was carried out in a UV photochemical reactor with a quartz tube, achieving 88% degradation within 60 min. This degradation was achieved at a dye concentration of 40 ppm using a catalytic dose of 0.01 g. The degradation process followed pseudo-first-order kinetics.

SEWAGE TREATMENT PLANT'S SLUDGE HANDLING TECHNOLOGIES: AN OVERVIEW

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5.16/2(P)

Keywords: *Environmental sustainability; Hydrothermal carbonization; Sewage sludge; Valuable nutrients; Wastewater treatment*

The Sewage treatment plant (STP) receives wastewater from households, commercial buildings, and sometimes it may also include industrial wastewater for its treatment. During various stages of wastewater treatment, sewage sludge, also known as biosolids, is formed as a by-product. It cannot be used directly for agricultural land because it contains pathogens that can contaminate our environment. Hence, it is necessary to treat this sludge before it is discharged into the environment. The present paper aims to review various sludge treatment techniques along with their advantages, disadvantages, and the application of value-added products obtained after the treatment. It includes chemical (ozonation, wet oxidation, and solar photo fenton), mechanical (consolidation and dewatering –sludge treatment reed beds), hydrothermal carbonization (HYC) (mechano-chemical), biological (composting in a rotary drum, vermicomposting, anaerobic digestion (AD) (with the addition of sonication), and anaerobic co-digestion (AcD), electrochemical, and several thermal (combustion, co-combustion, supercritical water gasification(SWG), pyrolysis, co-pyrolysis (microwave assisted), processes of STP's sludge treatment. From the literature review, it has been observed that HYC combined with AD and sludge treatment reed beds are both effective ways to treat sewage sludge. Both technologies have many benefits over other treatment technologies, including improved biogas production, increased energy recovery, ease of operation and maintenance, etc. The conclusion of this review paper is that the selection of STP's sludge treatment technology depends on its ease of use, maintenance, affordability, and environmental sustainability.

WATER QUALITY ASSESSMENT OF THE YAMUNA-DELHI STRETCH IN INDIA UTILISING A WATER QUALITYINDEX AND MULTIVARIATE STATISTICAL ANALYSIS

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5.17/3(P)

Keywords: *Physicochemical parameters, Yamuna River, Water quality Index, Principal component analysis*

As harmful effluent concentrations are released into freshwater aquatic ecosystems, the aquatic biota is being impacted. In this study, physicochemical parameters were evaluated, including water temperature, pH, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), nitrates (NO3-), electrical conductivity (EC), total dissolved solid (TSS), total suspended solids (TSS) and total solids (TS). Additionally, the Yamuna River's Water Quality Index (WQI) was calculated for the water samples that were taken from the chosen stations in order to determine whether they were suitable for drinking, irrigation, and farming. The WQI was determined using the Weighted Arithmetic Index technique. The WQI was found to be greater than 100 at all eight stations, which is significant and showed that the water quality grade was poor, making it unfit for drinking and agricultural use. The evaluation of physicochemical parameters revealed that home sewage and industrial effluents had a significant negative impact on the selected stations; as a result, proper cleaning of the river water before use is vital in order to prevent waterborne illnesses that could harm people and aquatic life. PCA helps to reduce data variation. It highlights the most essential factors that describe the entire dataset and summarises the statistical correlations among the elements with little loss of original information. A cooperative effort by the government and local organisations is essential for improving and maintaining the river's water quality.

USE OF MICROBIOLOGICALLY INDUCED CALCIUM CARBONATE PRECIPITATION (MICP) AS A SOIL STABILIZER

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5.18/4(P)

Keywords: *MICP; Sustainability; Biomass; Soil Stabilization.*

Traditionally we use soil stabilizing by mechanical, hydraulic, chemically, or by reinforcement. But now-a-days we get a new aspect to stabilize the soil by using living aspect of soil which includes bio-chemical engineering into geotechnical engineering. Bio-cementation is a need and scope for sustainable improvement of geotechnical properties in soil i.e., with less impact on the environment. One of its techniques is Microbiologically induced calcium carbonate precipitation (MICP). This method uses biological cycle of microbes or enzymes to form Calcite (a most stabilize polymorph form of calcium carbonate) by aerobic and anaerobic respiration depending upon the bacteria uses like cyanobacteria, nitrate reducing bacteria, sulfate reducing bacteria etc. But generally, urease-producing bacteria is used as the reaction are simple and easily controlled and handled. MICP is just not used to modify the shear strength or permeability of soil but also used in mitigate the liquified soil, stabilizing the heavy metal in the soil, underground mine waste and backfill optimization. The external environmental condition like temperature, pressure, pH etc. that effects the formation of calcite and its structure. In this paper we will go through some previous works related to MICP and summarize them as a review, of all those extensive works.

ASSESTMENT OF SOIL CONTAMINATION DUE TO HEAVY METALS: A CASE STUDY OF OKHLA INDUSTRIAL AREA, NEW DELHI

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5.19/5(P)

Keywords: *Soil contamination, Heavy Metals, Industrial area, Pollution, Human health*

Heavy metal-related soil contamination is a significant issue in industrial areas. Since, it has impact on both human health and the planet's ecological balance. The purpose of the present research paper is to assess the level of heavy metal contamination in the soil of Okhla Industrial area of New Delhi. Significant causes of heavy metal contamination in soils are industrial processes including mining and metal manufacture. The study has been divided into 5 zones and soil samples have been collected from each zone using an auger at a depth of 0 to 2.5 metres. A total of 25 soil samples have been taken and transported to the laboratory for analysis. Before undertaking the analysis, the samples have been air dried and sieved through a 2 mm mesh size. The samples have been examined for the existence of heavy metals like lead (Pb), cadmium (Cd), chromium (Cr), and nickel (Ni) using an inductively coupled plasma optical emission spectrometer.

The results have shown that all the zones have been contaminated with heavy metals, with Zone 5 having the greatest concentrations of Pb and Cd, Zone 2 has been found to have the highest concentration of Cr, while Zone 4 has the highest concentration of Ni. The contamination of heavy metals in the soil of Okhla Industrial Area, New Delhi, is a matter of great concern and it is extremely important to take remedial measures to minimise the impact of heavy metals on soil quality and human's health.

PHYSIO-CHEMICAL CHARACTERIZATION OF MUNICIPAL SOLID WASTE DUMPED IN LANDFILL

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5.20/6(P)

Keywords: *Municipal solid waste; moisture content; density; optimum moisture content; pH; electrical conductivity*

Rapid urbanisation and the shift of population towards cities has contributed to higher municipal solid waste generation especially in metropolitan cities of India. The composition and quantity of Municipal Solid Waste (MSW) alters with time and place. Also, improper collection, instinctive techniques of disposal and minimal use of technical solutions for handling MSW triggers crisis in natural environment- water pollution, air pollution and soil pollution, and consequently, health of population. This paper presents physical and chemical analysis of MSW dumped at Okhla landfill site, Delhi. Primarily, site investigations have been carried out followed by collection of samples. Further, several laboratory tests have been performed on the samples to investigate parameters such as- physical composition, moisture content, density, optimum moisture content, and chemical composition, pH, electrical conductivity, carbon, hydrogen, nitrogen and sulphur. The physical composition of samples has been found to be substantially heterogenous. The mean values for moisture content and optimum moisture content have been observed as 10.15% and 18.25% respectively. Moreover, the mean of density, pH, electrical conductivity, carbon, hydrogen, nitrogen, and sulphur has been obtained as 1135 kg/m3 7.23, 2.57 mho/cm, 4.9%, 0.74%, 0.15% and 0.78% respectively. These results have also been compared with the MSW characteristics of different cities of India and observed to be very close values.

CONTROLLING OF AUTOMOBILE EXHAUST EMISSION USING ADSORPTION TECHNIQUE

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5.21/7(P)

Keywords*: Carbon dioxide (CO2) discharge, zeolite 13X, tailpipe and folio material*

In this review, primary motivation is to discuss the reduction in the contamination which is caused due to vehicles fumes gas, guarantee the contamination free climate and mean to augment the productivity of discharge control. Vehicle exhaust gases like CO2, CO, HC are profoundly poisonous. These are detrimental not only to the climate but also so the general wellbeing. In this context, our primary concern is planning of stuffed tail pipe section and contain adsorbent zeolite 13X to decrease the poisonous of discharge of gases. In this study, we have utilized an adsorbent named zeolite 13X and folio material with the capacity to adsorb CO2 ,CO,NOX and HC which emerging from the vehicular motor after the exhaust cycle.

SESSION-VI

HEALTH BIOTECHNOLOGY

EXPLORING MIS INSERTION AND MISINCORPORATION OF NUCLEOTIDES DURING CDNA SYNTHESIS BY HIV-1 RT: IMPLICATIONS IN DRUG RESISTANCE

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6.1/1(I)

The human immunodeficiency virus type 1 reverse transcriptase (HIV-1RT), a heterodimeric protein, plays a key role in catalyzing the proviral cDNA synthesis. We have established by site-directed mutagenesis that the replacement of the positively charged side chain of lysine at position 154 (K154) of HIV-1RT may result into the development of mutant recombinants with drug resistant properties. Using DNA polymerase activity assay and the dideoxy nucleotides, we have demonstrated that the replacement of a positively charged side chain of lysine by any other hydrophobic (Ala, Val, Leu, Ile, Trp) or basic (Arg) amino acid side chains may lead to the emergence of mutant variants with abilities to cause mis insertion and misincorporation of nucleotides in the growing chain. In contrast, the replacement of lysine with the negatively charged amino acid side chains (Glu, Asp) caused significant reduction in activity with improvement in fidelity of the enzyme. Using the gel shift assay and the radiolabeled primers for both the DNA and RNA templates, we have established the preference of addition of wrong nucleotides against a specific template base by the mutant HIV-1RTs. The present research paper describes our understanding on the underlying mechanisms of drug resistance in HIV-1 against the second generation antiretrovirals and the possible strategies to encounter challenges in chemotherapy.

DEVELOPMENT OF NOVEL MULTIPLEX METHYLIGHT ASSAY FOR EARLY DETECTION OF EPITHELIAL OVARIAN CANCER USING LIQUID BIOPSY

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6.2/2(I)

To date, the major unmet needs in combating epithelial ovarian cancer (EOC) are its prompt early diagnosis and personalized treatment. Assessment of tumor specific methylation changes in tissue or body fluids might provide insights into disease mechanisms and discovery of biomarkers. We assessed the diagnostic relevance of seven candidate hypermethylated tumor suppressor genes for detection of EOC in circulating cell free DNA as a minimally invasive tool using multiplex MethyLight assay. The promoter methylation frequencies for all the seven candidate genes were significantly higher in cancer samples than in normal matched controls (P=<0.00001). In tissue samples, the multiplex MethyLight assay for HOXA9, HIC1 and SOX1 were the best performing gene panels in terms of sensitivity and specificity {HOXA9 + HIC1 (88.24% sensitivity, 88.57% specificity; AUC =0.92), HOXA9 + SOX1 (85.88% sensitivity, 88.57% specificity; AUC =0.92) and HIC1 +SOX1 (83.53% sensitivity, 88.57% specificity; AUC =0.89}, respectively), thereby confirming that their methylation was highly cancer specific. The best discriminatory gene panel in EOC serum samples was two-gene combination of HOXA9+HIC1.The combined sensitivity for the best discriminatory marker panel in serum CFDNA was 88.9% with specificity of 100% and AUC=0.95 thus establishing this serum biomarker panel for early screening of ovarian cancer.

TO COMBAT AGAINST ANTIMICROBIAL RESISTANCE BY BIOFILM DISRUPTION: EXPLORING NOVEL PEPTIDE LOADED NANOCARRIERS

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6.3/3(I)

Keywords: *Antimicrobial Resistance; Biofilm;S. aureus; Composite Nanoparticles*

Background: The emergence of threatening "superbugs" of drug resistant bacterial strain due undiscerning use of antibiotics which has caused upsurge in the global prevalence of the disease caused by antimicrobial resistance (AMR) strain of bacterium. Multi-faceted strategies are being adopted by bacteria to evade killing and develop resistance against antibiotics, one of which is biofilm formation. Methicillin-resistant Staphylococcus aureus (MRSA) accounts for 64% of positive cases, and Mycobacterium tuberculosis accounts for 54% of multidrug resistant (MDR) and 28% of extensive drug resistant (XDR) cases, as per the WHO report. The aim of this study was to evaluate the potential of peptide, tween-80 and artificial lung surfactant (ALS) to destabilize S. aureus biofilms.

Methods: Novel peptide-loaded nanoparticles (NPs) was prepared using a double emulsion and solvent evaporation method. The optimal activity of these NPs was characterized using different techniques. The efficacy of peptide-loaded NPs was studied by biofilm inhibition and disruption using crystal violet staining, bright field microscopy, and scanning electron microscopy (SEM). During the study, S. aureus biofilm was exposed with different dose of peptide loaded NPs for 2 hrs and biofilm disruption and inhibition was studied.

Results: The sizes of the formulation-loaded NPs and composite NPs were 288 ± 3 and 363 ± 4 nm, respectively. The zeta potential of the NPs was −18 ± 0.23, and that of the composite particles was 19 ± 0.40. The encapsulation efficiency of the PLGA NPs was 88%. These composite NPs were easily taken up by A549 cells with minimal or no cytotoxicity. The present study emphasizes that the peptide efficiently disrupt S. aureus biofilm with no cytotoxicity or very little cytotoxicity, while maintaining the integrity of the encapsulated peptide.

Conclusions: These results showed the potential of therapy based on the biofilm disruption approach and could be a potential adjunct therapy to fight AMR due to biofilm formation.

MALARIA SURFACE PROTEINS AS POTENTIAL VACCINE CANDIDATES

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6.4/4(I)

The effectiveness of a disease's treatment and its ability to spread are both impacted by an early and accurate diagnosis. There are many kinds of diagnostic kits, but due to their simple use yet sensitive approach, Rapid Diagnostic Test (RDT) is the most anticipated method that the WHO has advised to create (if not available) or improve (Luo et al., 2019). False positive RDT results are common, but they continue to be the main worry when employing antigen-based RDTs. A false positive result can impose a devastating physical and mental impact (Corona, HIV) and criticism. False positive testing can be caused by a variety of factors, but the most common ones are cross- reactivity with other antigens and the persistence of the antigen in the serum even after the disease has been treated (Reid et al., 2020). Therefore, a novel strategy will be used in the proposed research to increase specificity and eliminate false positives. It can be used for infectious disorders like COVID-19 or HIV as well as vector-borne diseases. The proposed method is aimed towards identifying the pathogen's antigen based on i) Highly conserved proteins to prevent cross-reactivity ii) antigens with a very low half-life to remove the false positives and iii) antigens with very high abundance to enhance the sensitivity. For validation, we will use in-silico, in-vitro, and in-vivo methods. This strategy will produce significantly enhanced RDTs for infectious diseases.

OPTIMIZATION OF WASTE TRANSFORMER OIL INTO VALUE ADDED PRODUCTS

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6.5/1(O)

Keywords: *Waste transformer oil, Biodiesel, Transesterification, Mathematical Model.*

Biofuels are one of the promising alternatives to conventional fuels and can be prepared by easily available feedstock i.e., waste transformer oil (WTO). WTO is hazardous to environment as it is toxic and acidic in nature, still it can be converted into an alternative fuel by applying different methods. The present study involves the conversion of WTO into biodiesel by transesterification/esterification method using methanol/butanol as an alcohol and KOH/H2SO4 as a catalyst at 65-75℃temperature (1hour). The fuel properties such as kinematic viscosity, flashpoint, specific gravity etc. are measured and a comparative study has been conducted. Further during the experimentation, the various independent and dependent variables were involved which are identified to know the behaviour of one variable on other. This helps to optimize the experimentation in terms of reducing experimental time and cost involved in the experimentation. The approach to formulate the mathematical model is to predict the performance the Sp. gravity, Kinematic viscosity, Flash point (℃), Fire point (℃), gross calorific values kJ/kg, cetane index and %yield using the so that best combination can be utilized as a fuel in the diesel engine. Hence the aim of this paper is to obtain WTO biodiesel, check the dependence of all the variables on the operating reaction conditions and validate it by mathematical sensitivity analysis.

BIOLOGICAL DETOXIFICATION AND DEGRADATION OF SYNTHETIC DYE USING MANGROVE MICROBIAL COMMUNITIES

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6.6/2(O)

Synthetic dyes have led to widespread pollution and ecological concerns due to their persistence and potential toxicity. In recent years, utilization of mangrove microbial communities for biological detoxification and degradation of synthetic dyes has gained significant attention. This is an eco-friendly approach to remediation. Mangroves, as unique ecosystems situated at the interface of land and sea, harbor diverse microbial communities that degrade and detoxify complex organic compounds. This paper aims to provide an overview of the role played by mangrove microbial communities in synthetic dye detoxification and degradation. It explores the underlying mechanisms involved in biodegradation, including the enzymatic activities and metabolic pathways employed by these microorganisms. of their degradation by mangrove microbial communities. The study further examines the factors influencing dye degradation efficiency, including pH, temperature, contact time, concentrations, rotation time, dose availability etc. Additionally, it investigates the interactions between different microorganism species within the mangrove ecosystem and their synergistic effects on dye degradation. The potential application of mangrove microbial communities in large-scale dye remediation projects is explored, along with the challenges and future research directions in this field. It underscores the importance of comprehending the intricate interactions between microorganisms and their environment to devise effective dye remediation strategies. By harnessing the unique capabilities of mangrove ecosystems, it is possible to develop sustainable and environmentally friendly solutions for synthetic dye-contaminated environments.

IDENTIFICATION OF LEAF DISEASE FROM DIGITAL MULTISAMPLING AND CLASSIFICATION USING SUPPORT VECTOR MACHINE CLASSIFIER

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6.7/3(O)

Keywords: *Image Processing; Image Segmentation; K-Means clustering technique; Leaf Disease Detection; Support Vector Machine (SVM)*

Plant disease contributes significantly to a deterioration in the quantity and quality of agricultural goods. Plant disease studies involve the study of visually observable patterns on plants. Image processing methods can be used for identification and examination of the plant diseases. Diseased symptoms are frequently visible on the leaves, stem, and fruit. This method composed of five steps: (i) collection of image, (ii) image pre-processing, (iii) segmentation, (iv) extraction of features, (v) classification. The image of plant leaf is separated into segments, and their features are calculated by using the clusters. The clusters are influenced by the disease by using the K-means clustering technique and a multi-support vector machine (SVM) algorithm for identification. The experimental result showed that the suggested method can perfectly detect and classify the four prevalent diseases on plant leaf which are: *Alternaria alternata*, *Anthracnose*, *Bacterial Blight* and *Cercospora Leaf Spot*. In this study, the efficiency of leaf disease is observed 97.23% via using support vector machine (SVM) classifier.

OXIDATIVE TORREFACTION AND DENSIFICATION OF PADDY STRAW

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6.8/4(O)

Keyword: *Paddy straw, Torrefaction, Densification, Higher heating Value*

Biomass is a more desirable energy source due to its renewable nature, cheaper price, greater availability, and capacity to store carbon. However, some of its qualities make it challenging to employ in its unprocessed state. To investigate the changes in chemical composition or to increase its properties as a solid fuel, torrefaction experiments were performed on samples of paddy straw at different average temperatures i.e at 220, 250, 270, and300 oC under minimized oxidative atmosphere and average residence time for torrefaction process was 15 min. Moving bed biomass torrefaction reactor equipment was employed for this process. The operating temperature is primarily controlled by the air-biomass equivalency ratio, which has a greater impact on torrefaction than residence duration. Mass and energy balance shows Paddy straw's energy yield decreases as torrefaction temperature increases; at 300 oC, it was 73.17% and torrefaction index(Itorr) increases and it was 1.38. Raw and torrefied paddy straw biomass were subjected to proximate, ultimate and calorific value analyses. It was found that calorific value of torrefied biomass increases from 14.672 MJ/kg to 20.32 MJ/kg with temperature from 220 to 300oC. The torrefied straw was subjected to grinding and pelletization and tested for different properties such as Meyer hardness, density, hydrophobicity, and mechanical specific energy consumption. It was found that the grinding energy requirement trend followed the order --220 > 250 > 270 > 300---- and the pelletizing energy requirement followed the order --220 > 250 > 270 > 300---- .

ENHANCING THE KEEPING QUALITY OF FRESH-CUT BRINJAL USING PROPYL GALLATE AND GALLIC ACID

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6.9/1(P)

Keywords: *Propyl gallate (PG), Gallic acid (GA), Polyphenol oxidase (PPO), Peroxidase (POD)*

Enzymatic browning is the major problem in minimally processed food products. The phenomenon of browning observed on the surface of fresh-cut fruits and vegetables was due to melanin production. In the present study, antioxidants, propyl gallate (PG), and gallic acid (GA) were employed to inhibit the enzymatic browning of fresh-cut brinjal. Fresh-cut brinjal slices dipped in different concentrations of GA and PG and water followed by storage at room temperature (RT) and cold temperature (CT)—the fresh untreated sample was considered the control. The results showed that samples treated with 0.1mM PG and GA displayed a maximum inhibitory effect on the enzyme polyphenol oxidase (PPO) and Peroxidase (POD), thus inhibiting surface browning. Furthermore, storage studies, weight loss, color analysis, and total phenolic content were also determined at CT for 16 days and RT for 8 days. Untreated samples stored at RT showed maximal weight loss, reduced phenolic content, and increased surface browning. Samples treated with high concentrations (0.1mM) of PG and GA proved to have better quality control and increased shelf life at cold temperatures.

A FRAMEWORK FOR THE DEVELOPMENT OF STABLE PRODUCTION OF PLANTS THROUGH THE DETECTION OF PLANT DISEASE AND ITS RECOVERY USING MACHINE LEARNING MODELS

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6.10/2(P)

Keywords. *Machine Learning Algorithm, Random Forest algorithm, Decision Tree*

Economic development is a policy which aims in improving the social and economic conditions of the nation. The productivity of plant products plays a major role in economic development of a nation and country. The productivity of plant brings food to the persons residing in the nation and the productivity of plant either in raw form or in revised form have been exported. If the productivity of plant decreases, that hampers to supply of food to the persons residing in the country as well as the export amount which has been supposed to export. Plants are susceptible to various diseases in their early stages. If the diseases can not be identified at the initial stage, then these may badly affect the total yield, resulting in a decrease in the production of that plant. To overcome this problem, certain preventive measures can be taken by the application of certain medicine or certain other material to the disease affected plant so that the plant can be recovered from disease. If the disease can not be recovered at early stage, the affected plant can be destroyed and new plant can be planted. In that case plant production will not be hampered and as a result usage of plant production and revenues through export will also not reduced. Here in this paper an effort is being made to apply machine learning models like Random Forest, Decision Tree, Logistic Regression, K-nearest neighbour, Gaussian Naïve Bayes, Support Vector Machine, Gradient Boosting algorithm using linear function and Radial basis function have been used and applied to the textual features (contrast, correlation, energy, homogeneity) of images. Accuracy, classification report and confidence matrix have been used as an evaluation parameter for selecting a particular machine learning model.

EFFECTIVE VALORIZATION OF AGRICULTURAL RESIDUE USING TORREFACTION PRETREATMENT: BIO-COAL ANALYSIS

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6.11/3(P)

Keywords: *Torrefaction; Waste management; Biomass valorization; Bio-coal; Sustainable technology*

About 352 million tons of stubble are burnt on fields annually after harvest, leading to environmental pollution. National Capital Region and New Delhi experience harsh air quality index due to excessive air pollution. If appropriately managed, abundant agricultural waste residues could generate carbon-neutral and renewable commercial assets. Torrefaction, a simple thermo chemical treatment process, can effectively treat lignocellulosic biomass. In this study, the torrefaction of rice husk was carried out in a lab-scale fixed-bed torrefaction reactor. The effect of torrefaction temperatures (200, 250, and 3000C) on product and energy yield was studied. The bio-coal yield decreased from 97-70 wt% with a rise in temperature. The percentage of carbon increased from 37-52 wt%,while the percentage of oxygen decreased from 41-25 wt%, respectively, with an increase in reaction temperature. The energy yield decreased from 98-76% with an increase in torrefaction temperature. The fuel characteristic of bio-coal enhanced with increasing temperature resulting in more hydrophobicity, energy densification, higher calorific values, and increased grindability. Along with bio-coal production, torrefaction pretreatment of rice husk resulted in the production of torrefied condensate and non-condensable gases. The torrefied products (bio-coal and condensate) could be further utilized to recover high-value-added compounds.

WASTE BIOMASS VALORIZATION OF BETELNUT INFLORESCENCE AND RED LUCKY NUT SEED PODS: CHARACTERIZATION AND KINETIC STUDY

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6.12/4(P)

Keywords: *Biomass, Betel nut inflorescence (BNI), and red lucky nut seed pod (RLP), Kinetics, KAS, FWO*

Sustainable technologies provide a route to address future energy needs by converting lignocellulosic biomass into fuels, eco-friendly substances, and chemicals. These advancements hold promise as substitutes for fossil fuels while maintaining a carbon-neutral footprint. The current research is centered around investigating the potential of biomass waste Betel nut inflorescence (BNI), and red lucky nut seed pod (RLP) for producing biofuels through thorough physiochemical analysis. Various methods were used to characterize the selected biomass waste, including proximate and ultimate analysis, FTIR spectroscopy, TGA, and XRD. Among the studied biomass types, the RLP biomass exhibited the highest calorific value, 15.84 MJ/kg. To understand the kinetics of the process, model-free techniques like Kissinger-Akahira-Sunose (KAS) and Flynn-Wall-Ozawa (FWO) were employed to determine the kinetic parameters. The strive to transition to cleaner energy sources and biomass-to-fuel conversion emerges as a crucial bridge toward achieving a greener and more resilient energy landscape.

UTILIZATION OF WASTE BOF SLAG IN POROUS CONCRETE PAVEMENT TO ENHANCE SUSTAINABILITY

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6.13/5(P)

Keywords: *Waste BOF slag, Porous concrete pavement, Sustainability, Mechanical properties, Permeability.*

With the growing concern for environmental sustainability, there is a critical need to explore innovative approaches that minimize waste generation and maximize resource efficiency in construction practices. Porous concrete pavement, widely used in transportation infrastructure, presents an opportunity to integrate sustainable materials and techniques for a greener future. This study focuses on the utilization of Basic Oxygen Furnace (BOF) slag as a substitute for conventional aggregates in porous concrete pavement, with the aim of enhancing sustainability in the construction industry. The aggregates were replaced with BOF slag at 0, 25, 50, 75 and 100%. The properties of waste BOF slag are examined to assess its suitability as an alternative aggregate material. The mechanical properties of the porous concrete pavement incorporating waste BOF slag are analysed, focusing on compressive strength, flexural strength, and splitting tensile strength. The permeability and drainage performance of the pavement is evaluated to assess its effectiveness in storm-water management and reduction of urban flooding. The experimental results emphasize the potential of employing BOF Slag as a porous concrete mix in pavement applications. Incorporating 50% waste BOF Slag as a replacement for aggregates enables the production of new porous concrete that exhibits satisfactory characteristics in the hardened state. Overall based on the findings, it is observed that the utilization of waste BOF slag in porous concrete pavement enhances mechanical properties, and improves permeability and drainage performance.

SESSION-VII

EMERGING TRENDS IN BIOTECHNOLOGY

MICROBIAL FUEL CELLS: AN EMERGING TECHNOLOGY FOR SUSTAINABLE WASTE WATER TREATMENT AND GENERATION OF GREEN ELECTRICITY

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7.1/1(I)

Keywords: *Microbial Fuel Cell, Bioelectricity, Waste-water treatment, Exo-electrogens*

Waste water pollution is one of the greatest threats in today's world, as due to the rapid urbanization and industrialization, millions of meter cubic waste water is generated and discharged in the environment without proper treatment. Globally, around 80% of all wastewater produced is discharged into the environment without sufficient treatment. According to UN Water, high-income countries treat on average about 70% of the wastewater they generate. The major reason for discharge of untreated waste water both domestic and industrial into the water bodies is the high-cost and energy requirement involved in treatment of the same, as the current wastewater treatment technologies are not sufficient to meet the ever-growing demands due to rapid industrialization and population growth. Therefore, it is essential to build up an energy-efficient treatment method. The increase in worldwide energy demand is anticipated to rise by 37% by 2040. Due to constant decline in the conventional non-renewable energy sources, it is necessary to adopt renewable energy to meet the demands of future energy scenario. Microbial fuel cell (MFC) is a technology in which bio-electricity is produced from wastewater using microorganism as a biocatalyst, simultaneously achieving wastewater treatment. In this system, microorganism converts of the chemical energy of biodegradable organic matter in wastewater into electrical energy. Several researchers have developed MFC-centered pilot-scale hybrid wastewater treatment plants for the treatment of domestic and industrial wastewater. In-spite of the potential of MFC as a source of renewable energy and its wide applicability for waste-water treatment, the technique is not yet established successfully for field applications. Low and irregular electrical output and high internal resistance are the limiting factors in the practical application of the technology. Researchers have performed multiple strategic attempts to minimize these factors by developing efficient reactor designs for minimizing internal resistance, stacking multiple reactors into one enlarge system (modularization). Also, much work has been done on modification of electrodes for better energy outputs. Hence, the MFC technology has immense potential for production of clean bio-energy along with sustainable treatment of waste streams.

OPTIMIZATION OF BIOHYDROGEN PRODUCTION FROM STARCH BY *BACILLUS FIRMUS* NMBL-03 USING BOX-BEHNKEN DESIGN MODEL OF RSM

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7.2/2(I)

Keywords: *Bacillus firmus, Box-Behnken Design, RSM, Process parameter optimization.*

The three parameters viz. pH, iron and nickel along with starch as carbon source were investigated for their impacts on hydrogen production by novel lab isolate *Bacillus firmus* NMBL-03 which is a very potential hydrogen producing facultative anaerobic bacteria. Their interactive effects were also evaluated to improve the biohydrogen production by using statistical tools i.e. Box-Behnken Design (BBD) and Response Surface Methodology (RSM). From single parameter optimization, the optimized conditions for individual parameter i.e. pH- 6.5, $FeSO_4.2H_2O$ - 0.05 µM, $NiCl_2.6H_2O$ - 0.25 µM were obtained with maximum hydrogen yield as 0.96 ± 0.0467 mol H_2/mol glucose. Taking these optimum points as base, multi-parameter optimization was conducted using BBD & RSM. All the three factors showed their significant impacts on hydrogen production. From statistical analysis by RSM, the excellent fitting of results found with its model. During validation studies the maximum yield of hydrogen i.e. 2.2 mol H_2/mol glucose at validation points i.e. pH- 6.285, $FeSO_4.7H_2O$ - 0.056 µM, $NiCl_2.6H_2O$ - 0.249 µM were obtained from RSM. The interactive effects were depicted by surface and contour plots to better understand their pattern of impact on *Bacillus firmus* in the course of hydrogen production. Organic acids viz. acetate, butyrate and lactate were analyzed as the major end metabolites in the spent media. The hydrogen yield was fairly improved by process parameter optimization.

PHOSPHORESCENT AND MAGNETIC (MULTI-MODAL) NANOCRYSTALS FOR BIOMEDICAL APPLICATIONS

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7.3/3(I)

Lanthanide - doped metal oxide nanocrystals which are emerging as a promising new class of optical/magnetic multimodal bioprobes have recently attracted revived interest owing to their distinct optical and magnetic properties. Although single-modality nanoparticles with fluorescence or magnetic characteristics have been widely used in biosensing and bioimaging, they are not sufficient to obtain all the necessary information of the medical samples. Thus, to meet the demands of modern biomedical technology, the development of next-generation bio probes is essential. These probes integrate the advantages of different diagnostic modes into one single particle and can overcome the current limitations of sensitivity and resolution in medical assays, biodetection/imaging and significantly improve the outcome of existing therapeutics. In comparison to other fluorescent bio-markers these doped nanocrystals possess better optical features, such as narrow emission band widths (<10 nm), large Stokes or anti-Stokes shift (larger than 100–200 nm), and long luminescence lifetimes (μs–ms range), due to their intra-4f transitions shielded by the outer 5s and 5p obitals. It is anticipated that the multimodal lanthanide doped metal oxide nanocrystals can be guided by external magnetic fields to the target of interest whereas the strong photo luminescence from the lanthanide ions can be used for real time tracking. There is problem of low penetration depth both with regard to excitation and emission in the conventional fluorescent probes while the technique of MRI has higher penetration depth and hence higher resolution because biological tissues are transparent to magnetic fields. In this talk, some of the recent developments for controlled and scalable synthesis of lanthanide- doped inorganic multimodal bioprobes (including core–shell structured and single-phase nanoparticles) along with their characterizations will be discussed. The potential of these materials in targeted anticancer drug delivery, MRI and other clinical therapeutics and diagnostics (i.e. theranostics) will also be highlighted.

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MOO OF ALGAL BIODIESEL PROCESS RETROFITTED USING DIVIDING WALL COLUMN AND MULTISTAGE VAPOR RECOMPRESSION CONSIDERING ECONOMIC, ENVIRONMENTAL, AND SAFETY OBJECTIVES

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7.4/4(I)

Multiobjective optimization (MOO) of intensified in situ algal biodiesel process is conducted in this study to promote sustainability. Esterification/transesterification of the algal lipids is performed with the aid-in of ultrasonication, and lipids were catalyzed using an ionic liquid catalyst. Process was first developed and then it was retrofitted by combining two conventional distillation columns into a dividing wall column (DWC), which was further retrofitted using mechanical vapor recompression (DWC-MVR) to reduce energy consumption and carbon emission. Later, an Excel based hybridized multiobjective differential evolutionary dynamic local search (HMODE-DLS) algorithm was used for the constrained MOO, whereas Aspen Plus V 11 was used for the process simulation. Break even cost (BEC), eco indicator (EI99) and individual risk (IR) were taken as criteria to assess the performance of the processes in terms of economics, environmental impact, and safety, respectively. First, bi-objective studies were conducted, and finally, all three objectives were studied all together. Pareto-optimal solutions obtained from HMODE-DLS algorithm were then ranked using simple additive weighted (SAW) method to determine the best solution. The Pareto optimal fronts illustrated that BEC was reduced at the expense of IR and EI99. The trade-offs between objectives facilitate better process design and operation while satisfying unavoidable constraints related to the processes.

ADVANCEMENTS IN VACCINE DEVELOPMENT AND DIAGNOSTIC TECHNIQUES: A COMPREHENSIVE RESEARCH REVIEW

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7.5/1(O)

Keywords: *vaccine development, diagnostic techniques, advancements, disease control, public health*

Vaccines and diagnostic techniques are essential tools for preventing, controlling, and treating diseases. This comprehensive review examines recent advances in vaccine development and diagnostic techniques, highlighting their impact on disease control and public health outcomes. The review starts with discussion on traditional vaccine approaches, such as live attenuated, inactivated, and subunit vaccines. It then discusses cutting-edge vaccine technologies, such as mRNA vaccines, viral vector vaccines, DNA vaccines, and nanoparticle-based vaccines. These advancements have revolutionized the field by offering enhanced safety, efficacy, and rapid development capabilities. Side by side the review explores advances in diagnostic techniques. Traditional methods, such as microscopy, serological tests, and molecular diagnostics, are examined. After this, it proceeds to discuss Novel approaches, such as point-of-care testing (POCT), next-generation sequencing (NGS), and immunoassays. The role of artificial intelligence (AI) in diagnostics is also discussed, highlighting the potential of machine learning algorithms and image recognition for accurate and efficient diagnosis. The integration of vaccines and diagnostics is a key focus of this review. The importance of combining these two disciplines is emphasized, along with successful examples of integration in disease control. The review explores the impact of these advancements on public health, including disease prevention, reduced morbidity and mortality rates, and economic benefits. The review addresses future directions, challenges, and ethical considerations in vaccine development and diagnostic innovation. It underscores the need for continued research, collaboration, and effective regulatory policies to ensure the successful translation of advancements into improved public health outcomes.

INVESTIGATING THE ANTI-CANCER POTENTIAL OF ORGANOSELENIUM-SUBSTITUTED SCHIFF BASE CRYSTAL STRUCTURE AND ITS CU(II) COMPLEX IN PANCREATIC DUCTAL ADENOCARCINOMA

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7.6/2(O)

Keywords: *Organ selenium substituted Schiff base, Copper (II) complex, pancreatic ductal adenocarcinoma, clonogenicity, cell cycle, apoptosis.*

Pancreatic Ductal Adenocarcinoma a type of Pancreatic Cancer, ranks as the fourth prominent cause of cancer-related deaths worldwide. It is a relatively uncommon form of cancer originating from the Ductal epithelium of the pancreas, accounting for 90% of pancreatic cancer cases. Elderly individuals with a history of smoking, diabetes, obesity, or pancreatitis are considered at higher risk for developing this type of cancer. Our research focuses on synthesizing and characterizing novel Schiff base ligands and their metal complexes. In this study, we have successfully synthesized a new Schiff base and its copper complexes. These compounds have demonstrated significant anti-proliferative activity against several pancreatic cancer cell lines, including CFPAC-1, BxPC-3, PANC-1, Panc10.05, and SW1990. They exhibited no notable cytotoxic effects on normal pancreatic cells (HPNE), even at higher concentrations. Moreover, treatment with the copper complex named MOF-Cu-1 has shown dose-dependent inhibition of the clonogenic ability of the pancreatic cancer cells mentioned above. Additionally, this compound induces cell cycle arrest in the G1/S phase and promotes apoptosis in a dose-dependent manner. These findings highlight the potential of the Schiff base in complex with copper as a promising candidate for further investigation into its role in mediating anticancer activity. This compound specifically targets the activation of apoptosis and reactive oxygen species pathways, providing a basis for future research endeavors. In conclusion, our research underscores the therapeutic potential of the synthesized Schiff base and its copper complexes in combating pancreatic cancer. These findings pave the way for further studies to elucidate their precise mechanisms of action and explore their clinical applications.

SERUM URIC ACID AND RANDOM BLOOD SUGAR AS POTENTIAL CORRELATES OF HYPERTENSION

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7.7/3(O)

Keywords: *Hypertension; Coronary heart disease; Hyperuricemia; Serum uric acid; Insulin resistance; Random blood sugar.*

The hypertension prevalence is increasing on a worldwide basis, and it is considered to be a key contributor to coronary heart disease (CHD). Further, it is also a risk factor for type 2 diabetes mellitus. Therefore, in this study, we aimed to investigate the relationship between serum uric acid (SUA) and random blood sugar (RBS) with blood pressure in the selected population of Prayagraj district. The data was collected from urban wards of Prayagraj district in which 200 adult males were screened for blood pressure, SUA and RBS levels. The blood pressure was measured using standard sphygmomanometer. The serum uric acid was determined using Erba Uric Acid DES Kit, Modified-Trinder Method, End Point. The random blood sugar levels were measured using a glucometer. American heart Association (AHA) 2017 guidelines was used to classify hypertensive subjects (130mmHg and above for systolic and 80mmHg and above for diastolic blood pressure). The mean SUA level for hypertensive group (6.9±1.3mg/dL) was significantly higher ($p<0.001$) than normotensive group (3.8± 1.3mg/dL). The significant difference was found for RBS between both the groups. It was observed that there was a strong positive correlation present between SUA and systolic ($r=0.83$, $p<0.001$) blood pressure and with diastolic ($r=0.78$, $p<0.001$) blood pressure too. The RBS levels also showed a significant positive correlation with systolic ($r=0.55$, $p<0.001$) and with diastolic ($r=0.51$, $p<0.001$) blood pressure. Thus it can be concluded that SUA and RBS can be considered as important risk factors for hypertension.

ELECTROCHEMICAL SENSOR FOR THE DETECTION OF AN ANTI-CANCER DRUG IMATINIB BASED ON METAL ORGANIC FRAMEWORKS ANDGRAPHENE OXIDE NANOCOMPOSITES.

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7.8/4(O)

Keywords: *Imatinib; Glassy carbon electrode; Graphene Oxide; Metal-organic frameworks; Nanocomposite*

A cutting-edge electrochemical sensor was developed by modifying a glassy carbon electrode (GCE) with a nanocomposite comprising Graphene Oxide and Metal-Organic Frameworks (MOFs). This innovative sensor exhibited remarkable catalytic properties, enabling highly sensitive detection of imatinib (IMB). The sensor's structure and appearance were thoroughly characterized using electrochemical impedance spectroscopy (EIS) and field emission scanning electron microscopy (FE-SEM). To assess the porosity of the MOF material, the Brunauer-Emmett-Teller (BET) and Barrett-Joyner-Halenda (BJH) techniques were employed. Under carefully optimized experimental conditions, the sensor displayed excellent electrocatalytic performance in detecting IMB. The sensor achieved an outstanding limit of detection (LOD), signifying its exceptional sensitivity. These results showcase the sensor's potential for accurately measuring IMB concentrations even at extremely lowlevels. In summary, the integration of Graphene Oxide and MOFs on the GCE platform resulted in a highly sensitive and reliable electrochemical sensor. Its outstanding performance, along with the comprehensive structural characterization, opens up new possibilities for various analytical applications, especially in the field of pharmaceutical analysis and biomedical research.

AN ENVIRONMENTAL REGULATORY IMPACT ANALYSIS OF GREEN INFRASTRUCTURE FOR SUSTAINABLE CITIES IN INDIA

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7.9/5(O)

Keywords: *Sustainability; Green Infrastructure; Urban Planning; Policy; SDGs*

In the growing concerns about climate change in a rapidly urbanising country like India there has been a growing number of Green Infrastructure (GI) based solutions that are being explored to make the cities more sustainable and resilient to the impacts of Climate Change. As seen in many developing countries that has already implemented GI planning, it is important to have a strong policy framework for the wide and effective implementation of GI. There has been very little research done on India's policy framework in the context of GI. This paper analyses various acts, policies, rules and bylaws, missions, schemes, plans, programmes, advisories and guidelines that has implications in GI planning and implementation in cities using environmental regulatory impact analysis (E-RIA) developed by Anderson and Gough, 2022. Thirty-one policy instruments were analysed for their effectiveness in GI planning and implementation, and for their alignment with relevant Sustainable Development Goals. The results show that the maximum number of the policy instruments fall in the minimum coercive category; there are also several instruments that are moderately coercive. Five policy instruments including Smart Cities Mission and AMRUT are highly coercive and very efficient in urban GI implementation. The analysis concluded that India has a wide range of policy instruments based on sustainability for urban GI planning and implementation, yet it lacks integration of these instruments and a wider use of GI as a concept in its policy documents.

PROCESS PARAMETER OPTIMIZATION OF ELECTROCHEMICAL MACHINING PROCESSES USING THE RAO ALGORITHMS

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7.10/6(O)

Keywords: *Optimization techniques; Electrochemical machining; Non-traditional machining processes; Rao algorithms.*

Electrochemical Machining (ECM) is a versatile and efficient non-conventional machining process used for the precise removal of material from conductive work piece materials. The optimization of process parameters is crucial for enhancing the performance and quality of ECM. The optimization of process parameters is crucial to achieving the optimum value of response parameters. This study proposes the use of the Rao algorithms, a recently developed optimization technique, to optimize the process parameters of ECM and its accompanying processes. In three independent case studies that were previously optimized using various optimization techniques, the effects of various process parameters are examined using the Rao algorithms. The optimal set of response parameters found from the Rao algorithms were found to be superior than other advanced optimization techniques. This study concludes that the Rao algorithms are promising and effective approach for process parameter optimization in ECM and its accompanying processes, which can enhance the machining efficiency and quality in various industrial applications.

PROCESS OPTIMIZATION FOR HIGH-YIELD EXOPOLYSACCHARIDE PRODUCTION IN SYNECHOCOCCUS ALGAL CULTURE: A SUSTAINABLEAPPROACH

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7.11/7(O)

Keywords*: Exopolysaccharide (EPS) production, Synechococcus algae, Response Surface Methodology (RSM), BG-11 Media, miniTAB*

The microalgae Synechococcus are of great interest to biotechnology and environmental sustainability due to their potential applications, including biofuel production, healthcare, nutraceutical and cosmetics industry, and bioremediation of industrial wastewater. The objective of this study is to optimize exopolysaccharide (EPS)production in Synechococcus algae culture by evaluating the effects of dipotassium hydrogen phosphate, magnesium sulphate heptahydrate, and calcium chloride dihydrate on growth and exopolysaccharide production. Exopolysaccharide (EPS) production were closely monitored, and statistically analyzed using Response Surface Methodology (RSM), to determine optimal levels for maximizing EPS production. The study also examined the relationship between these variables via Response Surface Methodology (RSM) using miniTAB software. Optimization of EPS production in Synechococcus algal culture for enhanced production will promote development of safe to use with zero minimal side effects-based healthcare products (antibacterial, antioxidant, anticancer, and immunomodulatory agents).

CFD SIMULATION OF OPERATION THEATRE FOR COMFORT OF PATIENT

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7.12/1(P)

Keywords: *CFD analysis, Finite element method, Human comfort, HVAC, k-Ɛ model*

The purpose of this study was to enhance patient comfort during surgical procedures by simulating air flow and temperature distribution in an operating room using computational fluid dynamics (CFD). The ventilation system was modelled, and its influence on the thermal environment was examined. CFD simulation is an effective tool for modelling and analysing the air flow and temperature distribution in a complex environment such as an operating theatre. Our study utilised this approach to investigate how the ventilation system affects the thermal environment and, subsequently patient comfort. The outcomes demonstrated how air flow and temperature distribution can be optimized to reduce patient discomfort and ensure their wellbeing during surgery. This study's findings can be utilized to enhance the overall patient experience in the operating room and, ultimately, to improve the efficacy of surgical procedures. Air flow and temperature distribution in complex environments, such as operating rooms, can be effectively modelled and analyzed using CFD simulation. Utilizing this methodology, the study investigated the impacts of the ventilation system on patient comfort and thermal environment. Four cases of different height and position of cooling air in Operation theatre is modelled in Solid works and simulated in CFD for examining the most suitable position of inlet air in the operation theatre. In this study the velocity streamline and temperature are compared with human comfort conditions. A double inlet on two adjacent walls proves to be best effective positions for maintaining the human comfort condition according to Operation theatre velocity 1-2m/sec and 23°C Temperature.

BIOMEDICAL APPLICATIONS OF METAL ORGANIC FRAMEWORK COMPOUNDS

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7.13/2(P)

Keywords: *Drug Delivery, Tissue Engineering, Biosensing, MOFs.*

Due to their outstanding qualities, Metal-Organic Frameworks (MOFs) have become attractive contenders for biomedical applications. This review offers a thorough examination of MOFs in biomedicine. It is explained how to create MOFs, how to characterize them, and how to use them for tissue engineering, imaging, and drug delivery. The key feature of Metal Organic Framework Compounds is high porosity and customizable architectures make itfor targeted therapy and controlled release of drugs. Important property of MOFs to encapsulate substances enhances therapeutic effectiveness and reduces negative effects. MOFs act as contrast agents in medical imaging, boosting techniques like MRI, CT, and PET. The imaging agents can be included into MOFs' structures; resolution and accuracy are increased. MOFs also have the potential to be used in biosensing, which would allow for the accurate identification of diseases and bimolecular. This is important for the early detection and monitoring of illnesses. MOFs are included into tissue engineering scaffolds to provide mechanical support, promote cell adhesion and enable controlled release of bioactive chemicals in an effort to advance regenerative medicine.

IN SILICO EXPLORATION OF NATURALLY-DERIVED BIOACTIVES AS POTENTIAL INDUCERS OF OLIGODENDROGLIAL TRANSDIFFERENTIATION OFSTEM CELLS

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7.14/3(P)

Keywords: *Stem cells; Oligodendrocytes; curcumin; Withaniasomnifera; Smoothened receptor; Molecular docking.*

Demyelinating disorders comprise damage to the myelin sheath, a protective lipid-rich covering around the axonal region of neurons. This loss of myelin coupled with the inability of neurons to divide results in widespread weakening of action potentials, defective conduction of nerve impulses, poor axonal maintenance and ultimately progressive loss of neurons. Stem cell therapy aims at neuroregeneration via an expansive spectrum of approaches among which remyelination-based approaches target the replenishment of oligodendrocytes (OLs) – neuroglial cells which aid in neuronal maintenance and more importantly remyelination. But numerous in vitro differentiation protocols for oligodendroglial lineage induction face issues such as prolonged timespan, dependence on synthetic inducers, exorbitant expenses and sub-par differentiation efficiency. Our current in silico study aimed to identify natural replacements for synthetic inducers from a pool of bioactive compounds derived from Curcuma longa and Withaniasomnifera to transdifferentiate OLs from mesenchymal stem cells (MSCs). Smoothened receptor (Smo) - mediated downstream signaling promotes OL differentiation and lineage progression of pre-myelinating OLs to myelinating OLs. Hence, we performed pharmacokinetics prediction and molecular docking of these bioactives withSmo considering the receptor's contribution to oligodendrogenesis via the canonical sonic hedgehog (SHH)pathway. Out of 1289 analogues of curcumin and 80 bioactives of Withaniasomnifera we identified the compounds with PubChem I.Ds. 68815167 and 25880 respectively as the best docked ligands. The curcumin analogue68815167 could be proposed as a lead molecule for interaction with Smo and activation of its downstream cascade to enhance OL differentiation.

SUSTAINABLE IOT DEVICE TO ASSESS PREGNANT WOMEN TO OVERCOME MISCARRIAGES

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7.15/4(P)

Keywords: *Pregnancy, Gestation, Location, Heart Rate, IoT, Sustainable, Sensor*

Pregnancy is an immensely delightful time in the life of a woman; however it also happens to be the most difficult. The childbirth occurs after 38 weeks of fertilization. In the proposed system the fetal heart rate and contractions are continually calculated by an AD8232 HR sensor. A Neo-6M GPS sensor is used to track the current location of the pregnant mother, whereas a GSM MODULE is used to send the alert message. The pulse rate readings of the mother are assessed at every second by the proposed sustainable IoT device that includes various sensors. If the mother goes through the labor pain stage, both the mother and the fetus experience sudden excitement and a rapid rise in their pulse rate. This triggers the device to send an alert message informing the occurred event through Short Messing Services (SMS) to the registered caretaker/family members/guardian's mobile number.

SESSION-VIII

ONLINE PRESENTATIONS AND STRUCTURAL METHODS FOR SUSTAINABLE DEVELOPMENT

SDG 3- GOOD HEALTH AND WELL- BEING, AMELIORATING WOMEN'S HEALTH THROUGH SOCIAL MEDIA: AREVIEW

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8.1/1(OO)

Keywords: *Communication; Social media platforms; Women's health issues; Information dissemination; Women emancipation.*

This paper critically assesses whether social media platforms have adequately reflected the field of healthcare for women. This would be important for accomplishing and accelerating the Sustainable Development Goals (SDGs)for gender equality and health as delineated by the United Nations. Representation of women's health in the broader context of healthcare services with reference to social media communication has been analysed after conducting a comprehensive review of the literature. Any nation's development depends on the health of its citizens. Women constitute almost half of the population; awareness about their health is of utmost importance. In the fast-paced world, many times, women are ignorant about their health, they take it for granted by not seeking timely decisions and actions; resulting in serious health issues. In this technology-driven world, social media platforms indeed, play a pivotal role in knowledge dissemination. In this age of technology, information spreads to the remotest part of the globe within no time; hence, it becomes imperative that accurate data is disseminated. Social media has the power to engage users and modify their behavior for the sake of their health. Thus, social media can serve as a catalyst for achieving gender equality and the health and well-being of women. By creating a safe space for discussions, social media can help break down taboos and encourage women to talk openly about topics that were once considered taboo.

ROLE OF MACHINE LEARNING IN THE DESIGN OF CROP IRRIGATION SYSTEM

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8.2/2(OO)

Keywords: *Agriculture; Internet of Things; Machine learning; Saffron; Sensors.*

Saffron is a highly prized and demanded spice globally due to its labour-intensive harvesting method. As per the data available in literature, it takes about 200-300 hours of labour to plant saffron corms on one hectare of land and30-40 hours per hectare to manually irrigate the fields several times a week. One of the major problems faced in saffron cultivation is its rate of production with exponentially rising demand. The continuous monitoring and controlling parameters (Temperature, humidity, and light intensity) play a vital role in the optimal growth of the plant. But, one of the major challenges in saffron cultivation is water management for which the researchers need to strive for an automatic system of irrigation. To address this issue, we have proposed the use of sensors and a live data streaming app to maximize saffron production. The sensors can be remotely located in the saffron growing area which is connected to the app via wireless connections, allowing farmers to continuously monitor various parameters. The app, developed using technologies such as ReactJS and Google Firebase, allows for real-time data streaming, enabling farmers to view the current conditions at any time and make adjustments accordingly. Using this scheme, the farmers can ensure whether the conditions for saffron plant growth are optimal or not. Our proposed application has led to the efficient management saffron cultivation. This system has the potential to help meet the increasing demand for saffron globally while also reducing the labour-intensive process of saffron harvesting.

IDENTIFYING THE CURRENT TRENDS IN DESIGN AND DEPLOYMENT OF SOFTWARE IN AUTONOMOUS VEHICLE

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8.3/3(OO)

Keywords: *AUTOSAR, PARAMETRIZATION, ADAS, AUTONOMOUS VEHICLE*

The objective of this research is to give a generalised framework for the automotive industry. Despite the industry's fast expansion over the previous ten years, more and more manufacturers are focusing on designing fresh automobile kinds. The automotive industry finds it difficult to mass-assemble cars because of the stringent software and certification requirements. In the case of automobiles, ensuring the security of the drivers, passengers, and other pedestrians must be given top priority. Getting to your intended location is the primary objective of driving an automobile. Autonomous cars are somewhat constrained by the line of vision capabilities of the onboard sensors, such as radar, lidar, and cameras. Wireless inter-vehicle communication that conveys information that cannot be obtained in another method, in addition to data about automobiles that are out of sight, can be used to get around this limitation, allows for the adoption of collaborative conduct, which can greatly improve the movement of traffic and reduce energy use. Vehicles are interrelated for traffic control, and this promotes cybercrime. The value of the proposed research lies in combination with the safety of the driver and protection from the cyber-crime. The proposed system prepares vehicle software and provide extra level of security by using four security levels so that data cannot be shared and can be protected by giving unique sign to the data. By using Parameter Tools, the proposed system adds various features in the vehicle by taking care of data and driver safety and security.

A SMART CATALYTIC CONVERTER FOR MONITORING AND REDUCING VEHICULAR EMISSIONS USING IOT TECHNOLOGY

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8.4/4(OO)

Keywords *— Blynk Application, IoT Technology, Smart Catalytic Converter, Vehicular emissions*

With the increasing concern over environmental pollution and its impact on human health, reducing carbon emissions has become a priority for the automotive industry. There are existing solutions for reducing carbon emissions, such as catalytic converters, which are effective but may lose their efficacy over time due to the accumulation of impurities. In this article, we propose a smart catalytic converter that utilizes IoT technology and Blynk application to monitor and reduce vehicular emissions. The implemented system is designed using MQ135gas sensor, DHT11 sensor, Node MCU ESP8266, I2C Converter for LCD display, and LCD display to measure the levels of CO, Ammonia, Benzene, and smoke gases in the catalytic converter of a car. Unlike traditional catalytic converters, the implemented system sends an email notification to the driver using the Blynk application when the level of gases reaches a high level, prompting the driver to take necessary measures to reduce the carbon footprint. The system provides real-time updates on the sensor data, allowing the driver to monitor the emissions levels of the car. The implemented system offers an innovative solution to reduce carbon emissions and promote eco-friendliness in the automotive industry.

OPTIMIZATION OF PROCESS PARAMETERS FOR ULTRASOUND-ASSISTED SOLKETAL SYNTHESIS USING SULFATED ZIRCONIA CATALYST

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8.5/5(O)

Keywords: *Glycerol acetalization; Solketal; Ultrasound-assisted synthesis; Sulphated zirconia*

The reported work focuses on the ultrasound-assisted synthesis of solketal using glycerol and acetone as reactants and sulfated zirconia as the catalyst. The influence of process parameters like reactant ratio, catalyst dosing, ultrasonic voltage, tip height, reaction temperature, and reaction time are studied by the Taguchi method using Minitab. The three parameters, catalyst dosing, reactant ratio, and ultrasonic voltage, are found to be significant for the conversion of glycerol and optimized by Box-Behnken design (BBD) analysis. The effect of ultrasonic frequency on the conversion of glycerol has also been studied. The progress of the reaction is monitored by the ultrasonic velocity measurement through the reaction mixture. While synthesis of sulfated zirconia using the wet impregnation method, the acidity of the catalyst is increased by increasing the concentration of sulphuric acid from 0.5M to 1.0 M, which in turn would improve conversion. The catalyst characterization includes XRD, FTIR, EDS, FESEM, BET, and NH_3-TPD analysis. The heterogeneous solid acid catalyst, sulfated zirconia, can be easily recovered from the reaction mixture and reused.

GROWTH OF A TRANSLATING FLUID SPHERE IN A SUPERHEATED LIQUID– A REVISIT TO RUCKENSTEIN THEORY

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8.6/6(O)

Keywords: *Bubble Dynamics; Two-phase flow; Fluid Mechanics; Heat Transfer*

Ruckenstein (1959, 1971) proposed a mechanism of the heat transfer in the growth of a spherical vapor bubble translating in a superheated liquid. He obtained the theoretical results for Nusselt number Nu and growth constant β, assuming a potential flow of the surrounding liquid. We have revisited the theory and solved the energy equation of the surrounding in a Spherical Geometry, using a similarity variable and assuming the potential flow. It is interesting to note that a number of close form solutions for Nu and β can be obtained at different hydrodynamic conditions. A specific hydrodynamic condition favors the Ruckenstein theory. Our theoretical results have been compared with the numerical solutions and experimental results.

EVALUATING THE TECHNICAL EFFICIENCY OF DEBT MUTUAL FUNDS IN INDIA: AN EMPIRICAL ANALYSISUSING DATA ENVELOPMENT ANALYSIS (DEA)

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8.7/7(O)

Keywords: *Data envelopment analysis, technical efficiency, debt funds, Mutual Funds, India.*

The efficacy of debt mutual funds in the Indian investment market is critical. Thus, their technical efficiency must be evaluated. Data envelopment analysis is used in this study to analyse the efficacy of several sub-categories of debt fund plans offered to Indian investors and provide suggestions to regulators, practitioners, and policymakers. Using secondary data from the financial reports of the Association of Mutual Funds in India, the study shows that investment risk, rather than related expenditures, has a bigger influence on fund performance. According to the data, about 14% of debt funds were entirely efficient in one or more years, with an average efficiency of 79.12 percent for the research period. The analysis gives critical insights for improving the efficiency of debt funds in India, emphasizing minimizing investment risk.

RANKING DUAL RESPONSE DOE SOLUTIONS IN SURFACE GRINDING USING GREEN CUTTING FLUID

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8.8/8(O)

Keywords*: Multi-Criteria-Decision-Making (MCDM); R-method; Cashew Nut Shell Liquid (CNSL); Design Of Experiments (DOE); Taguchi method; green cutting fluid.*

Abrasive surface grinding is a common finishing technique used in machining to provide a quality finish to the surface and to attain dimensional precision. The output responses, such as surface texture and temperature during grinding etc., are significantly influenced by the surface grinding parameters, which include the coolant or Cutting Fluid (CF) employed, rotational speed, and grade of the grinding wheel etc. The settings of these parameters become vital to get the desired results. This is usually attempted experimentally with the Design Of Experiments(DOE), Taguchi and other optimization methods. This dual response study is considered the case of Multi-Criteria Decision-Making (MCDM), and R-method is applied for ranking the optimal outcomes and select the ideal one amongst them. The method is employed in the experimental examination of grinding responses, such as surface texture and temperature during grinding, where eco-friendly non-edible Cashew Nut Shell Liquid (CNSL) is used asa CF when EN8 material is surface-ground. The CF type, rotational speed and grade of the grinding wheel, size of the cut, and table speed are given consideration when grinding. Taguchi's 25 design and L16 orthogonal array are used to compare the performance of CNSL to the traditionally used chemical CF. It is observed that the best solution obtained from R-method matches with the best solution given by Taguchi analysis. Also, by using R-method, there is scope for the decisionmaker to change the weights of the responses and get the optimal solution.

EFFECT OF NEARBY EXCAVATION ON DIAPHRAGM WALL UNDER STATIC CONDITION

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8.9/9(O)

Keywords: *Nearby excavation; Diaphragm wall; Numerical modelling; PLAXIS 3D software*

Due to affordability issues and the lack of available land, there have been numerous projects calling for multi-story buildings with underground basements. The deep excavations needed to build these basements typically necessitate earth holding structures like diaphragm walls. Most of these constructions are surrounded by new construction, older structures and busy roads. As a result, the new construction and any excavation work needed for the construction nearby may affect the diaphragm walls that already exist. It is therefore, suggested to model the diaphragm wall and the neighboring excavation operations in order to study the influence of excavation on the diaphragm wall. For the investigation, a case study involving a 21.2 m deep anchored diaphragm wall to retain a14.2 m deep excavation necessary for the three levels of basement for an office building located in Noida is taken into account. The soil parameters and details of diaphragm wall with anchors are taken from the previous case study. The diaphragm wall and nearby excavation was modelled using PLAXIS 3D software. Effect of nearby excavation for the new construction on diaphragm wall was analyzed by varying the distance between diaphragm wall and the excavation, and results obtained from 3D numerical analysis were compared. It has been found that the horizontal deflection of the wall with nearby excavation increases with increasing distance between the wall and the excavation until it reaches a value that is similar to the horizontal deflection of the wall without nearby excavation.

PARAMETRIC ANALYSIS OF INDUSTRIAL SHED OF DIFFERENT SECTIONS UNDER THE EFFECT OF WIND LOAD

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8.10/10(O)

Keywords: *Industrial shed; ISLC200; Roof truss; SAP2000; Stresses*

The design and structural analysis of industrial sheds play a crucial role in ensuring their safety and performance under various loading conditions. Wind load is one of the most significant factors affecting the structural integrity of industrial sheds. Therefore, conducting a parametric analysis of different shed sections under the effect of wind load is essential to optimize their design and enhance their performance. During the parametric analysis, several factors must be considered, such as material properties, geometrical dimensions, wind speed, and the shed's orientation. In this paper, a trapezoidal roof truss has been analyzed by changing the section size and type of the top chord member throughout to achieve a more structurally stable industrial shed by comparison of the parameters like stresses, deformation, bending moment etc. Two different models having different section were analyzed using SAP2000 software. Wind loads can lead to structural failures if not properly accounted for, during the design phase. These loads generate both static and dynamic effects on industrial sheds, including wind pressure and uplift forces. This analysis aids in evaluating load distribution, deformation, shear stresses, bending moment and assessing the shed's overall stability. By comparing the performance of various sections, engineers can make informed decisions about selecting the most suitable section for a specific industrial shed application. This analysis ultimately enhances the shed's resilience, safety, and efficiency. The study can contribute to the development of efficient and resilient industrial sheds, ensuring the safety of workers in wind-prone areas.

PERFORMANCE OF SINGLE, DOUBLE AND TRIPLE HELIX PILES SUBJECTED TO STATIC TENSILE LOADS

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8.11/1(P)

Keywords. *Double helix; Finite element method; Helical pile; Influence zone; Spacing ratio; Tensile capacity*

With rapid increase in population and unprecedented urbanization, we must explore improved foundation systems that can be used in densely populated areas, generate less noise, causes little disturbance to surrounding structures, produce less spoils, and can be reused or recycled. These benefits over traditional piling systems maybe obtained using helical piles, a relatively novel foundation technique. A standard helical pile's main components comprise a long central steel shaft to which helix-shaped, round steel plates are welded. Helical piles are currently used as foundations for walkways, offshore projects, boardwalks, residential buildings, and retaining walls. They were initially designed to support transmission towers and lighthouses; however, their application has increased with the improvement in their designs. Since the shaft diameter is significantly less than the helix diameter, the bearing plate, or helix, contributes most to pile capacity. In this paper, the performance of helical piles under tensile loadings has been investigated under different soil conditions. The impact of the variation in pile uplift capacity with increase in the number of helices (n=1, 2, and 3) has been assessed and presented. The load distribution pattern, failure mechanism, and settlement-based failure have been examined using 2D finite element analyses.

EFFECT OF SAND MIXING ON THE GEOTECHNICAL PROPERTIES OF BLACK COTTON SOIL

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8.12/2(P)

Keywords: *Sand, Black Cotton soil, Stabilization, Swelling Pressure, Permeability, Compaction.*

Black cotton soils exhibit high swelling and shrinkage characteristics causing several challenges in civil engineering applications involving such soils. Stabilizing black cotton (BC) soil with sand as a sustainable engineering approach offers several advantages for soil improvement and environmental conservation. This study aimed to investigate the effect of mixing sand on some of the geotechnical properties of a black cotton soil. The soil samples were mixed with 10%, 20%, and 30% sand by weight and tested for sieve analysis, specific gravity, Atterberg limits, compaction, permeability and swelling characteristics. The results showed that with increasing sand content, the specific gravity, liquid limit, and plasticity index of the soil decreased significantly. The plastic limit also decreased but to a lesser extent. The maximum dry density increased and optimum moisture content decreased with increasing sand percentage. The sand mixing improves the workability and strength characteristics of the expansive black cotton soil. Up to 30% sand mixing caused over 50% reduction in liquid limit and plasticity index. Around 70% reduction in swelling pressure was noticed with the noticeable increment in the permeability. The study demonstrates that sand mixing can be an effective ground improvement technique for black cotton soil.

CRITICAL INSIGHTS INTO INDIAN ALUMINIUM INDUSTRIES: CARBON SCENARIOS, DECARBONIZATIONMEASURES, AND ECONOMIC PERSPECTIVES

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8.13/3(P)

Keywords: *Aluminium; Mass balance; Energy balance; Decarbonization measures, Economic analysis*

Limiting CO2 emissions while meeting the increasing demand is a major technological challenge faced by the aluminum industries. Approximately 98% of the energy used in the Indian aluminum sector comes mainly from the burning of coal and furnace oil in the captive power plants. This work presents possible decarbonization measures for the Indian aluminum sector along with an economic assessment for each of the measures. Mass and energy balance for a typical aluminum production unit were developed based on first principles to obtain the specific energy consumption for a base case. This was validated with the plant data available from Vedanta Aluminium, Lanjigarh, and showed a deviation of less than 3%. The average specific energy consumption for the Indian aluminium industry is 74.42 GJ/t of Al and the CO2 intensity is 20.49 t CO2/t of Al. A total of 10 decarbonization measures were analysed using the base case which can be classified as fuel saving measures (e.g., mechanical vapor recompression), renewable energy measures (e.g., biodiesel for calcination), electricity conservation options (e.g.,copper collector bar), and clean electricity (e.g., nuclear energy). The decarbonization measures were compared on the basis of cost of abated carbon. It was found that the electrolysis process in the smelter (Al production) had a greater potential for decarbonization compared to the refinery (alumina production). The distributed pot suction was found to be the largest energy saving and clean energy is the largest CO2 abatement measure. Together all the measures can save 17.64 t CO2/t of Al, which is 86% reduction.

ADVANCEMENTS IN ASH-BASED GEOPOLYMER CONCRETE: A COMPREHENSIVE OVERVIEW

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8.14/4(P)

Keywords: *GPC, Geopolymer, Density, Compressive strength, Sustainable, Response Surface Method*

The manufacturing procedure of ordinary Portland cement is widely acknowledged as a highly energy-intensive operation, leading to the release of detrimental greenhouse gases into the atmosphere, thus contributing to environmental contamination. The growth of worldwide infrastructural initiatives has resulted in a projected surge in the utilization of concrete, thereby stimulating the manufacturing of Ordinary Portland Cement (OPC). The inadequate utilization of fly ash produced by thermal power plants has led to environmental and disposal difficulties. The implementation of fly ash derived geopolymer concrete as a substitute for conventional Portland cement concrete presents a feasible resolution to tackle the environmental and land disposal predicaments. Geopolymer concrete demonstrates a diminished carbon footprint when compared to conventional Portland cement concrete. This research paper offers a thorough examination of diverse facets pertaining to geopolymer concrete derived from fly ash. The subject matter encompasses various aspects including composition, methodologies for mix design, the production process, curing protocols, advantages, drawbacks, and potential applications. Through a comprehensive analysis of relevant scholarly literature and empirical research, the primary objective of this paper is to synthesize and present a comprehensive comprehension of the topic at hand. The following document provides a comprehensive summary of the notable research discoveries regarding the characteristics of geopolymer concrete in both its fresh and hardened states. These investigations have been carried out within the last ten years. In summary, the objective of this study is to determine the key factors that should be considered when selecting an ideal curing method in order to achieve the desired performance of concrete. The aggregation of a significant quantity of data possesses the capacity to provide valuable insights for forthcoming research endeavors.

STATUS REVIEW OF SUSTAINABLE MANAGEMENT OF CONSTRUCTION AND DEMOLITION WASTE IN INDIA

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8.15/5(P)

Keywords: *Circular economy; Construction and demolition waste; Reduce–Reuse–Recycle SDG; Swachh Survekshan; Waste management.*

By adopting sustainable development goals, India pledges to balance its unprecedented development trend with the prevention of long-term environmental damage. Such urbanisation generates about 150 million tonnes p.a. of construction and demolition wastes (CDW), out of which only 1% is recycled. Poorly managed CDW degrades the environment and inflates the project cost. The existing frameworks namely, The CDW Management Rules 2016 and Swachh Survekshan have myopic scope to handle the CDW which is already generated. They overlook the more sustainable option of 3R Rule (Reduce–Reuse–Recycle) of circular economy. Compared to the intangible environmental cost, circular economy offers tangible financial benefit which can convince individual contractors to manage CDW in sustainable way. It needs support infrastructure of CDW processing plants which are currently too few or missing in the areas with highest potential of urban growth. Metro city of Kolkata is one such example. Ministry of Housing and Urban Affairs have identified the roadblocks and prepared the roadmap of adopting circular economy principles for CDW management though 3-pronged approach of design - construction, waste management and legislative or statutory. Though it loosely links to Swachh Survekshan via the second component but remains silent on other two. Hence, CDW management policies in fragmented manner are unable to bring the desired results. To bridge this gap, the current study proposes a 10-point policy framework which will be beneficial for policy makers for synchronizing the existing CDW management approaches and in turn make the construction sector more sustainable. Keywords: Circular economy; Construction and demolition waste; Reduce–Reuse–Recycle SDG; Swachh Survekshan; Waste management.

FAST AND EASY NATURAL GAMMA-RAY SPECTROMETRY METHOD TO FIND PRESENCE OF EXPANSIVE SOIL LAYERS IN CIVIL FOUNDATIONSITES FOR SAFE CONSTRUCTION PURPOSE

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8.16/6(P)

Expansive soils are considered unstable and weak for civil foundations of roads, buildings, bridges and dams. To assess the potential of Natural Gamma-ray Spectrometry (NGS) geophysical method in classifying foundation soils based on their expansiveness, radiometric scanning of collected soil samples and soil profiles in Varanasi rural area, India was carried out to record natural gamma-ray intensity due to Thorium and Potassium radioisotopes present in soils. Standard soil physico-chemical tests were carried out to find soil mechanical properties and chemical composition. Free swell tests and Atterberg limit experiments were carried out to find out expansion capacity of individual soil samples. The expansive soils were identified with the help of cross plot of gamma-ray potassium (GR-K) and thorium (GR-eTh) intensity data points in counts per sec (C/s) units. The increasing trend of GR-K matched with rise in potassium bearing mica and illite clays in soil. Swelling soils with higher organic matter and smectite clay contents had lower potassium and thorium levels. The results of NGS analysis matched with findings from conventional soil free swell and Atterberg methods. NGS devices in the form of slim probes can be thus used as an easy and fast geophysical method for survey of civil foundation sites to find presence of expansive soil layers and thus can contribute to create safe constructed structures.

A COMPREHENSIVE REVIEW ON GREEN INHIBITORS FOR CORROSION PROTECTION OF STEEL REINFORCEMENT IN REINFORCED CONCRETE MEMBERS

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8.17/7(P)

Keywords: *Corrosion resistance, Green Inhibitor, Fruit extracts, Sustainable Environment*

The article summarizes the need for green inhibitors in recent construction and the advances, opportunities, and the progress of green inhibitors in corrosion resistance. Since the corrosion is the most common problem faced in various buildings due to . There may be a various technology that can be used to prevent corrosion in steel structures. However green inhibitors have become an unavoidable technology in recent days. The fundamental concept behind most inhibitors is to create a very thin chemical layer typically one or two molecules thick on the surface of the steel in order prevent corrosion attack. The chromates, nitrites, molybdates, tungstate are the commonly used chemical inhibitors. However, the use of chromates is restricted in recent days, and these inhibitors have certain condition to react to the environment. Unlike, green inhibitors these have disadvantage of polluting the environment and in some cases, they may cause the pitting effect on the surface of the metals, if they were used in the low quantity. In recent days the researches on the use of green inhibitors have accelerated due to various reasons. Green inhibitors are those are obtained from the plant extracts, pharmaceutical drugs and so on. The recently used green inhibitors are eucalyptus leaves, ginger extract and some of fruits peeled skin, like banana peel, watermelon peel etc.

ESTIMATION THE PERFORMANCE OF THE CONCRETE USING ARTIFICIAL NEURAL NETWORK

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8.18/8(P)

Keywords: *Life Cycle Assessment, Environmental Impact, Assessment Method, Sustainability Assessment, Neural Network.*

A lot of structures have been constructed using concrete in last three decades worldwide. However, out of these constructed concrete structures, it is observed that few structures are showing deterioration, damage and disintegration due to non-durable concrete. These are problematic for the lifespan of the structures. This is challenging task for civil engineers to recognize the future performance of concrete characteristic at time of construction. If these short comings are determined at the time of construction, sudden collapse of the structure can be avoided in future. In this paper, five parameters were investigated to predict the performance of the concrete in the future. These parameters are density, void ratio, and water absorption after 28 days, specific gravity of coarse and fine aggregates. 30 sets of concrete cubes of grade M30 having dimension 150 mm × 150 mm × 150 mm were cast and these parameters were determined after curing of 28 days. The compressive strength of these cubes were determined and based on the compressive strength, future performances of the concrete were predicted. A neutral network was prepared to predict the future performance of the concrete using density, void ratio, water absorption, specific gravity of coarse and fine aggregate as input and future performance as output. Hence the performance of the concrete can be predicted using above investigated parameters that will be helpful to avoid the sudden collapse of the structures.

ANALYSIS OF DAMPING BEHAVIOR OF MULTI-LAYERED SANDWICH COMPOSITE WITH VISCOELASTIC CORE

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8.19/9(P)

Keywords: *Viscoelastic, Sandwich Composite, Isobutylene Isoprene Rubber (Butyl rubber), Natural Frequency, Vibration Damping*

The purpose of this paper is to determine the study of a finite element model for the analysis of multi-layered sandwich plates with a viscoelastic core and laminated anisotropic Aluminum face layers. The dynamic loading problem is solved in the time domain with viscoelastic time dependent material properties for the core. Mechanical parameters, such as stiffness, strength, fracture toughness, or damage resistance, are of particular relevance when examining composite material systems and are often taken into account in the context of basic static loading conditions. However, practically all applications for composites, like those for most materials, include dynamic loading, which requires analysis of the dynamic response of the composite. The dynamic behaviour of the viscoelastic sandwich model is compared with solutions found for the model without the viscoelastic core. The viscoelastic sandwich model was shown to be able to present highly accurate results using much less like the finite element method. To investigate the effect of the sheet thickness, under various boundary conditions, on the natural frequencies of the structure, several parametric tests are carried out. The numerical results found in ANSYS show that the amplitude of vibration could be deceased to a great extent by replacing the aluminium sheet with a viscoelastic core under dynamic loading end conditions.

PERFORMANCE EVALUATION OF PERVIOUS CONCRETE INCORPORATING MARBLE WASTE AND SILICA FUME

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8.20/10(P)

Keywords. *Pervious Concrete, Marble Waste, Silica Fume, Mechanical properties, Hydraulic properties.*

Pervious concrete plays a crucial role in sustainable urban development by effectively managing storm-water runoff, allowing rapid water infiltration, supporting groundwater recharge, and contributing to eco-friendly infrastructure. The composition of pervious concrete consists of coarse aggregates, cementitious materials, admixtures, water, and a restricted amount of fines, which collectively contribute to its porous structure. This study explores the utilization of marble waste as an alternative to conventional aggregates, while also incorporating silica fume as a replacement for cement to enhance the mechanical and hydraulic properties of pervious concrete. Experimental investigations were conducted to assess key performance characteristics, including compressive strength, flexural strength, splitting tensile strength, and permeability properties. The investigation involved the incorporation of marble waste into coarser aggregate gradation at three varying proportions (0%, 50%, and 100%). The results reveal that the addition of marble waste and silica fumes contributes to improved mechanical properties by enhancing the interlocking effect and promoting the densification of the cementitious matrix, resulting in increased compressive strength and reduced porosity. Furthermore, the application of super plasticizing additive in the pervious concrete showed advantageous workability and cohesiveness, eliminating the need for vibration techniques. The incorporation of waste marble at a 50% proportion and silica fume at a 10% proportion as substitutes for aggregates and cement, respectively, enables the production of new pervious concrete that exhibits satisfactory performance. Overall, the findings of this study contribute to the progress of environmentally friendly construction materials and promote the efficient and sustainable utilization of waste materials.

A LITERATURE REVIEW ON ELECTRIC TWO-WHEELERS IN INDIA: SUSTAINABLE MEANS TO TRAVEL

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8.21/11(P)

Keywords: *Electric-2-wheeler, environmental awareness, green concept.*

Green ennoblement is not just a trend, it is rather an obligation for society. Unless the urgency of the green concept acceptance is not scrupulously interpreted by the masses, it is the unabated duty of the governments, Intellectuals, Scientists and other learned personalities of the society to spread the message of promoting green throughout the globe. Paramount elucidation to the environmental pollution problems is through abandoning the source i.e. ICE and searching for electric vehicle alternatives on the roads.

The main objective of this research is to acquire an in-depth understanding of the previous studies on electric two-wheelers. This paper is a secondary data analysis of the electric two-wheelers prevalence and acceptability in Indian society. The paper through more than 25 research papers, studies the literature available and analysis how far electric two-wheelers are pursuing in Indian society, and also states their limitations that are jeopardizing the smooth road to their success. The study reveals that electric two-wheelers in Indian society are still in their nascent stage. Research and development, consumer awareness, and government initiatives are some of the major domains that need augmentation if the electric automobile industry is yearning for amelioration.

SESSION-IX

MANAGEMENT AND SOCIAL ISSUES

NUTRITION AND LIFESTYLE

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9.1/1(I)

Lifestyle habits mostly affect the state of nutrition in both children and adults. Insufficient sleep, poor nutrition, insufficient physical activity, suboptimal calorie intake have led to the fact that in some countries obesity is a bigger problem than hunger, which further entails certain health problems. Children who were taught to eat grains, vegetables, and fruits in childhood, that is, to eat healthily, have a lower risk of diseases such as type 2 diabetes, cancer, heart disease, and diseases closely related to obesity. The nutrition indicator is one of the indicators of obesity that is often used, but it is not relevant, so the circumferences of certain parts of the body are most often taken. In addition to the risk of disease, bad lifestyle habits also affect the growth and development of children. The set of intentions that are represented in the daily diary are presented in the food pyramid, which aims to regulate based on energy intake. Based on the results of the research, it is recommended that physical activity of 60 minutes a day can lead to the maintenance of body mass and thus to the reduction of the possibility of diseases.

SUSTAINABILITY FOR DEVELOPMENT

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9.2/2(I)

Sustainability is not 'an' alternative; it is the 'only' alternative. It is critical to understand that there is a social angle to the process of economic-technological growth. We have been ignoring it for long and have caused an irreparable loss to life on this planet. Sustainable development cannot be achieved without significantly transforming the way we build and manage our urban spaces. As per an estimate of United Nations, the urban population is expected to reach 6.5 billion by 2050. Cities occupy just 3 percent of the Earth's land but account for 60 to 80 percent of energy consumption and at least 70 percent of carbon emissions. At the same time, the economic role of cities is momentous. They generate about 80 percent of the global GDP. But it is important to remind ourselves that around 828 million people are estimated to live in slums, and the number is rising. The UN Sustainable Development Goals have reemphasized the issue on the global forum in a more specific manner for making appropriate action plans and implementing them. The issues are glaring and mammoth in size but it is high time that we face them with determination and strategically. Making sustainable cities (SDG 11) necessitates creating safe and affordable housing, and building resilient societies and economies. It is proposed here, that leaving it on the governments alone to find a solution to this ever increasing problem may not be enough. Also, the social bodies largely play the role of facilitator and do not have much resources to intervene directly. Hence there is a need to work out a participatory model for ensuring sustainability in a holistic manner. In this backdrop a participatory model is being proposed here. This model identifies five stakeholders and their respective roles in creating sustainable housing in urban settings.

STRESS MANAGEMENT

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9.3/3(I)

Stress has proliferated in modern society, becoming a significant problem among students of higher education. Stress is the body's physiological response to both good and unpleasant life circumstances.

Higher educational Institutions must address the issue of stress for successful curriculum competition. It has always been thought that teaching is an extremely stressful profession.

When the pressure is higher than the resource, stress ensues. Stress is not inherently harmful, but how we react to it matters. The majority of the stress we experience is self-generated. It is generated by how we view life. It is important to note that we cause the majority of our own problems in our daily lives by reacting negatively to situations, which may be due to a lack of awareness or an inability to respond positively.

ENVIRONMENTAL CSR AND REPEAT PATRONAGE INTENTION: MEDIATING ROLE OF BRAND ATTITUDE

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9.4/1(O)

Keywords: *Corporate Social Responsibility; CSR; Environmental CSR; Repeat Patronage Intention; Brand Attitude*

Consumers are becoming increasingly aware of environmental issues. Consequently, the company are also showing concern about the environment alongside its business operations. Environmental CSR is the concept that aims to lessen the negative consequences of a company's operation without compromising economic performance. The study aims to analyze the effect of environmental CSR on repeat patronage intention and seeks to examine the mediating role of brand attitude. A questionnaire-based survey was employed to collect the data from a total of 199consumers using the purposive sampling method. Analysis was carried out using structural equation modeling in Amos 22.0. The results indicate that environmental CSR has a significant impact on brand attitude and repeat patronage intention. In addition, brand attitude was found to exhibit positive impact on repeat patronage intention. Moreover, the results of mediation analysis show that brand attitude partially mediates the effect of environmental CSR on repeat patronage intention. The study also produced several interesting theoretical and practical implications which may be useful for academicians, managers and policy-makers.

SOCIO-ECONOMIC IMPACT ON SPIRITUAL AND RELIGIOUS TOURISM IN INDIA

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9.5/2(O)

Key words: *Religion, Rituals, Spirituality, Tourism, Motivation.*

This paper analyse the Spirituality and Religious practice and its relation with tourism in the Indian society. Spiritual and religious tourism is not a new concept it has been existed in society since dawn of civilization. It is one of the earliest forms of common tourism. People had travelled for religious practice and different kind of other religious motivations. There are many examples in history that shows Saints (Sadhus) and sometimes kings also move from place to place in the search of spirituality. Since ancient times India has been the center for religious, cultural and spiritual activities because it has several beliefs, strong foundation of ancient culture, various religion and their own religious practice and spiritual beliefs. In Hindu religion there is over Three million Gods, Goddess and many religious places where every Hindu wants to visit once in their life. Religion is not only about religious beliefs but it also focused on rituals, ceremonies, philosophies, manner, ethics etc. It teaches every Indian the way of life. There is a famous concept of “Tirth Yatra” for Hindus and “Haj Yatra” for Muslims which motivates Indians for religious and spiritual tourism more. So, there are many concepts in Indian society which directly connected to religious tourism. According to Tourism Industry in India, 60% of travel packages were made for religious purpose. This data shows the importance of religious tourism in Indian economy. That is why this paper is an attempt to know the socio-economic impact of spiritual and religious tourism in Indian society.

IMPACT OF FOREIGN DIRECT INVESTMENT (FDI) ON INDIAN STOCK MARKETS

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9.6/3(O)

Keywords: *FDI, FII, Share Markets, BSE, NSE*

In current scenario India has emerged as global leader in the world. Recently the statistics revealed the FDI flow in India has increased significantly in the month of November 2020-21 is 43.85 B USD. It is also at the peak from the last eight months of a this financial year and in comparison it is 37% higher than the last financial year of 2019-2020 (32.11 B USD). India is the suitable place for the investors. This paper examined the impact of Foreign Direct Investment (FDI) on the Bombay Stock Exchange and National Stock exchange. The purpose of this paper is to see the impact of FDI on growth of Bombnay Stock Exchange (BSE) and National Stock Exchange (NIFTY). Because these two are the major market players in India. There are two hypothesis frame, i.e., impact of FDI on the growth of BSE and NSE. Few literature reviews are mentioned related to the impact of FDI on Indian stock markets. This research is mainly based secondary data for the duration from 2000 to 2019. The Pearson's coefficient of correlation, scatter diagrams is the basic tool for analysis of data using the SPSS software. Foreign direct investment was found notably correlated among both the markets, i.e. NSE and BSE with a coefficient of correlation being 0.828 and 0.834 respectively. It means it showed a positive correlation between FDI and the stock markets. This research concluded that the investment through FDI in India increased the growth of stock markets. Therefore, we can suggest to the government of India and its regulating body to be a focus on increase more investment through the foreign direct investment for growth of domestic stock markets.

MANAGEMENT OF CYBER SECURITY: A REVIEW

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9.7/4(O)

Key words: *Computer, Cyber, Security, Attack, cyber security, information security, hacking etc.*

In this study, a survey of chosen literature on various aspects of cyber security is presented. When it comes to the subject of cyber security, a wide variety of topics are investigated. The discipline of information security has been a subject of research in computer science, software engineering, and information communications technology for a considerable period of time. Individuals who elucidate the weaknesses associated with cyber security assaults and criminal activities. The analysis conducted in our review demonstrates that computer system users have varying cognitive capacities that play a role in determining. The capacity of individuals or organizations to effectively mitigate information security hazards. We find deficiencies in the current state of affairs. This study aims to explore and propose potential psychological interventions that can assist computer system users in enhancing their overall user experience and performance. Adhering to security policies can effectively enhance both network and information security.

FOSTERING A SUSTAINABLE WORKFORCE: EXPLORING THE RELATIONSHIP BETWEEN TECHNOSTRESS, WORK EXHAUSTION, AND WORK-FAMILY CONFLICT AMONG REMOTE WORKERS

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9.8/5(O)

Keywords: *Technostress, work exhaustion, work-family conflict, remote workers, sustainable workforce*

In the current digital age, the widespread use of information and communication technologies (ICTs) has become even more pronounced, particularly for remote workers who have experienced heightened technology-related stress as a result of the COVID-19 pandemic and the shift to remote work. This increased reliance on ICTs has contributed to work exhaustion among remote workers, exacerbated by the obscuring of boundaries between work and home life, which has further led to work-family conflict (WFC). The objective of this study is to examine the impact of technostress on work exhaustion and the mediating role of WFC in the relationship. To investigate these relationships, PLS-SEM was utilized. The study involved a sample of 276 remote workers from the Indian IT industry who resided with their families. The findings of the analysis are presented and discussed, highlighting the implications for organizational policies and interventions that can effectively address and manage technostress, WFC and work exhaustion, ultimately fostering a sustainable workforce for organizations.

THE LEGACY OF PARTITION: A LITERARY PERSPECTIVE ON THE SDGS

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9.9/1(P)

Keywords: *Partition literature, Partition holocaust, Political freedom, Trauma, Women*

The Partition of India, a hallmark of world history, is an inevitable fact that gave rise to India's Independence. Still, the horrifying and terror-struck experiences that both people on India's eastern front and those on the western border have since then undergone are the subject matter of the partition fiction. Generations were displaced from their motherland and forced to settle in a foreign land, finding a forever home. During the Partition, the women and children suffered both mentally and physically. The emotionally charged subject of Partition and the Holocaust that followed it inspired writers who felt it was their duty to accurately portray the events in their work. Many authors of the Partition were present when the Partition genocide occurred and were even victims. In the present research endeavor, the researcher has explored the tragic experiences of Partition and its impact on women. The paper also seeks the contemporary relevance of this traumatic experience on women, especially in Subaltern Studies. To this end, the researcher has selected three novels, i.e., Amrita Pritam's Pinjar, Attia Hussain's Sunlight on a Broken Column, and Shauna Singh Baldwin's What the Body Remembers. These novels draw on the plight of the individuals that arise out of political decisions relating to national boundaries and the impact of violence and casualties in riots - communal and political as well. It exposes the lives of individuals in a society where the nation's division threatens individuals' political freedom and social standing. Partition literature is valuable for understanding the human cost of conflict and displacement. It can promote understanding and tolerance, which are essential for achieving sustainable development goals. By raising awareness of these issues, partition literature can help make the world more sustainable and equitable.

MAPPING PAST, PRESENT, FUTURE OF CUSTOMER ENGAGEMENT IN ONLINE BRAND COMMUNITIES: A BIBLIOMETRICS ANALYSIS

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9.10/2(P)

Keywords: *Customer engagement, online brand communities, bibliometric analysis, intellectual structure*

This study aims to comprehensively summarize research pertaining to customer engagement in online brand communities across several dimensions. Firstly, it delves into the details of published articles, geographical origins, authors, and their affiliations within the realm of customer engagement in online brand communities. Secondly, it employs intellectual structure to reveal past, present, and future of customer engagement within these online brand communities. To accomplish these objectives, the study employs bibliometric analysis through the utilization of the biblioshiny software and vow-viewer suite. This method facilitates an assessment of the scope and depth of research conducted in the field of customer engagement. The study focuses on an extensive dataset of 705 articles from the Scopus database, spanning between 1997 and 2023. Of noteworthy significance, this research represents a pioneering endeavor, amalgamating bibliometrics and intellectual structure which elucidates past, present, and future investigation of customer engagement. The study uncovers emerging clusters, themes associated with customer engagement. In turn, these findings provide valuable insights, highlighting potential trajectories for future research. In summary, this study contributes substantially to the comprehension of customer engagement by amalgamating diverse research perspectives.

INVESTIGATING RELATIONSHIP BETWEEN LIQUIDITY AND PROFITABILITY RATIOS OF IDBI BANK AND HDFC BANK

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9.11/3(P)

Keywords: *Bank; Current Assets; Current Debt; Liquidity; Profitability; Return on Equity*

Liquidity pertains to the ability of assets to be expeditiously and economically converted into cash, hence denoting an asset possessing a high degree of liquidity. The asset has a high level of liquidity, enabling it to be readily and inexpensively changed into cash within a short timeframe. Assets with higher levels of liquidity tend to possess greater utility. Additionally, profitability is indicative of the bank's capacity to generate revenue from its assets. This study investigates the IBDI and HDFC banks' liquidity ratios and profitability by employing multivariable linear regression analysis. The variables included for examination are benefit or profitability, return on capital, and liquid assets. The analysis is conducted over a period from 2019 to 2023.

CUSTOMER LIFETIME VALUE PREDICTION AND CUSTOMER SEGMENTATION IN E-COMMERCE: AN ANALYSIS USING BG-NBD AND GAMMA-GAMMA MODELS

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9.12/4(P)

Keywords- *E-commerce, Customer Lifetime Value (CLTV), Customer segmentation, BG-NBD model, Gamma-Gamma model*

In the dynamic world of e-commerce, our research focuses on predicting Customer Lifetime Value (CLTV) and segmenting customers using advanced models, namely the BG-NBD and Gamma-Gamma models. By analyzing real transaction data, our research provides valuable insights to empower data-driven decision-making in businesses. This paper categorize customers into segments such as "Champions," "Loyal Customers," "New Customers," and "At-Risk Customers," enabling tailored strategies based on their behavior. This approach equips e-commerce companies with the tools they need to optimize profitability and stay competitive in the ever-changing digital marketplace. Our research serves as a bridge between theoretical concepts and practical applications, offering essential resources for success in the industry.

TRADE-OFF STUDY ON ENVIRONMENTAL-ECONOMICAL ASPECTS OF A REACTIVITY CONTROLLED COMPRESSION IGNITION ENGINE USING 1-HEXANOL AND JATROPHA OIL/DIESEL IN DUAL FUEL MODE

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9.13/5(P)

Keywords: *RCCI, Jatropha oil, 1-hexanol, combustion pressure, performance and emissions.*

The current study focuses on the features of an RCCI engine that employs 1-hexanol as the LRF and JOBD20 as the HRF. Experiments run at maximum load and constant FIP (1000 bar) with varying hexanol energy shares. Compared with conventional biodiesel, RCCI engines lowered NOx and smoke emissions by 33% and 41% at full load, respectively. The BTE is somewhat reduced at full load when the HES exceeds 20% and raises by 6%. The HRR and peak pressure were much higher in the RCCI mode than in the single-fuel mode when using the biodiesel/hexanol made from jatropha oil. RCCI mode usage in diesel engines has cut 36% of NO_x emissions and 28.6 % of smoke opacity while modestly improving engine performance.

METAL ION-DOPED METAL OXIDE NANOMATERIALS IN HETEROGENEOUS CATALYSIS

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9.14/6(O)

Several metal oxides are used as the supports and sometimes, active sites for the heterogeneous catalytic reactions due to their high surface area and active parts for adsorption of reactive molecules on the metal oxide surface. The active metal dispersion on the metal oxides enhanced the catalytic activity due to the creation of a strong interface between them. The atoms present in the interface are more active and the catalytic reactions are mostly occurring in this region. However, other atoms in the active metal nanoparticles contribute less to the catalytic reaction. A single-atom dispersion on metal oxide can affect more towards the catalytic reaction because almost all single-atom particles are involved in the reactions. But, single-atom particles are not stable under the reaction condition and those will detach from the metal oxide surface. Metal ion-doped metal oxide nanomaterial can overcome this stability problem and show almost equal catalytic activity as a single-atom catalyst. Since, active metal ion bonds with lattice oxygen in the lattice of metal oxide, it stabilizes on the surface of metal oxide and participates in the catalytic reactions. During the oxidation reaction, especially CO or hydrocarbon oxidation, the lattice oxygen which present adjacent to the active metal is first bonded with adsorbed CO molecule on the active metal to convert into CO_2 and replenished by the streaming oxygen molecule. The oxide ion vacancy at active metal in the metal ion-doped metal oxide enhances the catalytic activity. Other than auto-exhaust treatment, noble metals, like Pd ion-doped TiO_2 showed high catalytic activity towards Heck reactions and hydrogenation of nitroarenes into their corresponding amines. In a recent study, the analysis of amine product by GC-MS is correlated with the analysis of amine-furfural complex by a double-beam UV-Vis spectrophotometer. The proposed mechanism of nitroarene hydrogenation by H_2 involves the breaking and rebinding of active metal and lattice oxygen bonds, which has to be supported by the DFT calculation. So, the surface mechanism of metal ion-doped metal oxide towards catalytic reaction and enhancement of catalytic reaction by changing of doping metal or metal oxide support are the future studies in the heterogeneous catalysis field.

विज्ञान एवं प्रौद्यौगिकी परिषद, उ.प्र.

(विज्ञान एवं प्रौद्यौगिकी विभाग, उ.प्र.)

विज्ञान भवन

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विज्ञान भवन

विशेष आकर्षण

- 75 जनपदों में गठित जिला विज्ञान क्लबों तथा 04 क्षेत्रीय विज्ञान एवं प्रौद्योगिकी केन्द्र (गोरखपुर, मुरादाबाद, आगरा एवं गाजियाबाद) के द्वारा विज्ञान लोकप्रियकरण एवं संचार।
- विद्यार्थियों के लिये वैज्ञानिक व्याख्यान व भ्रमण कार्यक्रम।
- समाज के विभिन्न वर्गों एवं लक्षित समुदायों में व्याप्त सामाजिक अंधविश्वासों व चमत्कारों के लिये वैज्ञानिक जागरुकता और विज्ञान प्रतियोगितायें।
- लखनऊ, गोरखपुर तथा रामपुर में संचालित 03 स्थायी नक्षत्रशालायें।
- मेधावी एमएससी विद्यार्थियों के लिये समर रिसर्च फेलोसिप।
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