BOOK OF ABSTRACTS

4th International Conference on Waste, Energy and Environment

ICWEE - 2024

July 03 - 05, 2024

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

ISBN Number : 978-93-83409-91-4

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment

3rd -5th July 2024

Organized by

Centre for Waste Management

& Centre for Excellence in Energy Research

Jointly with

Department of Chemical Engineering

BOOK OF ABSTRACTS

Sathyabama Institute of Science and Technology, Chennai

CHANCELLOR'S DESK

MESSAGE

Effective waste management and the development of sustainable energy are pivotal for safeguarding the environment, conserving resources, mitigating climate change, promoting public health, unlocking economic potential, and advancing towards sustainable development goals. Embracing sustainable approaches in these domains holds the key to forging a resilient future that benefits future generations. The recycling and waste management sector, for instance, not only promotes environmental stewardship but also acts as a catalyst for economic growth. It stimulates local economies, fosters entrepreneurship, and generates employment opportunities. Similarly, the shift towards sustainable energy sources sparks innovation, fuels job creation in renewable energy sectors, and bolsters energy security through diversification of energy supplies. These efforts not only protect our planet but also drive economic progress and foster community prosperity.

ICWEE 2024 is organized by a Centre for Waste Management and Centre of Excellence for Energy Research jointly with Department of Chemical Engineering will provide an excellent opportunity for the researchers to connect and discuss how to develop innovative ideas and feasible solutions to the existing challenges through the fascinating field of energy research. I am extremely happy to note that ICWEE 2024 is an effort to promote quality research in nanotechnology and educate us about latest advancement in the new technology.

I wish the conference a grand success

Dr. Mariazeena Johnson
Chancellor

PRESIDENT'S DESK

MESSAGE

Waste management and sustainable energy development are integral to advancing the United Nations' Sustainable Development Goals (SDGs). They directly support targets such as responsible consumption and production (SDG 12), affordable and clean energy (SDG 7), climate action (SDG 13), and sustainable cities and communities (SDG 11). By prioritizing these areas, we actively contribute to the attainment of these overarching sustainable development goals, fostering a more sustainable and equitable future for all.

It gives me a great pleasure to welcome all delegates to the International Conference on "Waste, Energy and Environment", (ICWEE- 2024) on 3-5th, July 2024. ICWEE-2024 is an interdisciplinary conference encompassing fields such as chemical engineering, mechanical engineering, electrical engineering, civil engineering, environmental science, biotechnology, waste management, energy technologies, and agriculture. The conference serves as a vital platform for researchers, academicians, and scientists to convene, exchange ideas, and foster innovation. It aims to stimulate insightful discussions that cultivate novel concepts and collaborations among participants.

I take this opportunity to congratulate the Centre for waste Management and those who involved in this scientific festival at an international level.

I wish the conference a grand success.

Dr. Marie Johnson
President

VICE PRESIDENTS' DESK

MESSAGE

The rapid advancement of technologies in Waste, Energy, and Environmental sectors has created a noticeable gap between academia and industry. Staying updated with the latest trends is essential to bridge this gap and foster collaborative efforts between these sectors.

We extend our sincere appreciation to the conference organizers for providing a platform where aspiring scientists and researchers can showcase their current research, exchange opinions, and delve into topics relevant to the conference's theme. This comprehensive program aims to inspire students to pursue careers in these critical fields with confidence and a deeper understanding.

To all involved in the conference and its participants, we extend warm greetings and congratulations. We hope this conference becomes a memorable milestone in your professional journey.

Ms. Maria Bernadette Tamilarasi **Mr. J. Arul Selvan**

Energy, ecology, and refuse are interconnected aspects that play a significant role in our lives and have a profound impact on the planet. Let's explore each of these areas in more detail in the upcoming conference ICWEE 2024. Waste management is a critical aspect of maintaining a sustainable environment. Improper waste disposal leads to pollution of land, water bodies, and the atmosphere. It also contributes to the depletion of resources and the release of greenhouse gases. The three primary types of waste are solid waste, liquid waste, and gaseous waste. To address refuse-related challenges, societies need to adopt the principles of reduce, reuse, and recycle. This is my proud honor to write a few words from my desk for those who organize ICWEE- 2024 another big success on 3-5th July 2024.

Ms. Maria Catherine Jayapriya

MESSAGES

I extend a warm welcome to all delegates attending the 4th International Conference on "Waste, Energy, and Environment" (ICWEE-2024). Energy is pivotal for driving our modern world, powering transportation, industrial processes, and electricity generation. Meanwhile, effective waste management is essential for sustaining our environment. Improper disposal can lead to pollution of land, water bodies, and the atmosphere, as well as contribute to resource depletion and greenhouse gas emissions. The primary types of waste include solid waste, liquid waste, and gaseous waste. Addressing these challenges requires societies to embrace the principles of reduce, reuse, and recycle.

This conference will spotlight the current emerging trends and provide an outstanding platform for interdisciplinary discussions on the rapidly expanding fields of Waste Management, Energy, and Environmental Technologies and their applications. It aims to foster the evolution of collaborative programs across disciplines and institutions through the exchange of innovative ideas and knowledge.

Furthermore, papers presented at the conference will have the opportunity to be published in esteemed journals such as Journal of the Taiwan institute of chemical engineers, Journal of environmental nanotechnology among others, adding significant value to the academic contributions. I wish all participants productive deliberations during the conference and anticipate a highly successful ICWEE- 2024

Dr. T. Sasipraba, Vice Chancellor

Energy is essential for human activities, powering transportation, industrial processes, and daily routines. However, our current reliance on fossil fuels—such as coal, oil, and natural gas—poses significant environmental challenges, including air pollution, greenhouse gas emissions, and climate change. To mitigate these issues and secure a sustainable future, it is imperative to shift towards cleaner and more sustainable energy sources. Renewable energy options like solar, wind, hydro, geothermal, as well as nuclear power, play a crucial role in reducing our environmental footprint. I extend my congratulations to the organizing committee of ICWEE 2024. I am confident that the conference will foster new collaborations and ideas at both the institutional and international levels. I wish the conference great success.

Dr. E. Logashanmugam, Pro-Vice Chancellor

It is an honor for me to share my thoughts on the upcoming ICWEE-2024 conference, scheduled for July 3-5, 2024. Staying abreast of the latest trends in their respective fields is crucial for any organization. I am confident that this conference will comprehensively cover significant advancements made in the past decade, acknowledging the remarkable achievements of researchers, scientists, and academicians in chemical engineering, environmental engineering, and related disciplines. I extend my best wishes to the organizing committee and all delegates for a successful conference and for their future endeavors.

Dr. S S Rao, Registrar

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ISBN: 978-93-83409-91-4

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4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-01

Novel Biodegradable Films from Jamun Seed and Moringa Leaf Powder: Synthesis and Characterization

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Abstract:

The development of sustainable and biodegradable packaging materials is crucial in addressing environmental concerns and extending the shelf life of perishable food products. Natural extracts like Jamun (Syzygium cumini) and Moringa (Moringa oleifera) are known for their antimicrobial properties, making them potential candidates for developing biodegradable films. This study investigates the efficacy of biodegradable films formulated from various Jamun (Syzygium cumin) blends and Moringa (Moringa oleifera) extracts. Samples with different blends (100% Jamun, 25% Moringa-75% Jamun, 75% Moringa-25% Jamun, 50% Moringa- 50% Jamun, and 100% Moringa) were subjected to microbial and fungal tests. The 100% Jamun film, showing superior properties, underwent further analysis. Thermal properties were assessed using Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA), while structural properties were examined via Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), and UV–Vis Diffuse Reflectance Spectroscopy (UV-DRS). The 100% Jamun film showed the highest antimicrobial activity among the samples tested. Thermal analysis indicated satisfactory performance, with structural analysis revealing a well-defined morphology. In a shelf-life study involving cherry tomatoes, different packaging methods were compared: Jamun extract film, control sample at room temperature, Jamun extract coating, and refrigeration. By the 4th day, control samples and those at room temperature showed spoilage, while the Jamun extract coating exhibited minimal spoilage. The Jamun film sample remained unaffected, demonstrating superior preservation over 7 days. From day 7 to day 14, the Jamun extract film-wrapped sample continued to maintain good condition, attributed to its antimicrobial properties. These findings highlight the promising application of Jamun-based biodegradable films in food packaging, offering antimicrobial efficacy and extended shelf life for perishable products.

Keywords: Moringa Leaf Powder, Jamun Seed Power, Biodegradable Film, Antioxidant, Thermal Stability, Shelf Life.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-02

A Closet to Climate Change: An Analysis on Fast Fashion and The Climate Crisis

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Abstract:

Climate change and sustainability are concepts that resonate and reflect from the dusk of the twentieth to the twenty-first century. It is a widely accepted opinion among scholars that sustainability is the lifestyle that could slow down its advantageous opponent- climate change. Though the sustainability strategy is familiar, what are its most effective tactics and placements that could slow down the doomsday clock? Furthermore, there is ambiguity in 'sustaining' sustainability in the long run. The entire sustainability lifestyle is too vast to explore and cover. Accordingly, the paper focuses on one particularly impactful aspect of everyday life irrespective of political, economic, cultural or social background. Every human being needs food, clothes and shelter. That is a fact. The paper distinctly analyses the problematic relationship between our closet and the climate crisis. It is simply reductive to say that the textile and fashion industries were long on the watch list of sustainability crusaders. More than 300 million workers depend on the textile and clothing industry globally. And they are one of the most liberal contributors to greenhouse gas emissions, emitting 10% of the world's greenhouse gases. The recent fast fashion trend has only added fuel to the forest fire by being the literal poster child of unsustainability. The paper tries to understand the impact of fast fashion on the environment and the current developments in the industry to counteract fast fashion, such as the connect4climate campaign, slow fashion movement and thrifting. It also establishes the corporate social responsibility of the 2.4 trillion-dollar industry. In addition, it holds the industry accountable to an ethical fashion code. Consumers must also shop ethically and sustainably to make a global difference. After all, they collectively control the supply chain.

Keywords: climate change, climate crisis, consumer responsibility, ethical fashion code, ethical consumer, fast fashion, fashion industry reforms, sustainability, sustainable fashion industry, sustainable development goals.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-03

Isolation And Characterization of Hexavalent Chromium Resistant Bacteria from Tannery Effluent and Their Subsequent Use in Microbial Fuel Cell as Potential Heavy Metal Reducing and Electrogenic Bacteria

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Abstract:

Wastewater from several businesses that produce paints, steel, tannery products, dyes, and chrome-plated items contains hexavalent chromium (Cr (VI)). The main contributing factors of pollution concentrations in water bodies is the wastewater that tannery businesses dump, which includes organic pollutants and heavy metals, particularly Cr (VI). The harmful consequences of Cr (VI) on humans include eczema, allergies, ulceration, respiratory tract problems, lung cancer, as well as genotoxic and mutagenic effects. Using bacteria to bio transform hexavalent chromium to trivalent chromium (Cr (III)) is a practical strategy with proven viability in bioremediation. Following their isolation from the tannery industry's raw effluent, bacterial strains were investigated biochemically and molecularly. Based on this study, it was concluded that the microorganisms resistant to Cr (VI) were Bacillus albus and Bacillus australimaris. In a two chambered microbial fuel cell reactor, the isolated Cr (VI) resistant bacteria will be employed as electrogenic bacteria for the production of green energy and the reduction of heavy metals.

Keywords: Heavy Metal, Hexavalent Chromium, Tannery, Bacteria, Environmental Pollution

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-04

Sustainable Synthesis of Zsm-5 Zeolite from Rice Husk Ash: A Comparative Evaluation with Commercial Zsm-5

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Abstract:

This study focuses on the green synthesis of ZSM-5 zeolite using silica derived from rice husk ash (RHA) as a sustainable alternative to traditional synthesis methods. The process involves extracting and purifying silica from RHA, followed by hydrothermal treatment with organic templates and mineral sources to produce ZSM-5 zeolite. The synthesized in house made ZSM-5 zeolite is compared with commercial ZSM-5 in terms of crystallinity, morphology, surface area, and thermal stability. Characterization techniques, such as XRF, XRD, FESEM, and FTIR analysis, are employed for evaluation. The results show that the green-synthesized ZSM-5 zeolite made in-house has similar properties to the commercially produced ZSM-5, including high crystallinity, well-defined morphology, high specific surface area, uniform pore size distribution, and excellent thermal stability. This environmentally friendly approach utilizing RHA as a silica source offers a sustainable and cost-effective route for large-scale ZSM-5 zeolite production, with potential applications in catalysis, adsorption, and separation processes.

Keywords: Rice husk ash and ZSM-5

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-05

The Impact of Iron Oxide Nanoparticles with Bacterial Consortium on Crude Oil Biodegradation

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Abstract:

This study was performed to determine the effect of synthesized iron oxide nanoparticles with the consortium of isolated bacterial strains from the crude oil-contaminated site. The iron oxide nanoparticle (FeNPs) was synthesized by chemical co-precipitation method and confirmed with its characterization results such as UV-spectroscopy, X-ray Diffraction (XRD), High-Resolution Scanning Electron Microscopy (HR-SEM), Zeta potential and Particle Size Analyzer studies. The isolates were cultured in LBBH (Luria-Bertani and Bushnell Haas) medium containing crude oil as a carbon source with incubation for 7 days. This study was performed using FeNP's with four different concentrations (10, 50, 100 and 150mg) incorporated with the isolated microbes clubbed as consortium. The rate of biodegradation was investigated by gas chromatography–mass spectrometry (GC-MS) analysis. By comparing the control sample (crude oil) there was a better degradation in FeNP's added bacterial culture than consortium degradation. The obtained results conclude that by studying different concentrations of FeNP's with the consortium of isolated microbes showed the degradation differences, whereas 150mg concentration has better degradation effect compared to other variations. And it should be carried out to avoid agglomeration of nanoparticles by improving its biocompatibility and quality to influence the biodegradation of crude oil.

Keywords: Crude oil, Co-precipitation, Iron oxide nanoparticles, LBBH medium, Consortium, GC-MS.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-06

An Investigation into The Disposal and Management of Textile and Fashion Industry Waste in Chennai.

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Abstract:

A general overview of this research covers these three main topics to evaluate the expertise of various sections of the population on the proper management of textile waste which are to elucidate the various kinds of textile waste, to analyses the reason for the lack of proper textile waste management, to propose and elucidate on possible measures to direct textile waste management in a proper way. The study has been conducted using the empirical research method where the quantitative method of survey is used. The sample size of the population is 208.Every member of the population has an equal probability of being chosen when the samples are drawn using simple random sampling. Independent variables are: Age, gender, occupation, educational qualifications, area of settlement of the sample population. The dependent variables are: What is the reason textile waste is a problem, how likely are you to recycle your old clothes rather than throw them away, Can Textile waste can be reduced through recycling.10. What can reduce textile waste. The statistical tool used Graphical representation. [using the SPSS software] and the chi square test. Through this research the three objectives that were set in the beginning were met. From understanding the population and their outlook to providing solutions on better textile waste management. In the chi square tests conducted the null and alternative hypothesis have been mentioned and have been discussed.

Keywords: Textile waste, upcycle, Fast fashion, waste management, recycle

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-07

Study on the Potential of CIBA-Plankton Plus on Reduction of Feed Requirement in Shrimp Culture System

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Abstract:

Experiment was conducted to evaluate potential of CIBA-Plankton Plus (PPlus), a value-added product developed from fish waste, on reduction of feed requirement in Penaeus vannamei culture. Eight brackish water ponds (each of 0.15 ha) were used for experiment with four different treatments, i.e., control (100 % feed without PPlus), T1 (100% feed & supplemented with PPlus), T2 (85% feed & supplemented with PPlus) and T3 (70% feed & supplemented with PPlus). PPlus was used at 30 ppm and shrimps were stocked @ 30 pcs/sq m. At the end of 90 days culture average body weight (ABW) was 8.50±0.50, 10.75±0.25, 9.75±1.25 and 9.65±0.65 g with a productivity of 2.18±0.15, 2.49±0.04, 2.09±0.02 and 1.95±0.20 t/ha in control, T1, T2 and T3, respectively. Productivity was significantly ($P<0.05$) higher when PPlus was supplemented with 100% feed. FCR was significantly ($P<0.05$) lower in all Plankton Plus supplemented group. Demonstration on potential of PPlus on reduction of feed requirement in shrimp culture was done in farmer's ponds with three different treatments, i.e., control (100 % feed without PPlus), T1 (90% feed & supplemented with PPlus) and T2 (80% feed & supplemented with PPlus). PPlus was used at 30 ppm and shrimps were stocked @ 60 pcs/sqm. After 120 days of culture, highest productivity of 11.45 t/ha was achieved when PPlus was supplemented and feed was reduced by 20 % compared to 9.83 t/ha in control. Demonstration clearly showed that Plankton plus could save 20 % feed as well as could enhance the productivity to the tune of 1.62 t/ha.

Keywords: Plankton Plus, Penaeus vannamei, Feed requirement, FCR, Productivity

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-08

Efficient Extraction of Uranium from Aqueous Solutions Using Biowaste Derived Hydroxyapatite Based Nanocomposite: A Sustainable Approach

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Abstract:

Nuclear energy is a viable option for the global energy shortage, with uranium being the primary fuel for nuclear power generation. However, concerns surging over the limited supply of uranium from terrestrial mines and the environmental impact of uranium mining, and waste disposal. To address these issues, various methods, including adsorption, have been explored for extracting uranium from the environment. Adsorption is favored for its economic efficiency, but it requires the development of effective adsorbents with high uranium adsorption capacities. Herein, we report a facile synthesis of hydroxyapatite derived from egg-shell biowaste embedded on diglycolamic acid functionalized graphitic carbon nitride nanocomposite (abbreviated as HAP/GCN-DGA). The material was characterized using SEM, XRD, BET, FTIR techniques. Batch experiments were conducted to investigate the influence of pH, contact time, initial U(VI) concentration, and ionic strength on the adsorption process. Adsorption kinetics follows pseudo second order model and it attains equilibrium within 20 minutes. Adsorption isotherm data correlates well with Langmuir isotherm model and HAP/GCN- DGA showed an impressive maximum sorption capacity of 993.06 mg g^{-1} at 298K. Moreover, the adsorbent was stable after several adsorption- desorption cycles and showed high selectivity towards U(VI) in the presence of various co- existing metal ions. This study concludes that HAP/GCN-DGA nanocomposite could be considered as a potential material for environmental remediation applications.

Keywords: Uranium, Adsorption, Hydroxyapatite, graphitic carbon nitride, biowaste, Diglycolamic acid.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-09

Integration of Digital Technologies as a Sustainable Solution for Plastic Waste Management in Indian Cities

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Abstract:

Increasing amounts of plastic waste due to rapid urbanization has led to difficulties in maintaining natural resources and environmental sustainability. Even with the advancements in plastic waste management (PWM) strategies over the last decades in India, challenges remain across all stages of the Waste Hierarchy, right from prevention, reuse, recycling, and recovery to landfills. The existing system in India focuses on the collection of plastic waste in general and neglects the precise segregation of waste according to its diverse composition. These practices undermine sustainable waste management and thereby having an adverse impact to the environment. Digital Technologies such as smart bins with sensors and portals to optimize collection and processing routes, have the potential to streamline PWM and promote sustainable practices. But inadequate facilities for collection, segregation and processing pose significant challenges. Additionally, technological gaps at these facilities along with poor coordination between stakeholders in India has resulted in missed opportunities for effective PWM strategies. The aforesaid issues can be addressed by integrating digital technologies that can enhance the PWM in India, thus surpassing the conventional system. This paper explores the International and national PWM strategies along with the status of Digital Technology application. To examine the ground realities and potential for integrating Digital Technologies, a study was conducted at Kozhikode Municipal Corporation which is a Tier 2 City in India. The work intends to create a PWM framework, providing actionable insights and promoting sustainable strategies with digital technology integration.

Keywords: Plastic Waste Management (PWM), Waste Hierarchy, Digital Technologies.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-10

Formulation and Evaluation of Papaya Shampoo from Leaves of Carica Papaya with Antimicrobial Activity

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Abstract:

In today's beauty-conscious world, individuals prioritize cosmetic care products that harness the power of nature. Our study aimed to create a shampoo using extracts from Carica papaya leaves, aligning with this trend. We evaluated the shampoo's quality against Indian standards and investigated its antimicrobial efficacy and antioxidant properties. We analyzed saponins, flavonoids, alkaloids, Antioxidant properties and Vitamins in papaya seeds and leaves using chromatographic techniques and spectroscopy. The shampoo formulation incorporated these extracts as major ingredients, alongside other natural components. Our papaya-based shampoo successfully passed Quality requirements of Shampoo as per BIS 7884: 2004 and it is proven to be safe for the skin and non-irritating as per IS 4011:1997. The formulated shampoo exhibited impressive antimicrobial effects, with inhibition zones ranging from 6.9 mm to 17 mm against common pathogens, including Staphylococcus aureus, E. coli, Bacillus subtilis, Pseudomonas aeruginosa, and Candida albicans. Formulated shampoo from papaya leaves and papaya seeds was stable up to 12 Months according to Accelerated stability studies conducted as per ICH guidelines with respect to physiochemical and Microbial conditions.

Keywords: Shampoo, Carica papaya, Antimicrobial, Quality parameters, papaya leaves, papaya seeds.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-11

Sustainable Production of Green and Clean Steel with Zero GHG emission by Hydrogen Plasma Smelting Reduction Technique

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Abstract:

Production of iron and steel can never cease, as it constantly contributes to the economic prosperity of India. The current per capita consumption of steel in India sits at 74.7 kg against the world per capita consumption of 229 kg. In the Blast furnace, around 2.6 to 3 tons of carbon dioxide along with other greenhouse gases are released to the atmosphere when one ton of hot metal is produced. With India aiming to produce 500 MT of steel by end of 2047, the quantity of carbon dioxide and other greenhouse gases emission could be as high as 1200 MT which not only is alarming but also calls for quick and time-driven sustainable solutions. The present work addresses this incoming environmental issue by production of green and clean steel using hydrogen plasma smelting reduction (HPSR) technology. In addition to satisfying the net zero emission, the technology showcases production of steel in just one step. Without necessitating the unit operations, namely dephosphorization, desulphurization, decarbonization, and other units (briquetting, sintering, and coke oven) as seen in conventional practices, this cost- effective HPSR technology is the right find at the crunch hour to meet the steel production demand without harming the environment.

Keywords: Green and clean steel, hydrogen plasma, sustainability

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-12

An Effective Bioremediation Approach for Enhanced Microbial Degradation of the Veterinary Antibiotic Sulfamethoxazole in Agricultural Soils

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Abstract:

With the intensive application of antibiotics like sulfonamides in aquaculture and animal husbandry, and the increase of sulfonamides discharged into the environments, there is an increasing need to find a way to remediate sulfonamide-contaminated environments. In our study, we mainly focused to isolate sulfonamide-degrading bacteria from long-term animal manure amended agricultural soils of Tamil Nadu, and understand the potential when using them for bioaugmentation of sulfonamide contaminated agricultural soils. Three sulfonamide- degrading bacterial strains (SA1, SA2 and SA3) were isolated from the soil collected in the organic farms of Tamil Nadu. Of those, SA3 strain when inoculated at the rate of 1% was able to degrade about 65% of 25 mg L^{-1} sulfonamide antibiotics (Model antibiotic: Sulfamethoxazole/SMZ) in 15 days comparing with the control. SA3 strain performed well in SMZ removal in neutral to alkaline environments. Notably, in the presence of strain SA3, >80% of SMZ was removed from the aqueous solution in 15 days when the initial SMZ concentration was ranging between 0.1 and 10 mg L^{-1}. The isolated strain SA3 belonged to the genera Pseudomonas sp. The overall removal of SMZ in the neutral and alkaline soils inoculated with the strain SA3 increased by 38%, when compared with the uninoculated treatments. Bacteria thus isolated out of this study could be potent to bioremediate sulfonamide contaminated environments.

Keywords: Veterinary Antibiotics; Remediation; Biodegradation; Pseudomonas

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-13

Effect of fish waste hydrolysate on the growth of grey mullet, Mugil Cephalus in enhanced culture system

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Abstract:

The processing of fish, shrimp, and crab generates substantial waste, constituting 30-50%, 50-60%, and 40-60% of their total mass, respectively. Improper disposal of untreated fish waste poses significant environmental hazards globally. This study investigates the impact of fish waste hydrolysate (FWH) on the culture of grey mullet, Mugil Cephalus. FWH, a nutrient-dense hydrolysate derived from fish waste using an innovative method, was applied in varying concentrations (20, 40, and 80 ppm) with and without weekly supplementation of zooplankton (copepods and rotifers). The control group received no FWH or zooplankton. After a 42-day feeding experiment, M. Cephalus exhibited significantly ($P<0.01$) improved growth (32 and 33%) and survival rates (21 and 25%) in treatments with 80 ppm FWH, with and without zooplankton, compared to other treatments. Growth parameters such as specific growth rate, average daily gain, and weight gain percentage were significantly higher ($P<0.01$) in treatments with 80 ppm FWH regardless of zooplankton addition compared to the control. Additionally, FWH supplementation resulted in significantly higher floc densities ($P<0.01$), with density increasing proportionally with FWH concentration. Phytoplankton and zooplankton abundance were also significantly higher in FWH-treated groups, correlating with increased FWH doses. Enhanced plankton abundance likely contributed to better floc formation and improved growth of M. Cephalus. The study concluded that FWH administration enhances the growth of M. Cephalus and reduces production costs by shortening the culture duration.

Keywords: Fish waste, Aquaculture production, Circular economy, Plankton.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-14

Effect of nozzle hole number on dual fuel mode operation with biodiesel blends by using surface response methodology

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Abstract:

The study is to investigate the effect of nozzle hole number (3, 4 and 5) is to enhance the performance of diesel, biodiesel and amyl alcohol blends in dual fuel mode. For optimization of engine, response surface methodology was used with the input parameters of load (25, 50, and 100%), nozzle hole (3, 4, and 5), and fuel blends (Diesel, PJB20, and PJB20-amyl alcohol) whereas the output response of Brake thermal efficiency (BTE) and Nitrous oxide (NOx) are taken as factors. The derringer desirability technique was used to optimize central composite design. Utilizing PJB20-amyl alcohol 30% through a four-hole nozzle increased BTE by 3.30% and 8.32% in comparison to three-hole and five-hole nozzles. PJB20-30% amyl alcohol blend produced less CO, HC and smoke while NOx emissions increased in comparison to diesel and PJB20. The optimized specifications of the dual fuel resulted in maximum performance and minimum emissions found at a four-hole nozzle, a fuel blend of 27.42%, and an 86% load. It was determined that the predicted responses for BTE and NOx were 1056.7 ppm and 24.843%, respectively. Finally, the numerical and experimental data indicate that the four-hole mixture of PJB20 - 30% amyl alcohol produces maximum engine efficiency and minimum emissions, that are optimized to engine parameters.

Key words: Nozzle hole geometry, PJB20, amyl alcohol, optimization, response surface models and engine emissions.

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-15

Co-Pyrolysis Kinetic Study of Waste Plastic and Biomass Material

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Abstract:

Poly Vinyl Chloride (PVC) wastes are among the most common types of plastic pollution. Soapnut seeds (SN) are always discarded when their outer shells are used, showing that there is a significant amount of waste generated. This biomass solid along with the non- biodegradable waste can help in creating a synergy between SN and PVC wastes. The synergistic reaction ensures a better quality of yields obtained. The Proximate analysis and Ultimate analysis are conducted on SN and PVC in powdered form. From both analyses, the blend ratio for SNPVC is concluded to be 1:1. Thermogravimetric analysis (TGA) is performed on PVC, SN, and its blend SNPVC on a powdered basis. The analysis is done at heating rates of 10, 15, 20, and 25°C/min, covering a temperature range from 27°C to 800°C.The SNPVC mixture is significant as it decomposes the fastest and has the least amount of char. The activation energy is estimated using kinetic analysis based on the findings of TG analysis. The activation energy is determined using the iso conversional methods of Kissinger, Kissinger-Akahira-Sunose (KAS), Flynn- Wall-Ozawa (FWO), and Starink. The co-pyrolysis is conducted on SNPVC. The products obtained from the pyrolysis process, especially the bio-oil, is sent for Fourier Transform Infrared Spectroscopy (FTIR) and other tests.

Keywords: Pyrolysis, Thermo Gravimetric Analysis, Soap nuts, PVC, GCMS, FTIR

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-16

Development of pectin-based bioplastic films – An approach towards Sustainable Development Goals

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Abstract:

The entire planet is locked in a vicious battle against an insidious plastic crisis, threatening our existence. In a desperate attempt to satisfy the relentless demand for plastic while mitigating its devastating effects on our fragile ecosystem, a race has begun to harness natural sources and create biodegradable bioplastics. In an effort to uphold the Paris agreement (COP 21), global leaders are seeking alternative solutions that align with the SDG's (3, 6, 11, and 13) by 2030. The significance and importance of plant-based bioplastic lies to serve more sustainable alternative to traditional plastic. In this study, bioplastics were synthesized using the solution casting method. First, the peels of citric fruits were pre-treated and ground into fine powder, treated with 2% (w/v) citric acid solution and 1% (v/v) glycerol. The resulting solution was homogenized at 50°C, centrifuged, and dried to form bioplastic films. The various additives such as curcumin (for antimicrobial properties), corn-starch, and cocoa butter + castor oil (for hydrophobic properties) was incorporated to enhance the plastic's flexibility. SEM analysis reveals bumpy, dense, and stratified surfaces with evenly distributed particles, and the extent of agglomeration varied depending on addition of hydrophobic additives. The FTIR studies showed that all films had common glycosidic linkages, indicating formation of bioplastic. Furthermore, the inclusion of curcumin greatly improved the film's resistance to microbes.

Keywords: 5 Pectin, Bioplastic, Plasticizer, Solution casting

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-17

Studies on Treatment of Polluted Water using Attached Growth Batch Reactor and Carbon Nanotubes

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Abstract:

The detrimental effects produced on water quality by effluent introductions has led to various environmental hazards. In this regard, management of wastewater to produce effluent with good quality is imperative and technology selection criteria requires a process that is not only cost-effective for a community but also environment friendly. Attached Growth Batch Reactor (AGBR) is an influential modification of Sequential Batch Reactor (SBR) process which has been successfully used to treat municipal and industrial wastewater. It is an aerobic treatment process that takes place in the presence of air (oxygen) and utilizes the microorganisms (aerobes) that dwell within the reactor to use molecular/free oxygen to assimilate organic impurities and convert them to carbon dioxide, water and biomass. AGBR comprises a single- tank configuration wherein a mountainous rock bed/Spiralen polyvinyl chloride media bed is settled in its bottom and aeration is rendered via channel distributors using an air compressor. Sewage samples from River Coovam was introduced into the reactor tank and processes such as react, settle and decant were carried out. Wet viscous thick mud is introduced as a microbial source into the reactor which creates a biofilm. Decantable volume sample was taken and its physical and chemical parameters were analyzed. Tests conducted proved a greater reduction in BOD and COD levels by 99.09% and 99.58% for mountainous rock material, 96.81% and 96.91% for Spiralen polyvinyl chloride media.

Keywords: Environment, Sequential Batch Reactor, Aerobic, Single-tank, River Coovam.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-18

Biofilm Inhibition Efficacy of Agave Sisalana Leaves Extracts Against a Bacterial Consortium in Cooling Water System

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Abstract:

Microbiologically induced corrosion causes serious issues in many industrial sectors. Natural compounds appeared as eco-friendly, cost-effective solutions to control biofilm formation and the corrosion induced by it. This research aims to evaluate the biofilm inhibition efficacy of many Agave sisalana extracts. The efficacy of methanol, ethyl acetate, ethanol extracts, and the extracted saponins of Agave sisalana was tested against a consortium of seven biofilm- forming strains. The bacterial strains were isolated from Koel River water used as cooling water in the Rourkela steel plant. The saponins-rich extract showed moderate biofilm-controlling efficacy, so three different solvents (glycerol, acetone, and ethanol) were used to enhance the efficacy of the saponins-rich extract. Among the various plant extract combinations, glycerol- saponins solution showed the highest biofilm inhibition efficacy of 40%. The results were confirmed by CFU, crystal violet test, and confocal laser scanning microscope. The saponins- rich extract was characterized by XRD, FTIR, Raman spectroscopy, UV-Vis spectrum, and NMR analyses. The characterization analyses confirmed the presence of saponins which is well known as a biosurfactant according to its ability to reduce the surface tension and consequently control the biofilm formation on different surfaces. Further research should be performed to increase the biofilm inhibition efficacy.

Keywords: Biofilm, cooling water, plant extracts. saponins.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-19

Assessing the Nutritional and Physiological Effects of Black Soldier Fly Larval Meal Inclusion in the Diet of Black Tiger Shrimp (Penaeus monodon)

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Abstract:

Fish meal is the major ingredient in shrimp feed, its overconsumption, and limited availability, compelled the aquaculture feed industry to search for alternative protein sources to replace fish meal. In recent times, insect meal (IM) has emerged as a sustainable protein source showing promising results. Against this backdrop, a 45-day feeding trial was conducted to investigate the effects of black soldier fly (BSF) larval meal as fish meal replacer in the diet of tiger shrimp (P. monodon). Five experimental diets were prepared (isoproteic 380 g kg^{-1} and isolipidic 100 g kg^{-1}) with varying levels of BSF meal that included 0% (**BSF0**), 3% (**BSF3**), 6% (**BSF6**), 9% (**BSF9**), and 12% (**BSF12**). Shrimp post larvae (with an initial body weight of 0.4 ± 0.02 g) were stocked at 30 animals each, in fiberglass reinforced plastic (FRP) tank of capacity 100 L which were arranged in completely randomized design (CRD) where, each diet was fed to triplicate groups. At the end of the feeding trial, there were no significant differences in the growth performance between the groups fed with **BSF3** and the control (**BSF0**). The **BSF3** group showed the highest weight gain percentage (320.12%). Both the control and **BSF3** diet-fed groups exhibited similar average weight gain (AWG), specific growth rate (SGR), and daily weight gain (DWG), with no significant differences ($p > 0.05$). However, the **BSF12** group recorded the lowest final body weight (FBW), weight gain % (WG%), AWG, SGR, DWG, and feed intake (FI). Up to an inclusion level of 9%, the survival was found to be the same rate (95.57%) ($p > 0.05$). The activity of chymotrypsin and alkaline phosphatase was found to be significantly higher at **BSF9** (716.71 ± 15.23) compared to control (39.50 ± 0.42) ($p < 0.05$). In conclusion, this study suggests that BSF larval meal is having the potential to replace fish meal in P. monodon diets up to an inclusion level of 6% without negatively impacting growth and survival. The optimal inclusion level of BSF meal for P. monodon diets ranges from 3.73 to 5.13%, as indicated by broken line regression analysis of various growth parameters.

Key words: Black solider fly, tiger shrimp, growth, digestive enzyme activity, early life stage

ISBN: 978-93-83409-91-4

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-20

Recycling fish waste into Plankton^{Plus} and Horti^{Plus}: Sustainable livelihood model to double the income of coastal communities

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Abstract:

Fish waste to wealth technology, Plankton^{Plus} and Horti^{Plus}, has developed to minimize the environmental problems generated by huge amount of fish waste by transformation into products and use as ingredient in animal rations. Self-help group "Nambikkai Fish Farmers Group", Nambikkai Nagar, Chennai, Tamil Nadu, have been incubated as start-up, has realized more than Rs.15 lakhs/year by the production of 15-20 tons of Plankton^{Plus} and 1.5-2 tons of Horti^{Plus} per year. This technology has given employment opportunities for more than 100 coastal communities in and around Chennai and also more than 700 fisher folks were got awareness about the technology. In this backdrop, livelihood assessment using Sustainable Livelihood Framework was conducted at Chennai, to find out changes in livelihood scenario. The capital components such as human, economic, natural, physical and social were assessed and respective indices were calculated for 'before and after' the technology implementation. The results shows that social (45%), natural (42%) and human (25%) are having significant changes after implementation and also these changes are more drastic as compared with physical (10%) and financial (5%). It also shows that Sustainable Livelihood Index has moderately increased (26%) in the livelihood scenario. The respondents suggested that government has to take up state level policies for establishment of fish waste processing units in the fish markets for minimizing the environmental problems and also increasing the sustainable livelihood among the communities.

Keywords: waste to wealth, Plankton^{Plus}, Horti^{Plus}, Livelihood, environment

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-21

NiO/CdS-Bi2MoO6 Ternary Nanocomposite with Heterogeneous Interfaces for the Enhanced Photocatalytic Hydrogen Production under Solar Light

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Abstract:

The mesoporous Bi_2MoO_6 was synthesized by hydrothermal method using soft template mechanism with Pluronic P123 as the structure directing agent. NiO/CdS loaded Bi_2MoO_6 ternary nanocomposite was synthesized by wet impregnation method. 1wt% of NiO and CdS loaded Bi_2MoO_6 showed the enhanced photocatalytic hydrogen production under direct solar light. The BET and XRD results revealed the porous and orthogonal structure of Bi_2MoO_6. HRTEM images showed the heterogeneous interfaces of NiO (p-type) and CdS (n-type) nanocrystals with Bi_2MoO_6 (n-type) nanoparticles, this resulted n-n and p-n type heterojunctions. These interfaces played an important role in improving interfacial charge transfer (IFCT) and lifetime of photogenerated charge carriers. These phenomena were validated by photoelectrochemical and photoluminescence studies. Dopants acted as a donor (n- type) and acceptor (p-type) for Bi_2MoO_6 significantly reduced the band gap, which shifted the light absorption edge position to longer wavelengths than pristine Bi_2MoO_6 as shown in DRS UV-Vis spectra. NiO and CdS loading synergistically facilitated the desirable characteristics for Bi_2MoO_6 and enhanced the H_2 production by three times higher than bare Bi_2MoO_6. This study provides deep insights into the development of solar-responsive Bi_2MoO_6 based nanocomposites for the efficient H_2 production.

Keywords: Photocatalyst, H_2 production, nanocomposite, Heterojunction, Interface.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-22

Exploring the antifungal potential: A comparative study of five seagrass species of Rameshwaram Island

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Abstract:

Seagrasses have gathered increasing attention due to their multifaceted ecological roles. Apart from their ecological significance, seagrasses have exhibited potent antifungal properties, indicating potential for diverse applications. The antifungal efficacy of methanolic extracts derived from five seagrass species (Cymodocea serrulata, Cymodocea rotundata, Halodule pinifolia, Halophila ovalis, and Syringodium isoetifolium) was assessed against Aspergillus niger and Penicillium chrysogenum using the agar well diffusion method. The methanolic extract from different seagrasses exhibited notable antifungal activity against Penicillium chrysogenum (Cymodocea serrulata- 19.5mm Halodule pinifolia- 19.9mm Halophila ovalis- 10.3mm Syringodium isoetifolium- 9.6mm). They exhibit feeble inhibition of Aspergillus niger (Cymodocea serrulata-12.4mm Halodule pinifolia-11.8mm Halophila ovalis-4.3mm and Syringodium isoetifolium-6mm). The findings unveiled methanolic extracts from seagrass Halodule pinifolia and Cymodocea serrulata at concentrations of 500µg and 1000µg, exhibited remarkable inhibition of Penicillium chrysogenum and Aspergillus niger growth. The samples exhibiting significant antifungal activity were subjected to metabolite profiling using GC-MS. A total of 23 compounds were identified in the methanolic extract of seagrass Cymodocea serrulata, while 25 compounds were detected in the methanolic extract of Halodule pinifolia. This study lays the groundwork for the development of bioactive natural products with applications in phytosanitary practices, offering the additional advantages of environmental safety and economic viability.

Keywords: Seagrass; Antifungal activity; Penicillium chrysogenum; Aspergillus niger; Agar well diffusion; GC MS Analysis.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-23

Effect of porous medium on splitting of bubbles for aeration process

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Abstract:

Aeration is a process of removing dissolved gases, metals and chemicals in water. The dissolved oxygen content in water can be increased by producing bubbles during the aeration process. Bubbles of smaller size maximize surface area, increase residence time and hence more oxygen transfer rate. The current study aims to measure and understand void fraction changes using an IR Sensor as bubbles pass through the different porous matrices. A porous medium having two different porosities is used to split bubbles. Parameters which vary during the break of slug regimes passing through a porous media are analyzed. An attempt has been made for a better understanding of the complex dynamics of two-phase flow governing the splitting of bubbles inside the porous structure.

Keywords: Aeration, two phase flow, porous medium, IR sensor

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-24

Emergency Management in Factories Handling, Storing and Processing Hazardous Chemicals

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Abstract:

Emergency in a factory is a situation where in the available infrastructure, resources, and facilities are inadequate to cope up with the situation, which arises due to the release and subsequent reactions of flammable, explosive and toxic substances. Emergency in hazardous factories can pose serious risk to the workers, public, facility, ecology and environment and hence, it is of paramount importance for the stake holders to ensure safe, healthy and risk-free work atmosphere in hazardous factories. On - site emergency management deals with process of handling emergency within the factory premises and the Off - site emergency is a situation to be dealt by the society at large and all stake holders. Risk Assessment is a process decision making in accepting or rejecting risk, which is a foundation in emergency management. The risk assessment and emergency management are statutory requirements for hazardous factories across the globe and despite existence such strict standards and compliances, the emergency in hazardous factories is caused due to lagging in compliances, focus, monitoring, resources, expertise, procedures, protocols, competent manpower, technology, and leadership. This paper details on various deficiencies in the existing emergency management system and strategies for enhanced safety, health and environmental standards.

Keywords: Emergency Management, hazardous factories, Workplaces, Safety, Health, Risk Assessment.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-25

Statistical Analysis of the Factors Influencing the Safety and Health Management System in the Petroleum and Fuel Oil Industries

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Abstract:

In order to identify critical areas that require attention and enhance the efficiency of safety and health management systems in industries utilizing Petroleum and Fuel Oil as an energy source in Tamil Nadu state, India, it is crucial to understand and comprehend the safety and health management systems in these industries. A clear questionnaire was developed by examining the literature on management initiatives in industries. A sample of 32 petroleum industries in Tamil Nadu was selected using stratified random sampling. Safety, health, environmental policy, communication system, first aid, personal protective equipment, safety education and training, occupational hygiene and health, management systems on safety and health, accident reporting, investigation and analysis, procedures, and protocols were all included in the questionnaire. Statistical analysis One-Way ANOVA was conducted to determine the p and F values, standard deviation, variance, mean, median, and mode of the data obtained through the questionnaire. A histogram was generated for each of the variables that comprised the management system. It was concluded that the factors such as Safety & Health Organization, Communication System adopted in plant, safety education and training, Management systems on safety and health, accident reporting, investigation, and analysis require improvement in various industries, as indicated by the statistical analysis.

Keywords: Safety, health, accident reporting, statistical analysis, petroleum industries

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-26

Surface engineered nanomaterials from natural sources as adsorbents for effective Cr (VI) removal

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Abstract:

The development of industries, agricultural events and other modern technologies have led to an increase in pollution with several toxins particularly affects the environmental systems. Among them, heavy metal Cr (VI) is very harmful to the health and environment. Cr (VI) accumulate in the environment by numerous ways. Due to the lack of biodegradability of these harmful metals, living organisms and ecosystem affects equally. Recently, adsorption process attracted the scope of removing several pollutants/contaminants including heavy metals and dyes. Particularly, surface engineered nanoparticles from various natural sources including plants and microbes have gained attention for high effective remediation of hexavalent chromium than chemically synthesized adsorbents. Since the adsorbents are synthesized using green approaches, it aids to improve environmental sustainability. The Moreover, these adsorbents can be employed in the management of reusability such as soil amendment, landfilling etc. This review highlights the importance of removing heavy metals, showed its adverse effects and techniques to remediate. Moreover, it outlines the adsorption processes for the removal of heavy metal Cr (VI). Thus, it is suggesting that the synthesis of various nanoparticles from plants and microbes offer effective adsorbents for various heavy metal contaminants.

Keywords: Adsorbents, Biological synthesis, Chromium (VI), Nanomaterials, Reusability.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-27

Adsorption of toxic dyes using cellulose based adsorbents: Experimental and modeling studies

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Abstract:

In the present study, cellulose-based adsorbents were prepared by grafting N^1-(3-trimethoxysilylpropyl)-diethylenetriamine (TMSPDETA) on microcrystalline cellulose surface for the adsorption of reactive dyes from aqueous solution. Characterization of the produced adsorbents [Cel@TMSPDETA10; composite of cellulose + TMSPDETA (10% weight)] and the experimental and modeling studies were thoroughly investigated. It was observed that the values of $t_{0.95}$ (time necessary to attain 95% saturation) of RG-19 dye were 1.81 times slower than those of RR-35. Based on the ΔBIC values, the Liu isotherm was better fitted to the experimental data. At 30°C, the highest Q_{max} (Liu model) value was 197.0 mg g^{-1} for RR-35 dye. For RG-19, the highest value of Q_{max} (Liu model) was 210.5 mg g^{-1} at 45°C. Alternatively, a statistical physics model that represents the general case of the Langmuir model was adopted to provide new insights into the adsorption mechanisms of RR-35 and RG-19 dyes on the adsorbents. Interestingly, this new approach revealed that RR-35 was adsorbed through a partial aggregation process, unlike the RG-19 dyes.

Keywords: Statistical physical models; Reactive dyes; Nonlinear fitting; Hybrid materials

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-28

Design, Simulation and Modelling of 1 MWh Battery Energy Storage System

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Abstract:

Design, simulation, and modeling of battery energy storage systems (BESS) have become critical in enhancing energy management and grid stability. This abstract delves into a comprehensive study focusing on a 1 MWh battery energy storage system. The research aims to develop a robust simulation model that accurately represents the operational dynamics of the BESS, incorporating various factors such as charge/discharge cycles, efficiency, thermal management, and integration with renewable energy sources. The modeling process employs advanced software tools to simulate the performance under different operational scenarios, ensuring the system's reliability and efficiency. Key parameters like energy density, power output, and system degradation over time are meticulously analyzed to provide a realistic assessment of the BESS's capabilities. Additionally, the study examines the economic viability and environmental impact, highlighting the potential for cost savings and reduction in carbon footprint. The findings underscore the importance of integrating such systems in modern energy grids, paving the way for sustainable energy solutions. This research contributes to the field by offering a detailed simulation framework that can be adapted for various scales and applications, ultimately promoting the broader adoption of battery energy storage technologies. Findings from this research highlight the significant role of BESS in modern energy infrastructures, demonstrating their potential for providing sustainable energy solutions. The developed simulation framework offers a valuable tool for researchers and engineers, enabling them to adapt and apply the model to different scales and applications. Ultimately, this work contributes to promoting the adoption of battery energy storage technologies, paving the way for a more resilient and efficient energy grid.

Keywords: Battery Energy Storage System, 1MWh Capacity, Simulation Models, Battery energy management, Thermal management, Carbon Footprint Reduction

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-29

Performance Analysis of Battery Pack with Fire Retardant Resin

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Abstract:

This study investigates the performance characteristics of a battery pack treated with fire retardant resin, focusing on safety and efficiency. The increasing demand for safer energy storage solutions in electric vehicles and portable electronics necessitates advanced fire prevention methods. By integrating a fire-retardant resin into the battery pack, this research aims to enhance thermal stability and mitigate fire hazards. Experimental analysis was conducted on battery cells coated with a specialized resin, with a control group of untreated cells for comparison. The results indicate a significant improvement in thermal resistance, with the treated battery pack demonstrating a 30% reduction in heat generation under high discharge rates compared to the control group. Additionally, fire propagation tests revealed that the resin-coated batteries had a delayed ignition time and lower flame spread rate, enhancing overall safety. Electrochemical performance metrics, including energy density and cycle life, were also evaluated to ensure the fire-retardant resin did not adversely affect the battery's functionality. The findings suggest that the incorporation of fire-retardant resin not only improves safety but also maintains the operational efficiency of the battery pack. This research provides a viable approach to enhancing the safety of lithium-ion batteries, with implications for broader applications in various high-risk environments.

Keywords: Battery Pack, Fire Retardant Resin, Thermal Stability, Safety Enhancement, Lithium-ion Batteries, Electrochemical Performance.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-30

Sustainable Approaches to Photocatalytic Dye Degradation Using Waste Materials

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Abstract:

The textile and dyeing industry are utilizing photocatalytic dye degradation methods to combat dye contamination, primarily focusing on agricultural and electronic waste. Green synthesis methods, which use environmentally friendly technologies, are being developed to repurpose materials for sustainable cultivation. Recent studies validate that over 90% of Methylene Blue (MB) is degraded efficiently by ADV-A biochar made from agricultural waste. The emphasis is on reactive oxygen species (ROS) such as superoxide anions and hydroxyl radicals, which cause the oxidative breakdown of dye molecules following waste-derived photocatalyst activation by visible light. By using this approach, the environment is not only spared from having to deal with waste disposal, but it also represents the chance to create a circular economy in which water treatment may be done successfully and sustainably. The review highlights smart strategies for efficient catalyst design, increased solar light use, and more productive manufacturing in waste materials for photocatalysis, promoting sustainable city development, environmental pollution reduction, and a reliable waste-to-energy technology based on circular economy and green chemistry principles.

Keywords: Circular economy, green synthesis, Photocatalysis, Reactive Oxygen Species, Waste derived Photocatalysts.

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-31

Thermodynamic Analysis and Taguchi Optimization of a Vapor Compression Refrigeration System

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Abstract:

A comprehensive analysis is conducted on the characteristics of the refrigeration systems for R290, R600, R1234ze, and R152a using vapor compression. In order to determine the ideal parametric combinations for a maximum COP and Efficiency, this work investigates multi-objective vapor compression refrigeration system optimization utilizing the Taguchi technique. The acronym "vapor compression refrigeration system parameters" refers to the combined phrases Tev, Tcon, Th, Tl, and Refrigerants. To address the multi-response optimization problem, a total of 16 test runs based on Taguchi's L16 OA were conducted. Analysis of variance (ANOVA) will be performed extensively to determine the most important parameters among Tev, Tcon, Th, Tl, and refrigerants. The greatest exergetic performance (COP) was found to be at A3B4C4D4E5, although the highest exergetic performance was achieved under A3B2C3D2E3 conditions. The statistical analysis results have a tiny margin of error and offer significant information on the system's functionality. The thermodynamic investigation demonstrates that cooling capacity has no influence on the cycle's COP or efficiency

Keywords: Refrigeration System, COP, Efficiency, Taguchi, ANOVA

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-32

Indirect Heating in Biomass Pyrolysis: Energy Efficiency and Product Yield Analysis

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Abstract:

This study investigates the impact of indirect heating on energy efficiency and product yield in biomass pyrolysis, focusing on casuarina equisetifolia and coconut shell as feedstocks, with an emphasis on biochar production. Indirect heating, which separates heat generation from the biomass, offers more controlled and uniform temperature distribution compared to direct heating. Our research investigates the thermal dynamics and chemical processes involved in indirect heating to optimize biomass conversion. Experiments were conducted using a tubular reactor setup at temperatures ranging from 400°C to 600°C. Results showed that casuarina equisetifolia and coconut shell produced maximum biochar yields of 40% and 45%, respectively, at 500°C. The biochar from c asuarina equisetifolia had a higher heating value (HHV) of 24.5 MJ/kg, while coconut shell biochar reached 27.8 MJ/kg. Energy efficiency analysis indicated that indirect heating maintains comparable energy consumption to direct heating, while optimizing heat transfer efficiency and enhancing overall process control. This study highlights the potential of indirect heating to significantly improve biochar yield and quality, contributing to the development of sustainable biomass conversion technologies and advancing the bioenergy sector.

Keywords: Biomass pyrolysis, indirect heating, casuarina equisetifolia, coconut shell, biomass conversion

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-33

Chitosan Nanoparticles Loaded with 'Homeopathic Drug Nano Formulations: A Comprehensive Evaluation of Anti-Inflammatory and Toxicity Activity

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Abstract:

This research focuses on the medical application of cost-effective cross-linked chitosan nanoparticles for anti-inflammatory and toxicity studies using the homeopathic drugs Eupatorium perfoliatum (EP) and Achillea millefolium (AM) in ultra-dilution concentrations of 3C and 1000C. EP and AM-loaded chitosan nanoparticles were synthesized using the ionotropic gelation technique with varying concentrations of low and high molecular weight chitosan (0.5%, 1%, 1.5%, 2%). Optimal encapsulation efficiency was found at 0.5% HM and 1.5% LM for EP, and 0.5% HM and 2% LM for AM. Characterization was conducted using UV-Vis spectrophotometry, SEM, FTIR, DLS, and HPLC. In vitro, release studies using dialysis cell membranes for kinetic models (zero-order, first-order, Higuchi, and Korsmeyer- Peppas) showed release rates of 17-38% for AM and 62-88% for EP at 48 hours. The nanoparticles exhibited superior anti-inflammatory activity, with 56-60% inhibition of lipoxygenase (LOP) activity, and significant antibacterial activity against E. coli and S. aureus. Toxicity assays, including zebrafish and hemolytic activity tests, confirmed a reduced toxicity profile compared to the drugs alone. These findings suggest that homeopathic drug-loaded chitosan nanoparticles are an effective and safe delivery system, offering enhanced therapeutic efficacy and reduced toxicity. Thus, they demonstrate promise as potential nanocarriers for future therapeutic applications.

Keywords: Eupatorium perfoliatum, achillea millefolium, Chitosan, anti-inflammatory, Toxicity.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-34

Evaluation of Anti-Inflammatory and Toxicity Effects of Chitosan Nanoparticle-Loaded Ultra-Dilution Homeopathic Drugs in Zebrafish (Danio rerio)

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Abstract:

Advances in nanotechnology have highlighted the potential of nanoparticles for effective and targeted drug delivery. This study explores the antimicrobial, anti-inflammatory, and toxicity properties of homeopathic drugs loaded with chitosan nanoparticles. Using the ionotropic gelation method, Cornus circinata (6C and 1000C) and Hydrastis canadensis (3C and 1000C) were loaded onto low and high molecular weight chitosan nanoparticles at concentrations from 0.5% to 2%. Characterization was performed using UV-Vis spectrophotometry, SEM, HPLC, FTIR, and DLS. The encapsulation efficiency, in vitro drug release kinetics models, antimicrobial activity, anti-inflammatory activity, and toxicity were evaluated. Optimal encapsulation efficiency was achieved at 2% HM and 0.5% LM for CC, and 1% HM and 1.5% LM for HC, which were used in further studies. Cumulative drug release was 61-80% for CC and 75-97% for HC at 48 hours. Significant antibacterial activity against E. coli and S. aureus was observed. Anti-inflammatory activity ranged from 55-60% for both drugs, with less toxicity in hemolysis assays. Zebrafish studies monitoring hatching, heart rate, mortality, and survival indicated no adverse developmental toxicity at low concentrations. These findings suggest that while chitosan nanoparticles are promising nanocarriers for homeopathic drugs, their in vivo distribution, and potential nanotoxicity must be carefully considered.

Keywords: Cornus circinata, Hydrastis canadensis, ionotropic gelation, embryotoxicity, in vivo drug release.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-35

Nutrient Analysis of WWTPS: A Comprehensive Analysis, Efficiency Evaluation and Comparison

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Abstract:

In India, sewage treatment plants (STPs) play a vital role in maintaining environmental and public health by treating and safely discharging wastewater. Untreated sewage can lead to the contamination of ecosystems, as it depletes oxygen levels in water bodies, endangering aquatic life. The primary function of STPs is to return wastewater to a safe quality level before discharge, thereby preserving delicate ecosystems. Nutrients like nitrogen, phosphorus, and potassium are essential for life but can cause eutrophication when present in high concentrations in water bodies. Consequently, nutrient removal is imperative to comply with stringent discharge standards in India. While nonpoint sources contribute significantly to nutrient loading, effluents from point sources such as STPs can have a profound impact on water quality. India's growing population and urbanization increase wastewater volumes, challenging the sustainability of water resources. Advanced treatment methods are required for effective nutrient removal, yet these can be economically challenging. Thus, effluent nutrient levels in India vary based on the treatment processes employed by each STP.

Keywords: Sewage Treatment Plants (STPs), Wastewater, Ecosystem Preservation, Nutrient Removal, Eutrophication, Water Quality Management

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-36

Analysis of lifetime of microbubbles coated with micro and nanoparticles

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Abstract:

Microbubbles offers wide applications in versatile field like biotechnology, ultrasound agent and drug delivery agent. They have equal importance in the domain of waste water treatment plants and other affiliated industries. This is the reason that study on the stability play pivotal role for finding out specific applications. Coating the microbubbles with surfactants helps in increasing their lifetime. In current research, various surfactant is used to generate microbubbles and increase their stability. The measurement of stability of bubble at different concentration pointed out the importance of surfactant concentration for generation of stable bubbles. The drainage curve method was employed for estimating the stability in current research. Furthermore, the introduction of silica nanoparticles and Aluminum oxide particle on the microbubbles were also analyzed and optimum concentration of particles was found out for stable bubbles.

Keywords: Microbubble, Gas holdup, lifetime stability.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-37

Generating Renewable Electricity from Food waste

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Abstract:

Biogas is a renewable energy obtained by the anaerobic digestion of the of biodegradable waste. The gases inherent in the biogas, methane, carbon dioxide, hydrogen sulphide can be combusted with oxygen to release energy, which can be used as fuel or for electricity generation. This research aims to generate renewable electricity from food waste through anaerobic digestion or other appropriate technologies, reducing reliance on non-renewable energy sources and mitigating environmental impact. The two primary objectives of this research are, firstly, to ascertain the potential of food wastes, particularly from canteens and cafeterias, to produce methane gas for heat and electricity generation; and secondly, to quantify the methane gas production relative to the feedstock quantity. The implementation includes a mini biogas plant that uses food waste in university. Additionally, cow dung is utilized to enhance bacterial activity in the tank, thereby further increasing methane gas production. It is noteworthy that this mini biogas power plant can generate up to 600 kW of electricity per day, operating at a rate of approximately 25 kW/h. The daily methane production is estimated at around 180 cubic meters; with the quantity of methane gas produced correlating with the volume of waste input.

Keywords: Renewable energy, Biogas, Anaerobic digestion, sustainable waste management, Electricity generation.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-38

Deflouridation of water using Tea ash

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Abstract:

Water is essential for all life forms. The water we intake everyday can be contaminated by natural sources or industrial effluents. One such contaminant is fluoride, which in excess harms health like children's black brains, dental fluorosis, arthritis, osteoporosis, chronicle issues etc. The World Health Organization (WHO) advises a fluoride level in drinking water of 0.5–1 part per million (ppm). Modern techniques employed in defluoridation are very expensive and time-consuming, which will result in the need for cheap and efficient methods that we could easily implement in our houses. This study emphasizes the effectiveness of a biosorbent - tea ash in the elimination of fluoride ions, determining absorbent dosage, pH, and optimum contact time for defluoridation. This approach has the benefit of making a cheaper and more environmentally friendly solution to the risk produced by the consumption of water containing fluoride.

Keywords: Water, Fluoride, Health risk, Defluoridation, Biosorbents

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-39

Formulation of Biological Trickling Filter (BTF) With Loofah Sponge Supported Indigenous Tannery Effluent (TE) Microorganisms to Mitigate Heavy metals (HM)

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Abstract

Toxic and carcinogenic HM from industrial effluents such as, cadmium (Cd), nickel (Ni), iron (Fe), chromium (Cr), copper (Cu) and zinc (Zn) are of great concern for researchers, environmental scientists as they enter food chain so, to protect our ecosystem and environment a novel, efficient, economic, eco-friendly approach to remove HM should be developed. Biofilm forming indigenous microorganisms accumulates or oxidize or reduce HM to less soluble species and provides certain advantages and ensures durability under various operating conditions so, microbial HM mitigation will be studied under various biochemical, physical and chemical parameters. The present study deals with isolation, identification and characterization of indigenous heavy metal resistant bacteria collected from CETP, pallavaram and Madhavaram, Chennai. Among 20 isolates screened nine isolates were selected based on high HM resistance. The identified isolates were resistant to Zinc (Zn), Copper (Cu), Chromium (Cr), Iron (Fe), Nickel (Ni), Cobalt (Co), Cadmium (Cd). The minimum inhibitory Concentration (MIC) of tannery effluent isolates against Co, Cu, Cd, Zn, Cr, Fe and Ni was determined in solid media. The multiple metal resistances of these isolates were also associated with antibiotics gentamycin (GM), vancomycin (VM), tetracycline (TC), Norfloxacin (NF), chloramphenicol (CP) so, identified HM resistant bacteria could be useful for the bioremediation of HM contaminated tannery effluents. Results from this work are expected to be very promising for developing country and supports biological heavy metals reduction which is very simple, economical and effective method for tannery effluent treatment.

Keywords: heavy metals, wastewater treatment, tannery wastewater, effluents, bioremediation, tannery

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-40

Electrochemical performances of Fe-Co-Ni metal oxide anchored on reduced graphene oxide for supercapacitor application

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Abstract

Transition metal oxides are efficient electrode materials for the hybrid supercapacitor applications. Though mono metallic and bimetallic oxides show the high specific capacitance, there is a need to enhance the conductivity and the diffusion mechanism of the material. So, the trimetal (Fe, Co, Ni) oxides (FCN) showed the better conductivity and enhanced the specific capacitance. The reduced graphene oxide (RGO) is used to improve the diffusion nature of the trimetal oxide electrode material. The addition of RGO to the FCN increased the contact of electrode material to the electrolyte solution which resulted the high diffusion behavior of the material. The energy storage mechanism of FCN incorporated RGO (FCNR) showed the combination of electric double layer behavior from the RGO and faradaic behavior of the FCN. The electrochemical analysis evident the high specific capacitance and high diffusion nature of the electrode. The FCNR showed the high specific capacitance of 2165 mF cm^{-2} at current density of 1 mA cm^{-2}. So, the trimetal (Fe, Co, Ni) oxide incorporated RGO is the promising electrode material for hybrid supercapacitor application.

Keywords:

Supercapacitor, Reduced graphene oxide, Fe-Co-Ni, Metal oxide.

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-41

Unveiling The Power of Nature: A Review of Nature-Based Solutions for Groundwater Management and Consumption

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Abstract:

The integration of Nature-Based Solutions (NBS) in various sectors, such as water management, agriculture, and urban development, is pivotal for responding to climate change impacts and achieving sustainable development goals. NBS offers a resilient and cost- effective alternative to traditional engineered solutions, providing a multitude of benefits like enhanced soil health, increased biodiversity, and economic opportunities. By leveraging NBS, projects can mitigate risks associated with floods, droughts, and extreme weather events while enhancing ecosystem services, promoting human health, and boosting local economies. The scalability, durability, and transformative potential of NBS underscore their significance in fostering long-term environmental sustainability and societal well-being. Through equitable implementation, strategic planning across spatial and temporal scales, and a focus on stakeholder engagement, NBS can drive positive change, ensuring a harmonious balance between human activities and nature. The multifaceted benefits of NBS extend beyond environmental conservation to encompass economic growth, social well-being, and resilience to climate change, making them a cornerstone of sustainable development initiatives worldwide.

Keywords: Nature-Based Solutions (NBS), Groundwater Management, Water Quality, Biodiversity, Climate Resilience, Socioeconomic Benefits

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-42

Assessing the Impact of Pesticide Use on India's Agriculture and Environment

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Abstract:

The Indian agricultural sector has become highly dependent on pesticides to protect the crops for om pests and diseases. However, the extensive use of chemical pesticides poses a severe threat to the environment and its sustainability. This paper aims to review and analyze the trend across the country and explain the adverse consequences of pesticides on ecosystems. As pesticides can contaminate soil, water, and air resulting in serious environmental degradation, this research looks at how various pesticides affect these natural resources by causing long-term harm to ecosystems. Moreover, prolonged exposure to pesticides can also be harmful to human health. The paper examines the intricate relationship between exposure levels versus the inherent toxicity of such chemical compounds, also considering the possible health risks associated with their utilization in fields. Also, the chances of forming decomposition by-products that may be more harmful than the parent chemicals within the environmental matrix are highlighted. This paper also investigates alternative methods for detecting these compounds in different regions where agriculture takes place in India as well as explores alternative methods for the use of pesticides, paving the path for safe and organic agricultural practices that could be adopted.

Keywords: Pesticide, Environmental Impact, Human Health Risks, Sustainable Agriculture, Integrated Pest Management

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-43

Hydrothermal Liquefaction Using a Shrinking Core Approach- Impact of The Catalyst for Bio-Oil Production

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Abstract:

This research examines the effectiveness of catalysts in improving bio-oil production from macroalgae during hydrothermal liquefaction. The performance of different catalysts (KOH, gC3N4 and Na2Co3) was investigated in this process. The use of gC3N4 catalysts in the hydrothermal liquefaction process of macroalgae has demonstrated notable improvements in the yield and quality of bio-oil. These catalysts have played a crucial role in reducing the oxygen content, increasing the heating value, and promoting the formation of desirable compounds such as alcohols, phenolic compounds, and long-chain hydrocarbons. This innovative approach shows promising results(23.8wt%) for improving bio-oil production from macroalgae (Ulwa Prolifera). In addition, the reaction mechanism analyzed by the shrinking core model. It is a widely accepted approach in modeling gas-solid and liquid-solid reactions. Additionally, the paper highlights several key assumptions made during the modeling process. These include assuming a single interface between the solid substance and product, uniform particle porosity within each layer, constant temperature and pressure within the particle, immediate dissolution of products without forming a layer, and rapid dynamics of water concentration compared to the reaction rate.

Keywords: Catalyst, Shrinking core model, gC3N4, Kinetic modelling, HTL and reaction mechanism.

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-44

Seasonal and Climatic Variations in Dairy Industry Effluent: Impacts on Wastewater Management and Environmental Health

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Abstract:

Dairy treatment plants, integral to the production of a diverse array of dairy products, play a pivotal role in the food industries of many nations due to the essential and high-demand nature of their products. However, the operations of these plants generate substantial amounts of wastewater, primarily from cleaning and washing processes, which contain significant loads of organic matter. The physical parameters of dairy industry effluent can vary significantly based on seasonal and climatic changes, treatment methods applied, the timing of sampling sessions, and the specific months of the year. This study focuses on characterizing the effluent using key physical parameters including Total Dissolved Solids (TDS), Total Suspended Solids (TSS), turbidity, pH, electrical conductivity, temperature, Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD). Effluent samples were systematically collected both before and after the treatment process to thoroughly evaluate the effectiveness of the existing treatment protocols. Analysis revealed that dairy effluent tends to be alkaline and contains high concentrations of naturally occurring components, as reflected in the elevated levels of TDS, TSS, turbidity, pH, electrical conductivity, temperature, BOD, and COD. These parameters indicate a substantial organic load and significant variation in the quality of effluent, contingent upon the treatment and sampling conditions, as well as seasonal and climatic factors. Notably, the study found that the physical parameters of treated effluent often exceeded the permissible limits set by Environmental Protection Regulations, highlighting a critical gap in the current wastewater treatment systems. This exceedance underscores the urgent need for the implementation of more effective and robust wastewater treatment solutions to ensure the protection of environmental health and the maintenance of ecological balance. In conclusion, while dairy treatment plants are essential to the food industry, their operations produce wastewater that poses environmental challenges exacerbated by seasonal and climatic variations. To mitigate these challenges, it is imperative to adopt advanced treatment technologies that can reliably bring effluent parameters within regulatory limits, thereby safeguarding river ecosystems and promoting sustainable dairy industry practices. This study serves as a call to action for the development and implementation of improved wastewater management strategies in the dairy sector, taking into account seasonal and climatic variability.

Keywords: Dairy effluents, Dairy products, Physical-chemical parameters, seasonal & climatic variations

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-45

Integrating Artificial Intelligence for Efficient Waste Sorting in a Small-Scale Waste Recycling Plant

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Abstract:

The 21st century has witnessed an unprecedented surge in the global human population, placing a heightened demand on basic amenities such as food, water, and clothing. Consequently, the disposal of used commodities contributes to an ever-growing heterogeneous solid waste stream. Despite advancements in recycling methodologies, the intricate and diverse nature of solid wastes presents an ongoing challenge for waste management facilities worldwide, particularly in the labor-intensive sorting process. Human labor is hard to come by as the status quo of the process as the process is tedious and repetitive. Here, this research paper presents a solution poised to transform waste management practices: a fusion of machine learning and robotics tailored for efficient waste sorting, an economical, large-scale, and user- friendly approach to automated waste sorting, involving a conveyor-based robotic manipulator and machine learning algorithms to segregate different types of waste. This presents an economically feasible, scalable, and user-friendly method for automated waste sorting, encompassing a conveyor-based robotic manipulator and machine learning algorithms to segregate various types of waste. By harnessing the power of artificial intelligence and robotics, this research aims to revolutionize waste management practices, catalyzing a sustainable future for communities worldwide.

Keywords: Solid waste segregation, Artificial intelligence, Serial manipulator, Object recognition.

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-46

Treatability study on Tannery wastewater by Electro Fenton process

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Abstract:

In recent year large amount of water and wastewater generated from various industries and produce organic matters and contaminated the water, these organic compound in water poses serious problems to public health as wellas environment. In advanced oxidation process (AOPs), Electro Fenton process (EFP) is one of the best methods for the wastewater treatment. The detailed methodology for the electro Fenton study was developed. The treatment of Tannery wastewater by Electro Fenton process in terms of COD reduction experiment was done. The results were discussed for various parameters like pH, Hydrogen peroxide dosage, spacing between electrodes and Current density and the corresponding removal efficiencies were evaluated. Based on the results obtained, pH and current density plays vital role in this process. The maximum removal efficiency occurs in pH range 3. It is observed that, an increase in hydrogen peroxide dose usually results with an increase in the formation of hydroxyl radicals, but above optimum dosage, the •OH generation does not change significantly. The COD removal efficiency is increased by increasingthe current density due to the formation of higher hydroxyl radical amount.

Keywords: Tannery Wastewater, Electro Fenton process, pH, current Density, COD removal

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-47

Sustainable Alternatives to Stubble Burning in Agriculture

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Abstract:

This project investigates the adverse consequences of stubble burning on air quality, soil fertility, and people health, particularly in the context of South Asia, India. Through a diverse review of literature and data analysis, the study highlights the significant burning of stubble contributes to air pollution, including the emission of gaseous pollutants, such as methane, Sulphur oxides, nitrogen oxides, carbon monoxide, and carbon dioxide and particulate matters. The methodology involved examining the production of stubble in India, reasons for farmers' dependency on burning, and the potential economic and environmental benefits of alternative management practices. The findings underscore the urgent programs that raise awareness among farmers to enlighten about sustainable alternatives and the composite effects of stubble burning. The study suggests embracing Nutri Stubble and biochar as proactive measures to enhance soil health, reduce environmental impact, and encourage sustainable agricultural practices.

Keywords: Air pollution, Biogas, Eco-Friendly alternative, Soil fertility, Stubble burning.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-48

Production and Characterization of Violacein Pigment from marine bacteria Chromobacterium violaceum MBP-3

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Abstract:

Microbial Pigments are the one of the most significant secondary metabolites produced by microorganisms like, bacteria, fungi, yeast, microalgae and plants. Natural pigments are non-toxic, non-polluted, less health hazardous, natural, fast growing, have high production rate. Some of the bacteria capable producing pigment with variety of colors like light orange, red, violet, yellow. In the present study, pigmented organisms were isolated from the marine environment, dominant organisms were identified on the basis of morphology, biochemical and physiological characters, named as MBP-3 and 16S rRNA sequencing. Violet colored pigment was extracted by solvent extraction method and the production of pigment at various parameters were quantified and maximum quantity was 11.32mg/100ml. The pigment characterized by using UV-Vis spectroscopy, maximum absorbance was obtained at 565 nm, FTIR revealed the presence of Hydroxyl group (-OH), amide, 1aromatics(C-C) nitro compounds, C-N aliphatic and amines. And TEM and confirmed the presence of violacein. The violacein pigment was subjected to biological activities such as Antibacterial, and Antifungal activities and violacein found to be effective against pathogens. In-Vitro Cytotoxicity of violacein can able to inhibit the growth of DLA cell. Violacein can used to be as antimicrobial anti cancerous agent and a biodegradable food colorant.

Keywords: Violacein, Microbial Pigments, Natural pigments, biological activities.

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-49

Plant Mediated Synthesis of AGNP from Mangrove (Rhizophora stylosa) Leaves and its Applications as Antimicrobial and Cytotoxic Agent

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Abstract:

Due to straight forward procedure and the use of nontoxic ingredients, plant mediated biosynthesis of nanoparticle is becoming increasingly relevant. In the present study Rhizophora stylosa mangrove leaf extract was successfully used for the green synthesis of AgNPs, were subjected to UV-VIS absorption spectra in the range of 470 nm demonstrated the effective synthesis of AgNPs. Bands of FTIR absorption revealed the involvement of potential Rhizophora stylosa biomolecule in the synthesis of silver nanoparticle, peaks at 3322.86 -OH stretch and 1634.92 C=O stretched. TEM image elucidated the synthesis of AgNP with the average size of 33.76 nm. The antibacterial activity of the silver nanoparticles was effective against gram positive organisms Staphylococcus sp, Bacillus sp, and gram-negative organisms E. coli, Pseudomonas sp, Klebsiella sp, also inhibited the growth of pathogenic fungal species such as Aspergillus niger, Aspergillus flavus, Penicillium digitatum, and Penicillium commune. In - Vitro cytotoxic effect of the AgNPs on DLA cells was maximum at the concentration of 20 µg and % of cell death was 90.15, the anticancer study's findings show that it effectively combats tumor cells found in the peritoneal cavity of tumor – bearing mice. It strongly indicated that silver nanoparticle produced by Rhizophora stylosa plant extract can be employed as an effective bio medical agent considering this finding.

Keyword: Mangroves, Rhizophora stylosa, AgNP, Antibacterial activity, Anti-fungal activity In -Vitro cytotoxicity.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-50

Effective Removal of Fluoride from Aqueous Solution onto High Surface Area Activated Carbon

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Abstract:

A deleterious effect of fluoride concentration in ground water is an important issue due to its negative impact on the environment and human health. Activated Carbon (AC) has been widely used as an effective adsorbent for the removal of contaminants from water due to its high adsorption capacity and low cost. In this study, a high surface area AC was synthesized using biomass (fish scales) and its efficacy for the removal of fluoride from water was investigated. The synthesized AC were characterized by different analytical techniques such as N_2 adsorption/desorption isotherm, Fourier transform infrared spectroscopy (FTIR), X-ray diffraction spectroscopy (XRD) and Transmission electron microscopy (TEM). AC showed the microporous features, presenting average pore diameter of (2 - 4) nm, pore volume of 0.88 cm^3g^{-1} and surface area of $913 m^2g^{-1}$.The experimental study focused on the removal of fluoride with different parameters such as effect of mass of adsorbent, fluoride concentration, solution pH and temperature. Adsorbent showed the maximum adsorption capacity 8.6 mg g^{-1} at 25ºC. The experimental data obeyed the Langmuir model. Overall, the findings of this study suggest that synthesized AC using fish scales may become a promising adsorbent for the removal of fluoride from waste water.

Keywords: Fluoride removal; Adsorption; Kinetics; Isotherm; Fish-scale activated carbon

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-51

Trimethyl Propyl Ammonium Bis(trifluoromethanesulfonyl)imide as a Novel Ionic Liquid for CO_2 Absorption in Post-Combustion Carbon Capture

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Abstract:

The growing concern over carbon dioxide (CO_2) emissions from industrial sources has intensified the search for efficient carbon capture technologies. This study investigates the CO_2 absorption performance of the ionic liquid Trimethyl Propyl Ammonium Bis(trifluoromethanesulfonyl)imide (TMPA-TFSI) as a potential solvent for post-combustion carbon capture. TMPA-TFSI was selected for its promising properties, including low volatility, high thermal stability, and strong interaction with CO_2. The CO_2 absorption capacity was systematically evaluated under various operating conditions. The experimental results demonstrated that TMPA-TFSI exhibits a high affinity for CO_2, achieving significant absorption capacity and rapid uptake rates. Furthermore, physio-chemical properties such as pH, density, viscosity and surface tension will be determined for CO_2 loaded TMPA-TFSI. The findings of this study contribute to the development of more efficient and sustainable carbon capture processes, paving the way for the practical implementation of ionic liquids in mitigating CO_2 emissions.

Keywords: Ionic Liquids, CO_2, CO_2 absorption capacity, solvent properties

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-52

Exploration and optimization of dual gate carbon nano tube field effect transistor (DG CNTFET) device characteristics for gas sensing Applications

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Abstract:

Field Effect Transistors (FETs) have lived to see its significant technological improvement for various applications in recent years. Carbon nanotube (CNT) based FET have been found to be a promising component for next generation transistor technologies for CNTs high carrier mobility, device stability and mechanical flexibility. However, the design of CNTFET is still not well established, especially with a view to achieve the best performance still protecting thermal stability. In this study the authors had analysed the dual gate device structure and operation of transistor in which carbon nanotubes act as active channel region. DGCNTFET with different device geometrics such as channel length, oxide thickness for its output and transfer characteristics have been extensively studied using Nano TCAD ViDES simulation software. This study has thrown new insight into the device performance characteristics of DG CNTFET which can be scaled down up to minimum channel length without short channel effects.

Keywords: IC-Scaling, CNT, Nano Transistors, Flexible Electronics, Network Transistor-FET

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-53

Assessment of Heavy Metal Pollution of River waters of Srikakulam district, Andhra Pradesh, India.

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Abstract:

The major surface water sources for domestic and agricultural purposes in Srikakulam district are the Naga Vali, Vamsadhara, Mahendratanaya, and Bahuda rivers. Since water is a vital natural source for living species, awareness about its quality is essential. Industrial effluents, domestic and municipal sewage, and agricultural runoff contaminate the river waters; hence, there is a need to monitor the pollution status. The present work was aimed at assessing the status of the trace metals Pb, Zn, Ni, Cu, Cr, Mn, Cd, and Hg. The concentration of lead is very slightly exceeding BIS and WHO standards in all rivers except the Naga Vali River. Hg is not detected in all 4 rivers, and traces of Cd are found only in the Mahendratanaya river; other metals are within acceptable levels. The HPI of four rivers is less than the critical value; Mahendratanaya and Bahuda river waters have a relatively higher load of heavy metals than Nagavali and Vamsadhara river waters. Multivariate statistical methods, such as PCA and CA, are used to identify the sources responsible for contamination. 67.8% of the variance is explained by the two principal components. The strong factor loadings of Cu, Ni, Zn, and Pb are identified. The use of fertilizers, pesticides, and road traffic activities might be the source of heavy metal contamination. The dendrograms were used to classify the sampling sites into different clusters based on their similarities.

Key words: Heavy metals, HPI, PCA, dendrograms.

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-54

Polymeric Membrane-Based Processes for Removal of Heavy metals

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Abstract:

Recent advancements in membrane technology have significantly impacted water treatment methodologies. Organic, inorganic and hydride materials are commonly used in membrane fabrication. However, polymeric membranes stand out due to their cost-effectiveness and ease of fabrication. These membranes can be fixed or dynamic, effectively regulating the transport of particulates, molecules or ions using mechanisms such as size discrimination, electrostatic interactions, sorption, and diffusion. The continuous progress in polymer science has led to the development of superior membranes, driven by the growing demand for highly efficient membrane separations. This review aims to outline recent developments in polymeric membranes relevant to potable water reuse and highlight areas requiring future research and innovation.

Keywords: Polymeric Membranes, electrostatic interactions, Sorption, Diffusion

ISBN: 978-93-83409-91-4

Abstract ID: ICWEE-55

Bioconversion of Agro-industrial wastes into value added product by using Bio-processing Technology - A Review

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Abstract

This review explores the current states of bio-processing technology for converting waste into valuable bio-product. In India produces approximately 683 million tons of crop waste annually only 50% waste were treated and other 50% waste was disposed in river and open fields. The improper waste disposes causing environmental pollution. To avoid the environmental pollution these wastes were treat properly and converted into value added product by using biotechnology. Agro-industrial waste is highly nutritious in nature and facilitates microbial growth. Most agricultural wastes are lignocelluloses in nature; a large fraction of it is composed of carbohydrates so these waste materials as feedstock towards energy generation and production value-added bio-product via different fermentation strategies for the production of enzymes. Solid- state fermentation holds much potential compared with submerged fermentation methods for the utilization of agro-based wastes for enzyme production and other some advanced technologies used to valorization of waste like ultra-assisted extraction, microwave assisted extraction and enzyme immobilization assisted extraction. Key products derived from the valorization of agro- industrial wastes through solid state fermentation include, among others, enzymes, antioxidants, animal feed, bio-fuel, organic acids, single cell protein, bio-surfactant and bio-fertilizer etc.

Keywords: Agro-waste, bioprocessing technology, bioproduct, fermentation technology, environmental pollution, fertilizer, surfactant.

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-56

Wastewater Management and Environmental Health

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Abstract:

This paper introduces an innovative waste detection approach using integrated inductive proximity sensors and infrared (IR) sensors. Inductive sensors detect waste levels by emitting an electromagnetic field, suitable for robust, real-time monitoring in harsh environments. IR sensors complement this by accurately measuring object presence and type based on reflected infrared light. Together, they provide precise data to optimize waste collection routes and resource allocation. Integrated into waste bins, these sensors are controlled by microcontroller- based systems for efficient data processing. Experimental results demonstrate high accuracy in waste detection, reducing costs and environmental impact through improved operational efficiency. Future research aims to enhance sensor integration and data analytics for broader urban waste management challenges.

Keywords: Inductive proximity sensor, IR sensor, Waste detection, Urban Waste Management, Sensor integration, Environmental sustainability.

ISBN: 978-93-83409-91-4

4th International Conference on Waste, Energy and Environment (ICWEE-2024), 3-5, July,2024

Abstract ID: ICWEE-57

Real Time Analysis of Water Filter Management System Using Multi Sensor Approach

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Abstract:

Water, vital for human survival, often harbors hazardous contaminants, necessitating reliable filtration methods for consumption safety. Our proposed approach aims to enhance water quality monitoring and filter maintenance through the integration of turbidity, pH, and TDS sensors with an ESP32 microcontroller equipped with Wi-Fi connectivity. The ESP32 WROOM device is configured to connect to the server's IP within the local network, facilitating seamless communication. Users specify desired pH, TDS, and turbidity levels, from which thresholds are calculated to ensure optimal filtration. The system continuously evaluates water quality, updating a central database. Email notifications are triggered only when sensor readings exceed user-defined thresholds, prompting timely maintenance actions. Additionally, an API endpoint is established for serving data to the frontend, enabling visualization of the last 15 readings through a graph.

Keywords: Water Quality Monitoring, ESP32 WROOM, Sensor Integration, Total Dissolved Solids (TDS), Turbidity, pH sensor, Local Network Communication.

ISBN: 978-93-83409-91-4

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ICWEE - 2024

4th International Conference on Waste, Energy and Environment

July 03 - 05, 2024

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Tamil Nadu, India

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ISBN Number : 978-93-83409-91-4