BOOK OF ABSTRACT

ISECE 2021

International Symposium on Environment and Chemical Engineering 2021

Safe Environment for Better Living

25-26 November 2021

Tecno Scientifica

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INDEX

ABOUT TECNO SCIENTIFICA

Tecno Scientifica is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Tecno Scientifica is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Tecno Scientifica with gratification and privilege announcing its "International Symposium on Environmental and Chemical Engineering"(ISECE 2021), an Online Event scheduled during November 25-26, 2021 with the theme "Safe Environment for better living" The main aim of ISECE-2021 provides interaction between Chemical and Environmental Engineering experts, Bioengineering professionals, R&D department, Young Researchers, Ph.D. scholars, and other professionals in the areas of Water, Remediation, Chemistry, Biotechnology, and Nanotechnology around the world to share about their research studies and new innovations in the field of Chemical and Environmental Engineering. You can increase your professional skills in this free time and discuss the practical challenges encountered and the solutions adopted.

OPENING REMARKS BY CHAIR

On behalf of the Organizing Committee, it is my pleasure to welcome all the participants today for International Symposium on Environmental and Chemical Engineering. The symposium is completely conducted on a digital platform due to COVID-19 pandemic. This symposium is organized by Tecno Scientifica and Biointerface Research in Chemistry.

We are honored to organize the symposium with five keynoted speeches and more than 50 participants registered from twelve countries. We welcome all the eminent speaker and guests from twelve countries from different expertise, you have come here to share their knowledge and vast experience with the academic community. This symposium aiming to provide an international forum for academics, scientists, experts from all over the world in the field of water, ecology and environment to exchange the latest ideas, theoretical and practical research findings. During the two-day symposium, there will be 51 presentations covering various topic such as: membrane application, water purification, water and wastewater treatment, enzymatic reaction, and environmental microbiology.

We greatly acknowledge our publishing partners, Bio-Interface Research in Applied Chemistry, that indexed in *Scopus, Web of Science (Cite Score 1.8), Chemical Abstract (ACS), and Scilit (MDPI),* Environmental Research, Engineering and Management, that indexed in *Scopus, EBSCO, and Cambridge Scientific Abstract (CSA),* and Tropical Aquatic and Soil Pollution, for their collaborative support in publishing the articles.

My greatest appreciation goes to the technical and organizing committee, all of whom contributed to the symposium's success.
I wish you have a wonderful and interactive event, and once again, I extend a warm greeting to The ISECE 2021.

Tony Hadibarata
Chair – ISECE2021

CONFERENCE SCHEDULE

DAY 01 – THURSDAY 25TH NOVEMBER 2021

Time (UTC+8)	Activities
8:50-9:00	Opening Ceremony & Welcoming Speech by ISECE 2021 Chairman **Assoc. Prof. Dr. Tony Hadibarata, Curtin University, Malaysia**
Keynote Presentations Moderator: Dr Nur Hasyimah Hashim, Curtin University	
9:00-9:30	Genomic approaches to environmental studies **Prof. Dr. Topik Hidayat, Universitas Pendidikan Indonesia, Indonesia**
9:30-10:00	Production of bioenergy and recovery of nutrients by microalgae produced from the agro-wastewater Palm Oil Mill Effluent (POME) **Dr. Hesam Kamyab, Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia**
10:00-10:30	Challenge of pollutant biodegradation by white-rot fungi **Dr. Ajeng Arum Sari, National Research and Innovation Agency, Indonesia**
10:30-10:40	Transition Break (10 minutes)

Presentation: Session 1 Moderator: Ratih Indri Hapsari, Ph.D., State Polytechnic of Malang, Indonesia	
10:40-11:00	Design, Development and Dye Removal Application of Zeolite Based Membranes **Dr. Sabarish Radoor, King Mongkut's University of Technology North Bangkok, Thailand**
11:00-11:20	Diatomite: A naturally occurring material and its application to water purification **Dr. Sriram G., JAIN University, India**
11:20-11:40	Can microbial fuel cell be a sustainable technology for wastewater treatment and resource recovery? **Dr. Yuanyao Ye, Huazhong University of Science and Technology, China**
11:40-12:00	Biological enhanced primary treatment: opportunities and challenges for sustainable wastewater treatment and energy recovery. **Dr. Muhammad Rizwan Azhar, Edith Cowan University, Australia**
12:0-13:00	Lunch Break (1 hour)

Presentation: Session 2 Moderator: Dr. Lee Yih Nin, Curtin University, Malaysia	
13:00-13:20	The possibility of using radiofrequency waves for the treatment of color, formation of coagulant flocs, and microorganism removal from wastewaters **Dr. Alireza Bazargan, University of Tehran, Iran**
13:20-13:40	Removal of Cr(VI) by adsorption-reduction process using cerium phosphate polypyrrole nanocomposite **Dr. Sumanta Sahu, National Institute of Technology, Rourkela, India**
13:40-14:00	Treatment of hot wash liquor using fly ash **Dr. S. Silvamani, University of Technology and Applied Sciences, Oman**
14:00-14:20	Synthesis and characterization of CDs/Al_2O_3 nanofibers nanocomposite for Pb^{2+} ions adsorption and reuse for latent fingerprint detection **Dr BG Fouda Mbanga, University of Johannesburg, South Africa**
14:20-14:30	Transition break (10 minutes)

Parallel Session 3 Moderator: Dr. Mohd Noor Hazwan Jusoh, Curtin University, Malaysia	
14:30-14:45	Study of A Novel Dropping Nitrification–Cotton-based Denitrification Reactor for Nitrogen Removal from Ammonium-contaminated Groundwater **Dr. Amit Kumar Maharjan, Yamanashi University, Japan**
14:45-15:00	Phosphorus Removal from Aqueous Solution by Using Waste Chicken Eggshell: Kinetic and Isotherm Model **Dr. Noorul Hudai Abdullah, Universiti Tun Hussein Onn Malaysia**
15:00-15:15	Methylene Blue Removal Using Microwave Activated Method of Solid Boiler Waste **Sofia Anita, Universitas Riau, Indonesia**
15:15-15:30	The Effect of Pressure to The Solubility of CO_2 on Diffuser Model Microbubble Generating device in Pressurized CO_2 Disinfection Equipment **Evi Kurniati, Universitas Brawijaya, Indonesia**
15:30-15:45	A Comparative Study the Characteristics of CaO from Sea Shells Waste (*Anadara Granosa*) and Egg Shells Waste (*Gallus* sp.) as Heterogeneous Catalyst for Biodiesel Production **E Elwina, Politeknik Negeri Lhokseumawe, Indonesia**
15:45-16:00	Alternative Source of Commercially Available Antibiotics to Curb the Drug-Resistant Microorganisms **Sultana Razia, Atomic Energy Research Establishment, Bangladesh**
End of Day 1	

Parallel Session 4 Moderator: Sri Wahyuni, Ph.D., Brawijaya University, Indonesia	
Link: https://curtin.webex.com/curtin/j.php?MTID=m949a675fb0390fca21ec3260faca341c	
14:30-14:45	Efficient paramylon production by *Euglena gracilis*–mixotrophic cultivation using organic waste compounds and sewage effluent **Rubiyatno, Yamanashi University, Japan**
14:45-15:00	Factorial Design for Optimization and Performance Evaluation of Palm Oil Mill Effluent (POME) using Electrocoagulation **Norhafezah Kasmuri, Universiti Teknologi MARA, Malaysia**
15:00-15:15	Anaerobic Decomposition of Coal Fly Ash with Sludge Black Water and Agricultural Biomass Waste **Yasa Palaguna Umar, Universitas Brawijaya, Indonesia**
15:15-15:30	Removal and biosorption of 4-Bromophenol by using filamentous fungi, *Pichia kluyveri* FM012 **Ismallianto Isia, Curtin University, Malaysia**
15:30-15:45	The Effect of Ralstonia pickettii Bacterium Addition on Methylene Blue Dye Biodecolorization by Brown-Rot Fungus *Gloeophyllum trabeum* **Badzlin Nabilah, Institut Teknologi Sepuluh Nopember, Indonesia**
15:45-16:00	Monosodium Glutamate as Corrosion Inhibitor for Low Carbon Steel in Circulated Crude Oil **Irwan Nurdin, Politeknik Negeri Lhokseumawe, Indonesia**
End of Day 1	

Parallel Session 5 Moderator: Dr Nur Hasyimah Hashim, Curtin University	
14:30-14:45	Evaluation of different GLDAS models and SWAT model to estimate Soil Moisture Content **Dilip Kumar, Govind Ballabh Pant Engineering College, India**
14:45-15:00	Reduction of Ammoniacal Nitrogen, COD AND Color from Rubber Processing Industry Effluent Using Bentonite as Adsorbent. **Nur Faizan Mohamad Rais, Universiti Tun Hussein Onn Malaysia**
15:00-15:15	Micro-Peat, Limestone, AC and Zeolite as Eco-Friendly Composite Media for COD and NH_3-N Removal **Mohd Arif Rosli, Universiti Tun Hussein Onn Malaysia**

15:15-15:30	Synthesis of Phase Change Materials Based on Parafin/Graphite with HDPE/PLA as Matrix **Nurhanifa Aidy, Politeknik Negeri Lhokseumawe, Indonesia**
15:30-15:45	Ethylene Prophylene Diene Monomer (EPDM) Based Phase Changing Material for Thermal Energy Storage **Teuku Rihayat, Nurhanifa Aidy, Isra Adelya Izzati, Politeknik Negeri Lhokseumawe, Indonesia**
15:45-16:00	Synthesis and characterization of biodiesel from *wollfia* by insitu transesterification process **S. Saifuddin, Politeknik Negeri Lhokseumawe, Indonesia**
End of Day 1	

DAY 02 – FRIDAY 26TH NOVEMBER

Time (UTC+8)	Activities
Keynote Presentations Moderator: Dr Risky Ayu Kristanti, National Research and Innovation Agency, Indonesia	
9:00-9:45	Transforming wastewater treatment plants to biorefinery plants: waste sludge as biocatalyst for bioplastic production **Prof. Dr. Michihiko Ike, Osaka University, Japan.**
9:45-10:30	Problems and Ecological Issues of Pharmaceutical Active Compounds **Assoc. Prof. Dr. Palanivel Sathishkumar, South China Normal University, Guangzhou, China**
10:30-11:15	Source Identification of Contaminants in an Aquifer using Meta-Heuristic Optimization Based Inverse Model **Prof. Dr. Rajib Kumar Bhattacharjya, Indian Institute of Technology Guwahati, India**
11:15-11:25	Transition break (10 minutes)

Presentation: Session 1 Moderator: Dr Lee Yih Nin, Curtin University	
11:25-11:45	Role of carbonic anhydrase in microalgal carbon capture **Dr. Ashok Kumar Nadda, Jaypee University of Information Technology, India**
11:45-12:05	Semifluidized bed adsorption column for efficient removal of hazardous pollutants from wastewater **Dr. Subrata Biswas, Curtin University, Australia**
12:05-12:25	Laccase mediator sysytem (LMS) is the robust catalytic toolkit for harnessing the removal of non-phenolic pollutants **Dr. Aniruddha Sarker, Kyungpook National University, South Korea**
12:25-14:00	Lunch break (1 hour 30 minutes)

Presentation: Session 2 Moderator: Dr. Yureana Wijayanti Ph.D, Bina Nusantara University, Indonesia	
14:00-14:20	Strongly coupled $NiCo_2O_4$/rGO hybrid nanosheets for the degradation of Congo red dye in aqueous solution **Dr Cheera Prasad, Jiangsu University, China**

14:20-14:40	Environmental remediation of toxic metal ions from wastewater using pH-sensitive hydrogels **Prof Dr. Sudarsan Shanmugavel, C Abdul Hakeem College of Engineering and Technology, India**
14:40-15:00	Utilization of biosolids as carrier material for sustainable agriculture **Dr Balakumaran MD, D.G.Vaishnav College, India**
15:00-15:20	Electrospun materials for cardiac patch application **Dr. Saravana Kumar Jaganathan, University of Hull, UK**
15:20-15:30	Transition break (10 minutes)

Parallel Session 3 Moderator: Dr. Mohd Noor Hazwan Jusoh, Curtin University, Malaysia	
15:30-15:45	Enzymatic Hydrolysis of Petai (*Parkia speciosa*) Peel as Bioethanol Feedstock Preparation **Rachmad Ramadhan Yogaswara, Universitas Pembangunan Nasional "Veteran" Jawa Timur, Indonesia**
15:45-16:00	Spectroscopic Analysis and Antimicrobial Activities of Hygienic Travel Soap from Dabai Fruits Oil **Dr. Liyana Amalina Adnan, Universiti Sains Islam Malaysia**
16:00-16:15	Peat water color purification using tubular ceramic membrane by crossflow filtration at various pressures and operating times **E. Elfiana, Politeknik Negeri Lhokseumawe, Indonesia**
16:15-16:30	The Kinetic Study of Composite Adsorbents in Contaminated Saline Water Using Plastic Waste **Mohd Baharudin Ridzuan, Universiti Tun Hussein Onn Malaysia**
End of Symposium	

Parallel Session 4 Moderator: Dr. Osi Arutanti, National Research and Innovation Agency, Indonesia	
15:30-15:45	Magnetic molecularly imprinted polymer nanoparticles for the extraction and clean-up of thiamethoxam and thiacloprid in light and dark honey **Ahmed Abdulhussein, University of Malaya, Malaysia**
15:45-16:00	Removal of acrylamide and caffein in gayo arabica coffee beans by vacuum roasting **N. Nahar, Politeknik Negeri Lhokseumawe, Indonesia**

16:00-16:15	Utilization of Tofu Wastewater-Anaerobic Digestion Effluent (TW-ADE) for Water Spinach (Ipomoea aquatica) Growth using Hydroponic System **Umi Hamidah, IPB University, Indonesia**
16:15-16:30	COD and NH_3-N Reduction from Leachate Using Paper Waste Sludge **Amir Detho, Universiti Tun Hussein Onn Malaysia**
End of Symposium	

Parallel Session 5: Moderator: Dr. Nurul Noraziemah Mohd Pauzi, Curtin University Malaysia	
15:30-15:45	The effect of mangrove (*Avicennia lanata*) and glycerol composition on the production of bioplastics **F. Faridah, Politeknik Negeri Lhokseumawe, Indonesia**
15:45-16:00	Removal of organic and nitrogen compounds from domestic landfill leachate by microalgae **Nikita Emalya, Universitas Syiah Kuala, Indonesia**
16:00-16:15	Ceramic Membrane-Based from Fly Ash-Clay for River Water Treatment **Sevie Diana, Politeknik Negeri Lhokseumawe, Indonesia**
16:15-16:30	Kinetic Studies Using Adsorption Capacity for the Removal of Ammonia Nitrogen and COD in Treatment of Landfill Leachate **Izat Yahaya, Universiti Tun Hussein Onn Malaysia**
End of Symposium	

PARTICPANT LIST

KEYNOTE SESSION ABSTRACT

Prof. Dr. Topik Hidayat
Biology Study Program, Universitas Pendidikan Indonesia, Indonesia

Genomic approaches to environmental studies

We have witnessed the explosion of DNA technology in the last two decades in the field of biology, especilally in the environmental science. In particular, the application of genomic approaches in environmental studies offers an exciting new solutions because of the existence of complex microbial communities and their role in biological dynamics in the environment. Genomic itself refers to the explanation of the content, organization, regulation, mechanism and evolution of the genomes of organisms, including animals, plants and microorganisms. One of the main branches of genomic studies is Metagenomics. Metagenomics are also called as ecological genomics or environmental genomics because they involve analyzing and utilizing natural and ecological communities. In metagenomics study, microbial (bacteria is common) community analysis method is approached microbial genomes which goes beyond the limitation of pure culture technologies and thus does not rely on pure culture. Regarding this, one of our study which is about metagenomic analysis for river water quality assessment based on DNA sequences of 16S rDNA will be presented and discussed in this symposium.

Dr. Hesam Kamyab
Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100, Kuala Lumpur, Malaysia

Production of bioenergy and recovery of nutrients by microalgae produced from the agro-wastewater Palm Oil Mill Effluent (POME)

Wastewater and environmental pollution are gaining interest in developing and developed countries. Malaysia is known as one of the world's biggest palm oil producers. Hence, it is important to develop an environmentally friendly and economical method for treating effluent from palm oil mills (POME). Wastewater can serve as an economical source or substrate of nutrients which can sustain microalgae cultivation. This can be a fantastic nutrient at the same time as remediating effluent and producing biomass for algal cultivation. Many microalgae species are currently being investigated to determine their potential and effectiveness for the application of phytoremediation, in particular high growth rates. However, it is expensive to use synthetic media to produce microalgae on a large scale. It is recognized that POME (as enriched media of nutrients) assisted enhanced growth of microalgae under certain conditions will considerably reduce the presence of organic and inorganic compounds. In this context, the ability of a wide range of predominant microalgae species with an emphasis on green microalgae (high efficiency of removal) has been investigated. In addition, we thoroughly explored the past, methods, and potential prospects of nutrient removal by green microalgae. This context addresses several possible strategies to resolve the environmental problem created by POME agro-waste water with an increase in the productivity of biomass that can be used as an alternative for energy production.

Dr. Ajeng Arum Sari
National Research and Innovation Agency – BRIN, Indonesia.

Challenge of pollutant biodegradation by white-rot fungi

Environmental problems are a major current challenge for modern societies. White rot fungi (WRF) are well known for their extensive pollutant degradation abilities. The extracellular ligninolytic systems of WRF that exhibit low substrate specificity, enable them to degrade different environmental contaminants. In recent decades, WRF and their ligninolytic enzymes have been widely applied in the removal of polycyclic aromatic hydrocarbons (PAHs), Persistent Organic Pollutants (POPs), pesticides, synthetic dyes, and other environmental pollutants, wherein promising results have been achieved. We present advances in WRF-based bioremediation of pollutants. Moreover, a new approach to facilitate the application of immobilization of WRF by using carrier system for WRF is introduced. The potential problems and observations that are worthy of additional research attention are also highlighted.

KEYWORDS: Biodegradation; white-rot fungi; ligninolytic enzymes; immobilization system

Prof. Dr. Michihiko Ike
Division of Sustainable Energy and Environmental Engineering, Osaka University, Osaka, Japan.

Transforming Wastewater Treatment Plants to Biorefinery Plants: Waste Sludge as Biocatayste for Bioplastic Production

A huge amount of excess sludge (WAS) is generated in wastewater treatment plants (WWTPs) as the waste. However, WAS has become recognized as a bioresource recently. Here a proposal was made to produce polyhydroxyalkanoates (PHAs) using WAS as the biocatalyst for greatly improving the resource value of WAS. PHAs are easily-degradable bioplastics, which are accumulated in certain microbes as the intercellular storage compounds. If PHAs can be produced by WAS using waste streams including those from regional industrial/agricultural activities as the substrates, WWTP will gain function of high-value material production, i.e. biorefinery plants, in addition to water clean-up. To assess the possibility of the proposed concept, this study evaluated the potential of WAS to accumulate PHAs from various substrates and actual/simulated industrial wastewaters (IWs). WAS obtained from a typical WWTP was aerobically cultivated with various substrates and IWs in nutrient-limited medium. Fatty acids, especially butyrate and pyruvate, were good substrates for PHAs accumulation by WAS. Sugars like glucoe and sucrose was utilized to accumulate PHAs and also glycogen. Further IWs could be utilized to significantly accumulate PHAs, reflecting the contained organic substrates. These results indicated that WAS has a significant potential to produce PHAs from various waste streams, and our concept is not “fiction”.

KEYWORDS: wasetwater treatment plant; waste activated sludge; polyhydroxyalkanoates; biorefinery

Assoc. Prof. Dr. Palanivel Satishkumar
South China Normal University, Guangzhou, China.

Problems and ecological issues of pharmaceutical active compounds

Nowadays, the increasing use of pharmaceutical drugs for human and animals is becoming a serious ecological problem and also these drug metabolites frequently detected in various environmental compartments. Especially, pharmaceutically active compounds (PhACs) have been recognized as a possible threat to nontarget organisms due to their inherent biological activity and their "pseudo-persistence". The present study, mainly focus on the global occurrence of diclofenac (a nonsteroidal anti-inflammatory drug) in environmental compartment and it negative impact, because this PhACs cause a serious threat to nontarget organism, including vultures, aquatic animals, plants and mammals. Therefore, this drug has turned into a contaminant of emerging concern; hence, it was included in the previous Watch List of the EU Water Framework Directive. in mammals, diclofenac could cause gastrointestinal complications, neurotoxicity, cardiotoxicity, hepatotoxicity, nephrotoxicity, hematotoxicity, genotoxicity, teratogenicity, bone fractures, and skin allergy even at a low concentration. This study offers evidence of fragmentary available data for the water environment, soil, sediment, and biota worldwide and supports the need for further data to address the risks associated with the presence of diclofenac in the environment. Finally, this study suggest that the presence of diclofenac and its metabolites in the environment may represent a high risk because of their synergistic interactions with existing contaminants, leading to the development of drug-resistant strains and the formation of newly emerging pollutants.

***KEYWORDS*:** Diclofenc; Ecological problem; Environmental compartments; Mammals; Pharmaceutical drugs; Toxicity

Prof. Dr. Rajib Kumar Bhattacharjya
Indian Institute of Technology, Guwahati, India.

Source Identification of Contaminants in an Aquifer using Meta-Heuristic Optimization Based Inverse Model

Groundwater contamination is one of the key problems that could take decades to be solved if not treated correctly. The contaminated groundwater is very difficult to restore to a potable state if one is unsure of the source of contamination and the source strength. This study aims at source identification for different initial conditions of the aquifer. The initial conditions can be defined into three categories: identifying the sources when the number of sources and the locations are known, identifying the sources when the number of sources is known, and identifying the sources with no information about the number of sources, location as well as the source strengths. Therefore, the problem of source identification is a mixed-integer problem as it contains the continuous variables (strength) and discrete (locations and number of locations) depending on the type of problem. For a given aquifer with a few observation wells detecting contamination, the problem is designed to predict the initial conditions of the aquifer to the time where the contamination happens. In this paper, we assumed the initial conditions of the aquifer and tested the outputs after modeling with the field outputs by minimizing their absolute errors. Such a type of modeling is called the inverse optimization approach. All the types of problems cannot be solved using classical optimization methods, and thus metaheuristic optimization techniques are required to be used to solve complex cases. In this paper, we have discussed the identification of unknown pollution source problem and their solution using different optimization-based strategies.

KEYWORDS: Groundwater contamination, source identification, finite volume method, inverse optimization, metaheuristic algorithms.

PRESENTATION SESSION ABSTRACT

Design, Development and Dye Removal Application of Zeolite Based Membranes

Sabarish Radoor[1*], Jasila Karayil[2], Suchart Siengchin[1*]

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Abstract

In this study, a novel PVA/SA/ZSM-5 zeolite membrane with good regeneration capacity was successfully prepared by solvent casting technique. The properties of the membranes were assessed by employing different characterization techniques such as X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FT-IR), scanning electron microscope (SEM), optical microscopy (OP), thermogravimetric analysis (TGA), contact angle and universal testing machine (UTM). XRD, TGA and UTM results revealed that the crystallinity and thermo-mechanical performance of the membrane could be tuned with zeolite content. The successful incorporation of zeolite into the polymer matrix was confirmed by FT-IR, SEM and OP analysis. The adsorption ability of the as-prepared membrane was evaluated with a model anionic dye, Congo red. Adsorption studies show that the removal efficiency of the membrane could be tuned by varying zeolite content, initial concentration of dye, contact time, pH and temperature. Maximum dye adsorption (5.33 mg/g) was observed for 2.5 wt% zeolite loaded membrane, at an initial dye concentration of 10 ppm, pH 3 and temperature 30ºC. The antibacterial efficiency of the membrane against gram-positive (Staphylococcus aureus) and gram-negative bacteria (Escherichia coli) was also reported. The results show that membrane inhibits the growth of both gram-positive and gram-negative bacteria. The adsorption isotherm was studied using two models: Langmuir and Freundlich isotherm. The results show that the experimental data fitted well with Freundlich isotherm with a high correlation coefficient (R^2=0.998). Meanwhile, the kinetic studies demonstrate that pseudo-second-order (R^2=0.999) model describe the adsorption of Congo red onto PVA/SA/ZSM-5 zeolite membrane better than pseudo-first-order (R^2=0.972) and intra particle diffusion model (R^2=0.91). The experimental studies thus suggest that PVA/SA/ZSM-5 zeolite could be a promising candidate for the removal of Congo red from aqueous solution.

Keywords: Sodium alginate; Adsorption; Congo red; Polyvinyl alcohol; ZSM-5 zeolite

Diatomite: A naturally occurring material and its application to water purification

Sriram Ganesan

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ABSTRACT:

As a result of industrial and human activities and also untreated toxic contaminants, water pollution has become a significant problem in the environment. The dye is among the most toxic and carcinogenic pollutants found in water bodies. So that, it should be removed from the water before being released from the industries. A simple way to remove dyes from water is by adsorption, which is highly effective and easy to do. Removing dyes from water by adsorption on highly porous and naturally available cheap material diatomite is crucial. However, bare diatomite shows less removal efficiency due to its surface having less -OH and surface areas. In order to maximize dye removal efficiency, further, the surface of diatomite was functionalized with various nano materials for various dye removal. Diverse techniques were used to characterize the materials before and after dye adsorption, including XRD, FESEM, FTIR, and N_2 adsorption-desorption. The adsorption studies were conducted by various parameters such as the effect of pH, adsorbent dosage, initial concentration of dye, contact time, effect of salt, selectivity and reusability. Additionally, the adsorption isotherms models and kinetic studies were analyzed. According to the results, modified diatomite is considered to be one of the cheapest materials for dye removal application.

KEYWORDS: Diatomite; Porous materials, nanoparticles, Surface modification; Dye removal; Adsorption

Can microbial fuel cell be a sustainable technology for wastewater treatment and resource recovery?

Yuanyao Ye [1], Huu Hao Ngo [2], Wenshan Guo [2] , Yiwen Liu [2]

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2 Centre for Technology in Water and Wastewater, School of Civil and Environmental Engineering, University of Technology Sydney, Sydney, NSW 2007, Australia;

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ABSTRACT: Microbial fuel cell (MFC) is currently considered as a promising technology for wastewater treatment. This study aims to evaluate the feasibility of a double-chamber MFC to remove nutrients toward their recovery from municipal wastewater. Results showed that nutrients can be recovered by chemical precipitation at high pH generated by the MFC itself while supplying aeration in the cathode chamber. Besides, the maximum power density of 254 mW/m^2 can be achieved in the MFC. Simultaneously, the MFC could successfully treat municipal wastewater with over 90% of organics being removed at a wider range of organic loading rate (OLR) from 435 to 725 mgCOD/L·d, but higher OLR may disrupt the recovery of PO_4^{3-}-P and NH_4^+-N. Excess ammonium concentration in the feed solution may compromise the generation of electricity. The hydraulic retention time (HRT) had negligible effects on the recovery of nutrients by the MFC system. In contrast, the maximum power generation declined when HRT increased. The OLR and HRT should be optimized if high efficiency in recovering NH_4^+-N and PO_4^{3-}-P, and energy is prioritized.

KEYWORDS: Domestic wastewater; Microbial fuel cell; Nutrient recovery; Energy recovery; Chemical precipitation.

Biological enhanced primary treatment: opportunities and challenges for sustainable wastewater treatment and energy recovery.

Muhammad Rizwan Azhar *[1], **Mehdi Khiadani** [1]

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ABSTRACT: Biological enhanced primary treatment has attracted research communities owing to increasing demands of measures to tackle climate change. BEPT is considered among the frontrunners of technologies to resource recovery from wastewater and change dynamics of conventional wastewater treatment plants (WWTPs) and transform them into water resource recovery facilities (WRRFs). Currently, BEPT has reached full scale implementation but not solely with biological processes, there are some coagulants in action to enhance separation of biological solids. Labscale and pilot trials have been reported to implement BEPT without any chemicals. However, lower removal of dissolved chemical oxygen demand (CODs) is a challenge to this technology. There are also concerns in higher COD removal rates as this can disrupt downstream processes such as nutrients removal which require certain level of organics. Addition of external carbon from municipal solid waste is considered an option to fulfil the demands of organics but cost associated with it should be considered. The other options to maximize benefits of BEPT is integrated technologies to treat wastewater such BEPT-membrane processes, BEPT-electrochemical treatment etc. pilot scale membrane aerated biological reactor (MABR) is considered as a promising option for nutrients removal without largely depending on high levels of organics. Similarly, electrochemical nutrients removal can be implemented to treat or recover nutrients from wastewater.

KEYWORDS: wastewater; biological; energy; resource recovery

The possibility of using radiofrequency waves for color treatment, coagulant floc formation, and microorganism removal from wastewater

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ABSTRACT: The use of radio frequency for water and wastewater treatment is a topic that has not been extensively explored so far and requires more inspection. In this study, the effect of 150 KHz radio-frequency (RF) inductance on decolorization, coagulation and sedimentation of flocs, and removal of bacteria were investigated. In order to induce RF, a low frequency HydroFlow S38 device (Hydropath) was used. Experiments were first conducted on synthetic samples, and then on landfill leachate from the Aradkooh complex (Kahrizak) in Tehran, Iran. The results of experiments indicate that RF had no significant effect on de-coloring in the absence of an oxidant and little to no effect in the presence of an oxidizing agent. Also, the coagulation and flocculation of ferric chloride remained unaffected; however, the use of RF was shown to reduce the number of bacteria significantly. The inductance of RF alone, without any other aid or chemical/physical treatment, was able to reduce the bacterial count by 35%. In addition, residence time was shown to have little effect on the effectiveness of RF inductance. Such findings could pave the way for future research regarding the use of RF for disinfection purposes**.**

KEYWORDS: Radio Frequency; Floc Formation; Color Removal; Disinfection; Bacteria;

Removal of Cr(VI) by adsorption-reduction process using cerium phosphate polypyrrole nanocomposite

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ABSTRACT: Flower like cerium phosphate polypyrrole nanocomposite material is synthesized by in situ oxidative polymerization method and used for sequestration for Cr(VI). Field emission scanning electron microscopy and transmission electron microscopy images reveal the flower-like morphology of the synthesized nanocomposite. Meanwhile, the fabrication of polypyrrole on cerium phosphate nanoparticles provides a plentiful of active adsorption sites to interact with hexavalent chromium ions. The Cr(VI) adsorption follows Langmuir isotherm model showing a high adsorption capacity of 117.78 mg g-1 at room temperature at low pH. The adsorption dynamic study demonstrates that the rate-determining step of adsorption is controlled by surface diffusion, pore diffusion and film diffusion. XPS spectra confirmed the simultaneous adsorption of Cr(VI) and in situ chemical reduction to Cr(III). Regeneration studies illustrate the efficiency of more than 80%, even after five cycles. The procured results make the $CePO_4$-PPY nanocomposite a promising adsorbent for the abatement of Cr(VI) from aqueous solution.

KEYWORDS: $CePO_4$-PPY; Cr(VI); Adsorption; Reduction; Kinetic study; Isotherm stud

Treatment of Hot Wash Liquor using Fly Ash

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ABSTRACT: Textile industries are the second largest water consuming industries next to agriculture. This research has aimed at investigating the utilization of fly ash as a low-cost adsorbent to treat hot wash liquor by employing one-factor-at-a-time. Contact time, effluent dosage, pH, mass of adsorbent, temperature, particle size and agitation speed have been varied to find the optimum conditions for dye removal from hot wash liquor by fly ash. The results from sorption process shows that the maximum dye removal of 86.07% has been obtained at time of 5 min, effluent to water ratio of 9:1, pH of 11, adsorbent dosage of 0.55 g/mL, temperature of 27 °C, fly ash particle size of 128 µm and agitation speed of 100 rpm. The analysis of results were performed through adsorption capapcity and percentage colour removal. Hence, the results suggested that fly ash could be used as an effective adsorbent for treating dyehouse effluents.

KEYWORDS: Adsorption, Dyeing, Hot wash liquor, Fly ash, One-factor-at-a-time

Synthesis and Characterization of Carbon Dots Coated Al_2O_3 Nanofibers Nanocomposite for Pb^{2+} ion Adsorption and Reuse for Latent Fingerprint Detection.

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Abstract

This study reports a new approach of preparation of carbon dots coated aluminum oxide nanofibers (CDs/Al_2O_3NFs) nanocomposite and reusing the spent adsorbent of Pb^{2+}-CDs/Al_2O_3NFs nanocomposite for latent fingerprint detection (LFP) after removing Pb^{2+} ions from aqueous solution. CDs/Al_2O_3NFs nanocomposite was prepared by using CDs and Al_2O_3NFs with adsorption processes. The prepared nanocomposite was then characterized by using UV-visible spectroscopy (UV-visible), Fourier transforms infrared spectroscopy (FTIR), Fluorescence, X-ray diffraction pattern (XRD), scanning electron microscope (SEM), Transmission electron microscopy (TEM), Energy-dispersive X-ray spectroscopy (EDS), Zeta potential, X-ray photoelectron spectroscopy (XPS). The size of the CDs average was 51.18 nm. The synthesized CDs/Al_2O_3NFs nanocomposite has proven to be a good adsorbent in Pb^{2+} removal from water with optimum pH 6, dosage 0. 2 g / L. The results were suited by Freundlich models rather than the Langmuir, which was indicated the linear fit of Freundlich models with (R^2 = 0.9896). This adsorption was related to the multilayer adsorption processes of Pb^{2+} ions on the CDs/Al_2O_3NFs nanocomposite surface. The adsorption capacity of CDs/Al_2O_3NFs nanocomposite showed the best removal of Pb^{2+} ions with q_m = (177. 83 mg/g), when compared to the previous reports. This adsorption followed the pseudo-second order kinetics and intra particle diffusion processes. ΔG and ΔH values indicated spontaneity and the endothermic nature of the adsorption process. CDs/Al_2O_3NFs nanocomposite therefore showed potential as an effective adsorbent. Furthermore, the metal loaded on the adsorbent Pb^{2+}-CDs/Al_2O_3NFs has proven to be sensitive and selective for LFP detection on various porous substrates. Hence Pb^{2+}-CDs/Al_2O_3NFs nanocomposite can be reused as a good fingerprint labelling agent in LFP detection so as to avoid secondary environmental pollution by disposal of the spent adsorbent.

Keyword: CDs/Al_2O_3NFs nanocomposite, Lead adsorption, Isotherm, kinetics, Thermodynamics, Reusable for latent fingerprint detection.

Role of carbonic anhydrase in microalgal carbon capture

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Abstract

The outpacing CO_2 has become an environmental concern leading to either restriction of its release in the atmosphere or by using it further for valuable products. Biological CO_2 sequestration through photosynthesis is the most sustainable approach been recognized for the capture of CO_2, and microalgae, a photoautotrophic micro-organism with its highest CO_2 fixing capabilities has been identified as the most potential sequestering candidate. Microalgal carbon capture is a clean and a cost-effective technology with production of many other valuable products which have wide application in many industries such as nutraceuticals, medicines, pharmaceuticals, biorefinery, bioenergy, aquaculture, feed and cosmeceuticals. Further, algae's carbon concentrating mechanism is enhanced by a zinc metalloenzyme, carbonic anhydrase which plays a vital role in converting CO_2 to bicarbonate and a proton and vice-versa, thus increasing the microalgal biomass. Therefore, to speed up the algal growth, many carbonic anhydrase immobilization techniques using nanostructures have been studied for the enhanced catalytic activity, stability, reusability and its resistance to harsh environments. Further, integrated/hybrid approaches are being used to enhance the CO_2 capture with co-production of valuable products for the development of an efficient and a cost-effective process.

Keywords: CO_2 sequestration, photosynthesis, carbonic anhydrase, microalgae, integrated approach

Semifluidized Bed Adsorption Column For Efficient Removal Of Hazardous Pollutants From Wastewater

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Abstract: Over the last few decades adsorption based wastewater treatment system has drawn significant attention for several advantages like low cost, easy operation availability of raw materials etc. Despite of such advantages still adsorption based technologies are not fully adopted for industrial application because of lack of proper research in continuous column. In the recent years various continuous adsorption columns have been studied for future application. The present research work has been focused on development and application of a novel semifluidized bed adsorption column for treatment of heavy metal and organic pollutant containing wastewater. The novel system was formed by combining packed bed and fluidized bed reactor together in a single column. Agricultural waste based biochar was prepared and encapsulated in alginate beads and the hybrid adsorbent has been used as solid phase of the reactor. Synthetic wastewater containing various heavy metals like Zn, Cu, Ni, Pb, Cd and organic pollutant like Phenol are treated in the system. The mechanism of the system also highlighted. Performance of the semifluidized bed has been studied with actual wastewater from steel plant. Further, process optimization and dynamic model of the system also developed and validated for scale up in future use.

Keywords: semifluidized bed, adsorption, heavy metal removal, dynamic modelling

Laccase mediator system (LMS) is the robust catalytic toolkit for harnessing the removal of non-phenolic pollutants

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ABSTRACT: Among the oxidoreductase, fungal laccase (derived from white-rot fungi) is a fairly popular enzyme for the removal of phenolic environmental pollutants. However, an emerging application of laccase along with phenolic mediators is also found to be effective to remove non-phenolic pollutants. Thus, the laccase mediator system (LMS) is served as a robust catalytic tool for enhanced removal of non-phenolic pollutants (e.g., aniline, chloroaniline, nitrous pollutants, etc.). In our study, the laccase derived from *Tramates versicolor* was found to be effective while reacting in presence of phenolic mediator catechol to degrade 3,5-dichloroaniline (a toxic non-phenolic metabolite derived from dicarboximide fungicides). The role of the phenolic mediator is acting as an electron shuttle for harnessing the removal of non-phenolic pollutants. In addition, LMS can significantly increase the reaction kinetics during the removal of phenolic pollutants in the wastewater treatment plants. Thus, LMS is one of the best green catalytic approaches for the bioremediation of a variety of pollutants. The optimum reaction conditions such as reaction pH, temperature, the concentration of the pollutants are the key triggering factors for controlling the biocatalysis of non-phenolic pollutants. However, the performance of LMS may be varied in the real world scenario, due to environmental factors and the soil organic matter contents. Thus, we reviewed and performed several comparative studies to evaluate the effectiveness of LMS in presence of natural organic matter. The findings of our studies and other related approaches concerning the feasibility of LMS is deciphering the biocatalysis of non-phenolic pollutants as a promising and sustainable approach. This LMS can be applied both in the real field and in lab experiments for remediation of non-phenolic and emerging pollutants.

KEYWORDS: Laccase; Biocatalysis; Mediator; Non-phenolic pollutants: Green catalysis

Strongly coupled $NiCo_2O_4$/rGO hybrid nanosheets for the degradation of Congo red dye in aqueous solution

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Abstract. The treatment of toxic organic pollutant is extremely beloved for the conservation of clean air, soil and water. In this study, (reduced graphene oxide) rGO/$NiCo_2O_4$ hybrid nanocomposite was prepared by a facile hydrothermal technique and employed for organic dye degradation from waste water. The synthesized $NiCo_2O_4$/rGO hybrid nanocomposite was studied by using FTIR, XRD, SEM, TEM, BET, Raman spectroscopy and UV-visible. The physical characterizations prove the deposition of $NiCo_2O_4$ particles on the rGO surface. The transmission electron microscope image demonstrated that the $NiCo_2O_4$ particles with an average size of ~46 nm were dispersed on the rGO surface. The obtained nanoparticles show the higher specific surface area of 56.4 m^2/g. Besides, the catalytic effectiveness of synthesized nanocomposite towards the Congo red (CR) dye reduction mediated by the electron (e^-) transfer route of BH_4^- ions was explained detail. The electrostatic interaction used between the $NiCo_2O_4$/rGO hybrid composite and Congo red increased degradation effectiveness of dye sample and the large specific surface area and extensive number of active sites totally removed the CR dye in 20 min.

Key words: Congo red; $NiCo_2O_4$/rGO hybrid composite; X-ray diffraction; FTIR.

Environmental remediation of toxic metal ions from wastewater using pH-sensitive hydrogels

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Abstract

Substantial needs and efforts have been made in the fabrication of pH-sensitive hydrogels for an initial sensing and successfully eliminating toxic metal ions from environments. The toxic metal ions viz., Cr^{3+}, Ni^{2+}, As^{2+},Cd^{2+},Pb^{2+},Cu^{2+} and Mg^{2+} from effluent wastewater were found a foremost origin of pollution for ground water sources. The presence of these ions is poisonous to human beings and aquatic life of microorganism. It should be removed from wastewater before discarding of from the industries. Several treatment skills have been described to remediate the possible toxic metal ions from aqueous media like adsorption and precipitation trials in terms of applicability, efficacy and cost. Conversely, adsorption method has the ability of meritoriously eliminating toxic metals at very low concentration. A number of adsorbents have been stated in the literature for this resolve and to the use of pH-sensitive hydrogel adsorbents for toxic metal ions removal in wastewater. The utilization of pH-sensitive hydrogels have exposed synergetic effects in the elimination of toxic metal ions as supportable environmental method in the near future.

Keywords: pH-sensitive hydrogels, toxic metal ions, wastewater treatment, pollution

Utilization of biosolids as carrier material for sustainable agriculture

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ABSTRACT:
Inorganic chemical-based fertilizers are the major component of soil management strategies currently used. The use of these fertilizers caused serious threats to human and environmental health. The current strategy is to use chemical fertilizers exclusively to maintain and increase agricultural productivity. Despite the fact that chemical fertilizers are credited with the growth of agriculture by nearly fifty percent, these fertilizers are linked with pollution of the environment and health risks as well. Due to the demand for better quality water and the enactment of stricter environmental laws, the production of sewage sludge (biosolids) has increased sharply in recent years. Managing biosolids and creating useful products out of them is a vital part of helping to decrease the emission of methane, an extremely potent greenhouse gas. This has necessitated the development of new technologies. Biosolids are the nutrient-rich organic materials resulting from treatment and processing of wastewater residuals. Inoculants containing effective microorganisms are commonly prepared as carrier-based bio fertilizers. Incorporating the microorganisms into a carrier material makes bio fertilizers easier to handle, enables long-term storage and increases their effectiveness. One of the major groups of bio fertilizers is bacterial inoculants, which often include rhizobia, nitrogen-fixing rhizobacteria, plant growth-promoting rhizobacteria, and phosphate-solubilizing bacteria. Hence, developing an adequate formulation of microbial inoculants incorporating along with bisolids (carrier materials) would results a sustainable and commercial product.

KEYWORDS: Biosolids, Fertilizers, PGPR, Sludge, Wastewater residue

Electrospun materials for cardiac patch application

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ABSTRACT: Scaffolds are used in tissue engineering application to support cell attachment and growth. Materials in medical application need to be compatible with surrounding tissues besides its intended function. To achieve this, electrospun scaffold mimicking native human extracellular matrix structure seems to be a viable option. Electrospun scaffolds renders appropriate porosity, fibre dimension and surface area suitable for the new tissue growth. Electrospun polyurethane scaffold supplemented with nickel oxide particles have been experimented for cardiac tissue engineering1. It was found to render necessary physiochemical cues and mechanical properties relevant to cardiac tissue engineering. Further, in vitro and blood compatibility test promoted their feasibility for the cardiac tissue engineering applications.

KEYWORDS: Scaffold; Tissue Engineering; Blood compatibility; Wettability

PARALLEL SESSION ABSTRACT

Study of A Novel Dropping Nitrification–Cotton-based Denitrification Reactor for Nitrogen Removal from Ammonium-contaminated Groundwater

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ABSTRACT: Excess of nitrogen (N) concentrations (ammonium [NH_4^+], nitrite [NO_2^-], and nitrate [NO_3^-]) in water makes it undrinkable. A novel dropping nitrification–cotton-based denitrification reactor was developed, and its total N removal ability from NH_4^+-contaminated groundwater was investigated for 91 days. Synthetic groundwater (30 mg-NH_4^+-N/L) was dropped from the top of 1-m long hanging dropping nitrification unit at 2.16 L/d flow rate, and the cotton-based denitrification unit was connected just below the dropping nitrification unit. The NH_4^+ in the groundwater was almost completely oxidized (> 90% nitrification efficiency) by nitrifying bacteria to NO_2^- and NO_3^- in the dropping nitrification unit. Subsequently, the generated NO_2^- and NO_3^- were denitrified (96%–98% denitrification efficiency) by denitrifying bacteria to N_2 gas in the cotton-based denitrification unit. Organic carbons released from the cotton presumably acted as electron donors for heterotrophic denitrification under anoxic condition. Nitrifying and denitrifying bacteria were colonized in higher abundance in the dropping nitrification and cotton-based denitrification units, respectively. The total N removal rate and efficiency of the dropping nitrification–cotton-based denitrification reactor were 58.1–66.9 mg-N/d and 96%–98%, respectively. The dropping nitrification–cotton-based denitrification reactor will be an efficient, sustainable, and promising option for total N removal from NH_4^+-contaminated groundwater.

KEYWORDS: cotton-based denitrification; dropping nitrification; NH_4^+-contaminated groundwater; nitrogen removal

Phosphorus Removal from Aqueous Solution by Using Waste Chicken Eggshell: Kinetic and Isotherm Model

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ABSTRACT: Excess phosphorus in water bodies stimulates algal growth and causes eutrophication. Various wastewater treatment technologies have been developed to solve this problem; however, the use of such technologies incurs high cost for their operation and maintenance. Hence, to seek the eco-friendly element in removing phosphate from wastewater, this study used chicken eggshell to remove phosphate in aqueous solution by using adsorbent with different particle sizes (0.075, 0.15, 0.30, 0.60, and 1.18 mm). The chicken eggshells were calcined at 800 °C in a furnace and used as adsorbents. The phosphate adsorption onto chicken eggshell data from experiments were fitted to kinetic and isotherm models. Chicken eggshell is an eco-friendly material that has potential as an adsorbent for removing phosphate from aqueous solution, where the highest removal is 98%. The best model for phosphate removal is the pseudo-second-order (PSO) model, as it fitted better with the data and has a high R^2 of 0.9999. Waste chicken eggshells have a multilayer adsorption property, making it a perfect adsorbent with high adsorption capabilities. The application of waste material to adsorb phosphate from aqueous solution shows the contribution of eco-friendly waste material use in real adsorption wastewater treatment technologies.

KEYWORDS: Eggshell, Eutrophication, Phosphate, Kinetic Model, Isotherm

Methylene Blue Removal Using Microwave Activated Method of Solid Boiler Waste

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ABSTRACT: Bottom ash and fly ash are hazardous solid waste. They produced from the burning process of palm oil shells and fiber at temperature of 900℃ in palm oil mills. This study aims to characterized and utilize both of ash boiler as adsorbent of methylene blue dye. Adsorbent from boiler ashes were prepared by using microwave activation method at 100 Watts with varies times (1; 2; 3; 4 and 5 minutes) to get optimum efficiency of methylene blue dye. The functional groups of ash non-activated and activated by microwave compared analyzed using Fourier Transform Infrared, surface morphology and elemental composition were analyzed and compared using Scanning Electron Microscope-Energy Dispersive X-Ray Spectroscopy. The results showed that the optimum adsorption efficiency for 3 minutes activation for bottom ash using methylene blue of 93.45% and fly ash of 99.94%, respectively. The activation process causes changes in the content of the adsorbent elements, i.e. loss of Fe element and and increased the percentage elements of O, Si, P, K and Al for bottom ash. Then, O, Mg, Al, Si, P, K, Ca elements increased, and loss of Fe and Cu for fly ash. The functional groups for both of ash unchanged due to activated process.

KEYWORDS: bottom ash; fly ash; methylene blue; microwave

The Effect of Pressure to The Solubility of CO_2 on Diffuser Model Microbubble Generating device in Pressurized CO_2 Disinfection Equipment

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ABSTRACT: The presence of pathogenic microorganisms may pollute the water and will directly affect on human health. Carbon dioxide (CO_2) has been widely used for food preservation such as jams, juices, etc. The key factor is that the solubility of CO_2 in the water or substance capable to eliminate microorganism activities as well as pathogenic microorganisms. The pressure of the chamber would increase the solubility of the CO_2 to the water sample thus more effective as disinfectant. Pressurized bubble carbon dioxide (CO_2) is a promising alternative technology for disinfection of water compare to others conventional disinfection. In the other hand, microbubble could also increase the solubility of CO_2 due to the decreasing of the size of water molecules. The varying pressures of 0.12 MPa, 0.16 MPa and 0.20 MPa were applied. A diffuser type microbubble generating device was installed. Observations were conducted on temperature, pH, and dissolved CO_2 concentration. Results showed that the higher pressure led to more solubility of CO_2 in the water sample and tended to lower pH caused by the formation of carbonate acid. However, higher temperature was occurring caused by the centrifugal type of flow generated from diffuser microbubbler.

KEYWORDS: pressurized CO_2; microbubble; disinfection

A Comparative Study the Characteristics of CaO from Shells *(Anadara Granosa)* and Egg Shells (*Gallus SP*) as Heterogeneous Catalyst for Biodiesel Production

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ABSTRACT: The most commonly used catalysts in the manufacture of biodiesel are homogeneous bases. However, the use of this catalyst has a disadvantage and it can not be reused. In contrast to a heterogeneous catalyst which is easier in the product purification process, they can be reused so as to minimize waste. In this study, biodiesel was made using a CaO catalyst as a heterogeneous base catalyst, CaO is synthesis from the CaCO3 calcination process. The source of CaCO3 is obtained from eggshell waste and shells. The Cao catalyst is made by calcining in a furnace at a temperature of 800˚C for 6 hours, and then the calcined catalyst is used as a catalyst for biodiesel. production by the transesterification method with the ratio of reactants 9:1 for 3 hours by varying concentrations of catalyst 1%, 3%, and 5%. The results show that the best analysis of the characteristics is CaO catalyst derived from eggshells 5% with a yield of 84.46%, the density is 0.853 kg/m^3, flash point is 105˚C, water content is 0.07% and viscosity is 4.393 mm^2/ second. Characterized by SEM and FTIR shows the micrographs prove that the catalyst shows a bigger surface.

KEYWORDS: catalyst; shells; eggshells; Biodiesel; heterogeneous

Alternative Source of Commercially Available Antibiotics to Curb the Drug-Resistant Microorganisms

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Antibiotics are natural or artificial compounds that have an inhibitory function on microorganisms. They have been used to treat infections for few decades. Since microorganisms have the ability to gain resistance power against some antibiotics, all antibiotics cannot be used to treat all types of infections. Moreover, recently emergence and spread of various multidrug-resistant microorganisms have posed alarming challenges to public health and agriculture worldwide. This dire scenario has been worsened by shortage research and development on antibiotics. Thus the purpose of the present study was to check the bacterial sensitivity against some commercially available antibiotics as well as to explore the antibacterial activity of some fruits peels wastes. For our study, four ATTCC bacterial strains (*Escherichia coli*, *Salmonella enteritidis, Bacillus subtilis* and *Staphylococcus aureus*), some anti biotics and six different fruits peels. For both susceptibility and antimicrobial activity tests, disc diffusion technique was applied in which antibiotics disks are placed on the plates which are inoculated with the test organism. After 24 hours of incubation period at 35±2°C, it was observed that all tested bacteria exhibited completely resistant against at least two antibiotics: *E. coli* against Methicillin, Erythromycin and Amoxycillin; *S. enteritidis* against Methicillin and Erythromycin; and both *B. subtilis* and *S. aureus* against Methicillin and Aztreonam. Thus except few antibiotic, four bacterial strains still sensitive to most of the antibiotics tested herein. However, in future this situation will be changed as bacteria are capable to gain resistance over time. While, among six alcoholic peel extracts, Water caltrops (Panifal) and Burmese grape (Lotkhon) exhibited anti-bacterial activity against all four bacterial strains. Panifal peel extract exhibited comparatively better activity (12-20mm) than Lotkon peel extract (6-20mm). For both Panifal and Lotkon peel extracts, the largest zone of inhibition was recorded 20 mm in diameter against *S. enteritidis* and *B. subtilis* respectively. Therefore, when commercially available antibiotics will be ineffective in future, then these two indigenous fruits peels can be alternative source of new antimicrobials to curb the drug-resistant microorganisms.

Keywords: Antibiotics, antibiotics sensitivity, fruits peels wastes, antimicrobial activity, novel antimicrobials, drug-resistant microorganisms.

Efficient paramylon production by *Euglena gracilis*–mixotrophic cultivation using organic waste compounds and sewage effluent

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ABSTRACT: *Euglena gracilis*, a freshwater green microlaga, has ability to synthesiz and accumulate bioproducts such as amino acid, lipid and paramylon. Paramylon is a unique bioproduct reported as immunostimulatory and feedstock for high-value nutritional supplements. Enhancement paramylon productivity of *E. gracilis* with low cost is a critical challenge at present study. In this study, we investigated the efficient paramylon production by *E. gracilis*–mixotrophic cultivation using sewage effluent and organic wastes. *E. gracilis* could grow well and efficiently produce paramylon in sewage effluent. The addition of organic wastes such as corn steep liquor, molasses, and waste wine significantly increased biomass and paramylon productivity of *E. gracilis* under mixtorophic cultivation. The paramylon content in cells and paramylon productivity of *E. gracilis* mixorophic cultivation in sewage effluent containing waste wine reached 67.7% and 47.8 mg/L/d, respectively. The mixorophic cultivation of *E. gracilis* using sewage effluent and organic wastes will be a promising strategy for enhancment of paramylon productivity of *E. gracilis*.

KEYWORDS: *Euglena gracilis*, paramylon, mixotrophic cultivation, sewage effluent, organic waste

Factorial Design for Optimization and Performance Evaluation of Palm Oil Mill Effluent (POME) using Electrocoagulation

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ABSTRACT: The palm oil industry needs a more effective method to treat palm oil mill effluent (POME) before being released into the river without polluting the environment. Thus, the best possible solution in treating POME is using electrocoagulation. This study focused on the factorial experimental design for optimization and performance evaluation in electrocoagulation treatment. This technique uses a direct current source between metal electrodes immersed in the effluent, which causes the dissolution of electrode plates into the effluent. At an appropriate pH, the metal ions can form a wide range of coagulated species and metal hydroxides that destabilize and aggregate particles or precipitate and adsorb the dissolved contaminants. The results showed that the characteristics of untreated pollutants exceeded the DOE standard limit. Therefore, the pollutants need to undergo several treatments before being released into the river. After going through the electrocoagulation process, R2 values of 0.7262 and 0.6566 shows a good agreement between experimental and predicted values of responses. Besides, the best removal for this process was recorded at a POME concentration of 10%. This study confirmed that the electrocoagulation process of POME could be treated even in high pollutants concentration, and the quality of the effluent discharge was well below the standard limits of DOE.

KEYWORDS: electrocoagulation; factorial design; palm oil mill effluent; regression equation

Anaerobic Decomposition of Coal Fly Ash with Sludge Blackwater and Agricultural Biomass Waste

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ABSTRACT: Decomposition done in purpose to improve the quality of soil. There are varieties of materials which can be used to support the process of decomposition. For it's quantity, the presence of coal fly ash leads to environmental problem which needs inovative ways in order to utilize the excessive quantity of it. Sludge black water is highly potential to support decomposition. The combination of coal fly ash and sludge black water are potentially to be the inovative materials to support decomposition. In this research, there were four variants of sludge black water percentage which are 0% ; 25% ; 50% ; 75%. This variance was accompanied by the varied of coal fly ash (FA) and rice husks (SP). Furthermore, 0,7% of EM4 was added into each combination. The anaerobic decomposition was done in 14 days and 21 days. The parameters such as C/N rate, water content, pH, C-organic, total Nitrogen (N), total Phosphorous (P), and total Kalium (K) were observed. The results were then compared to national standard for fertilizer with SNI 19-7030-2004 and SNI 7763:2018 This research was done through Completely Randomized Design to find the significance followed by the post hoc test such as Least Significance Different and Duncan. The result showed that the best result for parameter N, P and K were reached on 14 days decomposition with 75%:12,5%:12,5% of sludge Black water, fly ash and rice husk respectively. Longer time of decomposition (21 days) might increase the total P of the sample.

KEYWORDS: anaerobic decomposition; coal fly ash; disinfection

Removal and biosorption of 4-Bromophenol by using filamentous fungi, *Pichia kluyveri* FM012

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ABSTRACT: The usage of persistent pesticides has become a great concern because of the toxic effects on both aquatic flora and fauna as well as to humans. These pesticides are subject to removal by chemical precipitation, coagulation, electrochemical, ion-exchange resins and activated carbons. However, the physio-chemical treatment processes removal is still difficult, less effective and more expensive when the adsorptive pollutants like heavy metals, pesticides and dyes are in a low concentration range. Since physical and biological processes offer the most effective and natural way to treat pesticide pollution, therefore, the purpose of this research is to study the removal and biosorption process of 4-Bromophenol by using isolated potential fungus *Pichia kluyveri* FM012. The removal of 4-Bromophenol was calculated using a gas chromatography-flame ionization detector (GC-FID). On the other hand, physiochemical characterization of persistent pesticide and fungi FM012 is performed by Scanning Electron Microscopy (SEM) and Fourier Transform Infrared Spectroscopy (FTIR). The removal process of 4-Bromophenol is performed by varying contact time, pH and agitation. to get an optimum result. The experimental data of biosorption process fitted well with Langmuir isotherm and the pseudo-second-order model. The combination on both removal and biosorption are recommended methods and suitable for pesticide pollution treatment.

KEYWORDS: Pesticides; 4-Bromophenol; pH; FTIR, biosorption, pseudo-second-order

The Effect of *Ralstonia pickettii* Bacterium Addition on Methylene Blue Dye Biodecolorization by Brown-Rot Fungus *Gloeophyllum trabeum*

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ABSTRACT: Methylene blue (MB) is one of synthetic dye from thiazine group that used in textile industry. This dye is a stable compound which make it difficult to degrade in nature and can be harmful to human. The brown-rot fungus (BRF) *Gloeophyllum trabeum* had been previously reported about its ability to degrade MB, however, the decolorization ability was relatively low with long incubation period. Therefore, the improvement of MB degradation process by *G. trabeum* is needed. The effect of *Ralstonia pickettii* bacterium addition on MB biodecolorization by *G. trabeum* was investigated. The amount of *R. pickettii* that was added to *G. trabeum* were 2, 4, 6, 8, and 10 mL (1 mL = 1.39 x 10^8 CFU). The degradation process was conducted statically at 30 °C within 7 days incubation period. The result showed that the highest percentage of MB decolorization was obtained at the addition of 10 mL *R. pickettii*. The mixed cultures could decolorize MB approximately 85%, while *G. trabeum* only could degrade MB approximately 11%. The metabolite product produced from the process were $C_{12}H_{13}N_3O_6$, $C_{14}H_{14}N_3S$, $C_{12}H_{11}N_3SO_6$, $C_{12}H_{11}N_3SO_7$, and $C_{22}H_{15}N_3SO_5$. This study indicated that the addition of *R. pickettii* could enhance the ability of *G. trabeum* to decolorize MB.

KEYWORDS: Biodecolorization; Methylene Blue; Mixed Cultue; *Gloeophyllum trabeum, Ralstonia pickettii*

Monosodium Glutamate as Corrosion Inhibitor for Low Carbon Steel in Circulated Crude Oil

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Abstract: The corrosion inhibition of low carbon steel in a circulated crude oil environment was investigated using monosodium glutamate as a corrosion inhibitor. The corrosion measurement was examined using the weight loss method. Various monosodium glutamate concentrations and crude oil flow rates were investigated. The crude oil flow rates of 5, 10, 15, 20, and 25 L/min and concentrations of inhibitor monosodium glutamate 0, 50, 100, 150, 200, and 250 ppm were conducted. The measurement of low carbon steel corrosion rate, inhibition efficiency, and inhibition adsorption mechanism was examined. The results of the study show that increasing the flow rate increases the corrosion rate of carbon steel in crude oil while increasing the concentration of corrosion inhibitors decreases the corrosion rate of carbon steel in crude oil. The inhibitor efficiency of monosodium glutamate increased with increasing inhibitor concentration and flow rate. The highest inhibition efficiency was obtained at 75.21%, at a concentration of 250 ppm monosodium glutamate and a flow rate of 25 L/min. The adsorption of monosodium glutamate on the surface of low carbon steel metal follows Langmuir's adsorption isotherm.

Keywords: corrosion; low carbon steel; crude oil, circulated, monosodium glutamate; inhibitor

Evaluation of different GLDAS models and SWAT model to estimate Soil Moisture Content.

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ABSTRACT: Rainfall, runoff, and infiltration are significant segments of the water cycle. Every event is co-related with each other. Soil moisture provides over infiltration as a meaningful hydrologic process that holds different land surface appearances. Diffusely, the soil moisture determines the state of the field for different agricultural works and reflect as a tool for drought monitoring. Being so critical, soil moisture information is not usually available on a local scale. The Global Land Data Assimilation System (GLDAS) can be affording global and regional knowledge related to soil moisture at different depths, based on the different models of GLDAS. In this study, the Soil and Water Assessment Tool (SWAT) model is utilized to produce a series of soil water data at the monthly scale from historical weather data. The moisture data information has also been extracted from the different GLDAS models. Based on these two datasets, we attempted to build a relationship between satellite-based soil moisture data of various models of GLDAS and the soil moisture output of the SWAT hydrological model for the hilly regions of Uttarakhand catchment, and then they examined statistically. This paper simulated soil moisture from four different land surface models (LSM) (Mosaic, Noah, Community Land Model (CLM), and Variable Infiltration Capacity (VIC)) in GLDAS-2 is estimated against soil moisture ranges obtained from the SWAT model. The results show that all the Noah and VIC models can meet the results with SWAT model output with a correlation coefficient higher than 0.5.

KEYWORDS: GLDAS; LSMs Model; Soil moisture; SWAT; Uttarakhand

Reduction Of Ammoniacal Nitrogen, COD AND Color From Rubber Processing Industry Effluent Using Bentonite As Adsorbent.

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ABSTRACT: The effluent from the rubber processing industry usually containing a high concentration of organic compounds, suspended solid, color, nitrogen and another pollutants. If an excessive amount of ammonia and nitrogen is discharged into bodies of water, it may cause eutrophication and the death of various aquatic creatures. The goal of this experiment design was investigate the effectiveness of bentonite as an adsorbent for removal of ammoniacal nitrogen COD and color from rubber processing industry effluent. The samples of rubber processing industry effluent for this study were acquired directly from the discharging point of a manufacturer in Kluang, Malaysia. The effect of optimum adsorbent dosage, shaking speed, contact time, and pH were determined on removal of ammoniacal nitrogen COD and color. The obtained result reveals that the best batch adsorption experiment removal of ammoniacal nitrogen COD and color was achieved at pH, adsorbent dosage, contact time, and shaking speed was pH7, 4g, 200 rpm and 120 minutes respectively. The best removal efficiency of ammoniacal nitrogen, COD and color was achieved generally in the range of 85% of all batch experiment conducted. The kinetic equilibrium model data were fitted well to pseudofirst and pseudosecond order kinetics model. The pseudosecond order better-fitted the equilibrium data over the entire concentration range studied. The pseudosecond order kinetic model described best coefficient of determination compared to pseudofirst order kinetics model. The coefficient of determination for pseudosecond order was generally in the range of 0.9988–1.000 for 90% of all kinetics studies conducted.

KEYWORDS: Rubber effluent; adsorption; ammoniacal nitrogen; bentonite; COD; Color

Micro-Peat, Limestone, AC and Zeolite as Eco-Friendly Composite Media for COD and NH_3-N Removal

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ABSTRACT: The main objective of the current work was to investigate the optimum mixing ratio in removing two problematic paramters namely COD and ammoniacal nitrogen (NH_3-N). The optimum of mixing ratio was determined by batch study test. The results exhibited, the optimum ratio obtained for composite mixture media is (4.0:4.0) and also revealed that COD and NH_3-N produced the highest removal at 91% and 67% from the stabilized landfill leachate respectively. Indeed, the eco-friendly media was able to be used to investigate the both parameters and showed good agreement with the results from batch study test. Thus, the combination mixtures between natural low-cost and conventional media demonstrated an ideal option for stabilized landfill leachate treatment.

KEYWORDS: Ammoniacal nitrogen; COD; Adsorption; Landfill leachate; Composite media

Synthesis of Phase Change Materials Based on Parafin/Graphite with HDPE/PLA as Matrix

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ABSTRACT: A Phase Changing Material with the concept of storing latent heat absorbed from heat sourced based on Parafin/Graphite with HDPE/PLA as Matrix was investigated. Based on the results of the characteristic test of composite materials for phase change materials, mixing between Paraffin/Graphite and HDPE/PLA obtained the results of the Fourier Transform Infra Red (FTIR) test with an absorption peak of 727.16 cm^{-1} caused by the -CH2 functional group for HDPE, the peak absorption 1460.11cm^{-1} and 1361.74 cm^{-1} functional group –CH for paraffin, absorption peak 1755.2 cm^{-1} functional group C=O for PLA, absorption peak 2915 cm^{-1} functional group -CH for HDPE and absorption peak 3657.04 cm^{-1} functional group OH for PLA. The results of the X-Ray Diffraction (X-RD) test showed the presence of paraffin crystals at 2θ 21.3682. The results of the Scanning Electron Microscope (SEM) test sample 2 with a ratio of HDPE: PLA is 2,9:4,25 have a good morphology, as can be seen from the resulting image. The results of the Thermo Gravimetric Analysis (TGA) test sample 2 with a ratio of HDPE: PLA is 2,9:4,25 had the best results based on the weight loss of 2.203 mg and the difference between the onset and endset temperatures of 111.58^{o}C.

KEYWORDS: Graphite; PLA; HDPE; Paraffin; PCM

Ethylene Prophylene Diene Monomer (EPDM) Based Phase Changing Material For Thermal Energy Storage

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ABSTRACT: Phase change materials are widely used as thermal capacitors in solar thermal systems. Phase Changing Materials with carbon materials can directly absorb solar energy and be transferred to water for heating buildings and must have good thermal stability, and mechanical properties. The Phase Changing Material is miscible with other polymers such as Ethylene Propylene Diene Monomer (EPDM) which has good compatibility with paraffins. Prepare PCM with good mechanical properties, good EPDM mixture is used as a base polymer for preparing paraffin graphite composites. The obtained PCM has high tensile strength, high thermal conductivity, and large latent heat. This study aims to determine the effect of the paraffin: graphite ratio on the thermal resistance of the Phase Change Material (PCM) using the heating method at 180oC for 20 minutes with a variation of the ratio 9:1 and 8:2 with mass ratios PCM70 : EPDM30, PCM80 : EPDM20. , and PCM90 : EPDM10. Based on the results of tensile strength testing, thermal stability analysis and SEM, the maximum tensile strength is obtained at a mass ratio of 80% : 20% with a ratio of 9:1 which is 9.34 Mpa, has a thermal stability of 307.04oC at onset and Endset at a temperature of 399.50oC, However, there is an aggregate form that is agglomerate and has large pores, as well as a rough surface on the sample. While the results of the Morphology test using SEM, the best interaction between polymers with a mass ratio of 70%:30% at a ratio of 9:1, with a very well mixed surface, smooth, no lumps formed.

KEYWORDS: EPDM; Graphite; Paraffin; PCM; Polymers

Synthesis And Characterization Of Biodiesel From *Wollfia* By Insitu Transesterification Process

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Abstract: In this study biodiesel was made with wollfia, methanol, n-hexane, and potassium hydroxide (KOH) as raw materials. The purpose of making biodiesel is to analyze the quality and characteristics contained in biodiesel oil from wollfia with variations in the weight of wollfia raw materials (200 grams; 250 grams; 300 grams), with temperature variations of 50OC ; 55OC ; 60^{O}C. Process temperature greatly affects the success of the biodiesel-forming reaction. As the temperature increases, the biodiesel volume increases, the highest biodiesel volume is 81 ml. The addition of the number of raw materials resulted in increased biodiesel products. The obtained density of biodiesel with wolffia as raw material of 0.872 is still in the biodiesel density range which refers to SNI 04-7182:2015. Obtaining biodiesel with wolffia as raw material produces the best calorific value of 9,754.70 cal/gr. The use of wolffia of 300 grams is the best composition to produce biodiesel with quality according to SNI. Testing the quality of biodiesel in this studyusing GC-MS analysis found that biodiesel from wolffia contains methyl esters.

Keywords: Biodiesel, *wollfia*, In Situ Tranesterification.

Enzymatic Hydrolysis of Petai (*Parkia speciosa*) Peel as Bioethanol Feedstock Preparation

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Abstract: Petai (*Parkia speciosa*) that is one of familiar plant in Indonesia was used in this study for bioethanol synthesis due to its potential starch and cellulose contents. Petai peel was utilized in this research as raw material because all this time this peel was being waste and unused. The aim of this study is converting petai peel into glucose as bioethanol feedstock via enzymatic hydrolysis reaction. Petai peel was crushed into powder and reacted by water using two kind of enzymes that are α-amylase and gluco-amylase. The product of hydrolysis was analyzed using brix refractometer to observe its glucose content. Utilization of 10 ml α-amylase and gluco-amylase enzymes respectively with volume ratio of 1:1 could speed up its hydrolysis kinetics to 64,85% of conversion. This highest result showed 13,1% brix glucose concentration from refractometer analysis yielding 21,615 grams of glucose from 15 grams of petai peel. Hidrolysis of petai (*Parkia speciosa*) peel using α-amylase and gluco-amylase enzymes could be a new route to prepare a raw material for bioethanol synthesis from a kind of cellulose waste due to its effective performance during reaction.-

Keywords: bioethanol; enzyme; glucose; hydrolysis; *Parkia speciosa*

Spectroscopic Analysis and Antimicrobial Activities of Hygienic Travel Soap from Dabai Fruits Oil

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Abstract: An exotic dabai fruit (*Canarium odontophyllum*) from Sarawak, Malaysia is prominent among locals due to its high level of antioxidants which contributes to health and beauty. Therefore, this research discovered on dabai's pure oil that was successfully extracted from its fruit through solid-liquid extraction process to be used as travel soap. The dabai travel soap was invented and fabricated to a small ball size so that it can be rolled between fingers and dissolves during hand wash which could leave no residue and avoid recurrent infection. Dabai soap was further analyzed using Attenuated Total Reflectance - Fourier Transform Infrared (ATR-FTIR) spectrometers for screening of antioxidant compound. As a result, the FTIR spectrum showed that the presence of O-H group, C=O for carboxyl group, C=C for aromatic and C-O were coherent with the structure of antioxidant compound. Furthermore, the anti-microbial activity of dabai soap was performed using disc diffusion method and result indicated a prominent resistance against *Streptococcus* sp and *Staphylococcus aureus* sp. The presence of antioxidant compound and anti-microbial activity of dabai soap ensures its effectiveness for hygienic, health and beauty purpose.

Keywords: *Canarium odontophyllum*, travel soap, antioxidants

Peat water color purification using tubular ceramic membrane by crossflow filtration at various pressures and operating times

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ABSTRACT: Not supporting of the color quality of peat water is the target for applying tubular ceramic membrane technology in water purification which is measured based on changes in the color concentration of peat water before and after the treatment process. This study aims to determine the effect of the filtration time (15-75 minutes) of the crossflow filtration system on the membrane selectivity based on the rejection coefficient of decreasing color concentration at various pressure variations (0.5-2.0 bar). Tubular ceramic membranes are made using a mixture of natural ingredient zeolite (Z), clay (CL) activated carbon (CA), white Portland cement (ZW) and Polyvinyl Alcohol (PVA) with various compositions Z:CL = 10%:50% (M1) ; 30%:30% (M2); and 50%:10% (M3), 25% CA, 10% CW and 5% PVA. The membrane was made using the sintering method at a 8000C for 6 hours. The results showed a filtration time of 30 minutes and an operating pressure of 1.0 bar was founded rejection coefficient of peat water color up to 98.44%, have flux and permeability membrane are 352.69 L/m2.hr and 352.69 L/m2.hr.bar that is M3 membrane. Result of characterition shown density is 0.6849 g/cm3, a porosity is 31.091%, and a membrane pore size are 2.702-4.909 µm. The increase pressure couse increase flux membrane and permeability is decrease, couse decrease both selectivity membrane and rejection coefficient.

KEYWORDS: crossflow filtration, peat water, rejection coefficient of color, sintering method, variation of zeolite and clay

The Kinetic Study of Composite Adsorbents in Contaminated Saline Water Using Plastic Waste

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Abstract: A large amount of plastic waste causes contamination in the ocean due to the chemical present in plastic tending to leach out into the marine environment. The purpose of the research was to determine the adsorption properties of zeolite and activated carbon individually and in combination on marine water affected by plastic waste. Leaching of plastic waste was accomplished by using a plastic type of Polyethlene, PE from mineral bottle waste and Polystrene, PS from food packaging, which was a high concentration of heavy metal with a three-month leaching time. Results showed that activated carbon and the combination of these two media could be more efficient than zeolite in removing heavy metals, with 91.7% removal in 30g of activated carbon and 90.4% in 10g of combination media. Thus, activated carbon and the combination of these two media is effective in removing heavy metals. The experiments were fitted with the Langmuir and Freudlich isotherm models by using appropriate correlations for the equilibrium curve. A higher correlation coefficient is found with Langmuir model for activated carbon, zeolite, or both in combination compared to Freudlich model.

Keywords: Adsorption, heavy metals, zeolite, activated carbon, Equilibrium Curve

Magnetic molecularly imprinted polymer nanoparticles for the extraction and clean-up of thiamethoxam and thiacloprid in light and dark honey

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ABSTRACT

In this work, new selective and sensitive dual-template molecularly imprinted polymer nanoparticles (MIPs) were synthesized and characterized. Sorbent MIPs were investigated for simultaneous extraction and clean-up of thiamethoxam and thiacloprid from light and dark honey samples. In this study, ultra-high-performance liquid chromatography–tandem mass spectrometry triple-quadrupole (UHPLC-MS/MS) (QQQ) was used to detect and quantify the pesticides. The kinetic model with adsorption kinetics of sorbent was investigated. The optimal adsorption conditions were 80 mg of polymer MIPs, a 30-min extraction time, and a pH of 7. The detection limit (LOD) and the quantification limit (LOQ) varied from 0.045 to 0.070 µg kg^{-1} and from 0.07 to 0.10 µg kg^{-1}, respectively. The intra-day and inter-day precision (RSD, %) ranged from 1.3 to 2.0% and from 8.2 to 12.0%, respectively. The recovery of thiamethoxam and thiacloprid ranged from 96.8 to 106.5% and 95.3 to 104.4%, respectively, in light and dark honey samples. The results indicated that the present method can applied for the simultaneous determination of target insecticide residues in honey samples and the results are reliable and precise.

Removal Of Acrylamide And Caffein In Gayo Arabica Coffee Beans By Vacuum Roasting

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ABSTRACT

The conventional process of roasting coffee at high temperatures above 120 oC, in addition to having high caffeine levels and reducing nutrients from coffee, will also cause the formation of acrylamide compounds that cause cancer in humans. The coffee used is gayo arabica coffee (Green Bean). The purpose of this study was to produce healthy, acrylamide-free and low-caffeine coffee using a vacuum roaster. The coffee was roasted using a vacuum oven at a pressure of 0.1bar (0.102 kgf/cm2) at a temperature of 120,140 and 160ºC with time variations ranging from 30.60 and 90 minutes, so the results obtained were that there was no acrylamide compound formed during the roasting process and had a high content of the lower caffeine, the controlled flaming coffee sample is known to have acrylamide content in gayo arabica coffee 0.48 mg/kg and 0.659 mg/kg for the Ijen Robusta coffee sample, while for the caffeine in Gayo Arabica coffee 1406.87ppm and Ijen Robusta 3184.80ppm . The acrylamide test was carried out using the high performance liquid chromatography (HPLC) method at a wavelength of 202 nm, while the caffeine test was carried out using the UV-Vis Spectrophotometry method at a wavelength of 275 nm. Low coffee is considered safe for consumption and does not contain acrylamide which is harmful to health and lower levels of caffeine.

Keywords: Acrylamide, Caffeine, Cancer, Vacuum Roasting

Utilization of Tofu Wastewater-Anaerobic Digestion Effluent (TW-ADE) for Water Spinach (*Ipomoea aquatica*) Growth using Hydroponic System

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ABSTRACT: Effluent from Anaerobic Wastewater Treatment Plant (WWTP) treated tofu whey is an alternative for domestic water resources that can be reused for crop irrigation. The 120 m3 anaerobic WWTP in Giriharja Hamlet treated whey tofu about 40 m3 /day and produced 120 m3 /day biogas used by the residents. The deep flow technique (DFT) hydroponic system is expected to integrate secondary effluent processing with effluent utilization as a growing medium. The research aims to reuse the effluent from the anaerobic WWTP tofu industry for crop irrigation through hydroponic system. The DFT hydroponic system for water spinach cultivation was tested for 20 days. During the observation, there was a decreasing trend of ammonium level, while the opposite trend was found in the increasing nitrate level. The alkaline pH condition of the effluent is a limiting factor in the rate of nutrient uptake by the plant root but provides a conducive environment for the nitrifying bacteria. The effluent 25% enriched with 10ml/L AB-mix nutrition resulted in better water spinach growth and yield than other effluent concentrations. However, according to the findings, effluent 50%, 75%, and 100% were unsuitable for water spinach growth in hydroponic system.

KEYWORDS: crop irrigation; Giriharja hamlet; hydroponic system; Tofu waste; Tofu Wastewater-Anaerobic Digestion Effluent (TW-ADE); Water spinach

COD and NH_3-N Reduction From Leachate Using Paper Waste Sludge

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ABSTRACT: The paper industries is considered as one of the most polluter industry in the world produces paper waste sludge (PWS). The disposal practices of PWS pose extremely hazardous and a great concerned for the environment. The purpose of this research is to evaluate PWS as an effective alternative adsorbent material to partial replacement of activated carbon (AC) adsorbent for removal of pollutant from stabilized leachate. Both adsorbent media (AC & WPS) were combined together with different mixing ratio. The bench-scale experiment was used to determine the best optimal adsorbent replacement. The batch adsorption experiment was conducted in this study are pH7, 200rpm of shaken speed and 120 minutes with a contact time. The isotherm adsorption experimental finding results was describes that the Langmuir adsorption model better suited than Freundlich adsorption model based on the coefficient of determination (R^2). The equilibrium capacities of Langmuir model for NH_3-N and COD were 30.26 mgg^{-1} and 20.60 mgg^{-1} respectively. The optimal replacement ratio were traditionally two distinct ratios 2:2 and 3:1, according to the optimal reduction percentage for NH_3-N and COD. However, the best optimal reduction percentage for NH_3-N (55%) and for COD (85%) were achieved at the optimum mixing ratio (AC: PWS) of 2:2 respectively.

KEYWORDS: NH_3-N; COD; stabilized leachate; bench scale adsorption; paper waste sludge

The effect of mangrove (avicennia lanata) and glycerol composition on the production of bioplastics

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ABSTRACT: Bioplastics are plastics made from starch that can be decomposed naturally so that they can be an alternative to commercial plastics. This research looked at the effect of the composition of Mangrove powder and glycerol on the characteristics of the synthesized bioplastics. In this study, we also obtained the maximum composition of bioplastics made from mangrove powder with the addition of glycerol and chitosan. In this study, bioplastics were synthesized using starch as an optimizer of the mechanical properties of bioplastics, chitosan as reinforcement and water repellent, and glycerol as a plasticizer. The results of bioplastics were characterized by mechanical properties (tensile strength and elongation), hydrophobility, biodegradation, and functional groups. Based on the results of the study, the optimum composition of bioplastics was found, namely mangrove fruit (2 grams) and glycerol 0.9 ml, with a tensile strength value of 1,600 MPa, 67.9% elongation, 34.75% hydrophobility, and 39.98% biodegradation. The main functional groups of bioplastics were shown through the results of FTIR analysis, such as-Nh (3294.58 cm-1),-CH (2883.58 cm-1),-OH (2129.41 cm-1), and CO (1755.22 cm-1)**.**

KEYWORDS: bioplastic; mangrove, glycerol, chitosan, plasticise

Removal of organic and nitrogen compounds from domestic landfill leachate by microalgae

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ABSTRACT: Landfill leachate is a liquid waste produced due to contact between rainwater and garbage in the landfill. It contains high concentrations of organic and nitrogen that can contaminate groundwater and water resources. In Indonesia, leachate is treated using a pond system, covering collection, anaerobic, aerobic and stabilization ponds. The pond system not only requires a sizable land area but also necessitates high operational energy. The organic and nitrogen compounds in the leachate are suitable substrates for microalgae growth. This study was conducted to identify microalgae that can grow well in leachate and examine mixed microalgae cultures' ability to reduce leachate pollutants. Microalgae obtained from a leachate treatment plant in Blang Bintang, Aceh Besar, were grown in a laboratory-scale photobioreactor. The results showed that six microalgae species played a role in reducing leachate pollutants, namely *Synedra acus*, *Spirulina sp*., *Euglena sp*., *Trichocerca sp*., *Paramecium sp.,* and *Closteriopsis longissima*, with *Euglena sp*. as the most abundant. COD, BOD, nitrate, and nitrite removal of 76.26%, 75.48%, 74.86% and 73.52%, respectively, was observed during the experiment. As microalgae can grow well in leachate, in addition to reducing pollutants, such a treatment system can be integrated to produce biofuels and other bioproducts from microalgae biomass.

KEYWORDS: wastewater; landfill leachate; microalgae; organic, nitrogen

Ceramic Membrane-Based From Fly Ash-Clay For River Water Treatment

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ABSTRACT: Ceramic membrane-based fly ash-clay (FAC), sintered at low temperature has been implemented in river water treatment. Ceramic membrane with the composition of fly ash: clay 65%: 35% and sintered at 950 for 4 hours has been fabricated. X-ray diffraction (XRD) and energy-dispersive X-ray (EDX) were used to obtain a chemical characterization of fly ash and clay. The filtration process used dead-end and cross-flow systems with variations in operating pressure 0.25; 0.50; 0.75, 1.00, and 1.25 bar. The results showed that a ceramic membrane with a cross-flow at an operating pressure of 0.75bar could reflect Pb, Fe, TDS, Turbidity, and escherichia coli (E.coli) bacteria as much as 94.51% and 91.43%. The highest flux amounted to 457.543 L/m^2.h generated at 25 bar. The analysis using scanning electron microscopy (SEM) showed that the pore size of the FAC membrane before the filtration process was 0.9µm, with a membrane porosity of 40.82%. After the cross-flow filtration process at 0.75 bar and dead-end filtration at 0.25 bar, the membrane porosity decreased to 39.58 % and 37.97%, respectively.

KEYWORDS: clay; fly ash; ceramic membrane; cross-flow, dead-end, low temperature.

Kinetic Studies Using Adsorption Capacity for the Removal of Ammonia Nitrogen and COD in Treatment of Landfill Leachate

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Abstract: Waste paper sludge (WPS) and cockle shell (CS) has been investigated using adsorption capacity treatment process to obtain the optimum mixing ratio in removing two working parameters such as ammonia nitrogen (NH_3-N) and COD. Both alternative composite adsorbent were mixed together in different ratio. The adsorption batch study includes the preparation of 5g composite adsorbent, 200 mL of raw leachate sample at pH 8.64, with a shaking speed of 200 rpm for 300 minutes at room temperature. The finding result shows, the optimum ratio obtained for composite mixture adsorbent is (1:7) and the concentration capacity achieved for the ratio was 502 mg/L and 540 mg/L for NH_3-N and COD. The percentage optimum removal is 50.20% NH_3-N and 81.25% COD respectively. The kinetic studies revealed the composite adsorbent followed almost all the kinetic models namely pseudo-first order, pseudo-second order, Elovich and intra-particle diffusion, with pseudo-second order shows the most dominant. The value of correlation coefficient, R2 for second pseudo-order model is seems to be close to 1 for both parameters, namely 0.9995 for NH_3-N and 0.9998 for COD. The value of qe also approaches the value of experimental qe which can be conclude the absorption reactions are highly preferred as well as chemically occurring. Hence, the findings convinced on the applicability of WPS and CS for the treatment of landfill leachate in accordance to ensure the clean water could be achieved accordingly.

Keywords: Leachate, Waste Paper Sludge, Cockle Shell, Absorption

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