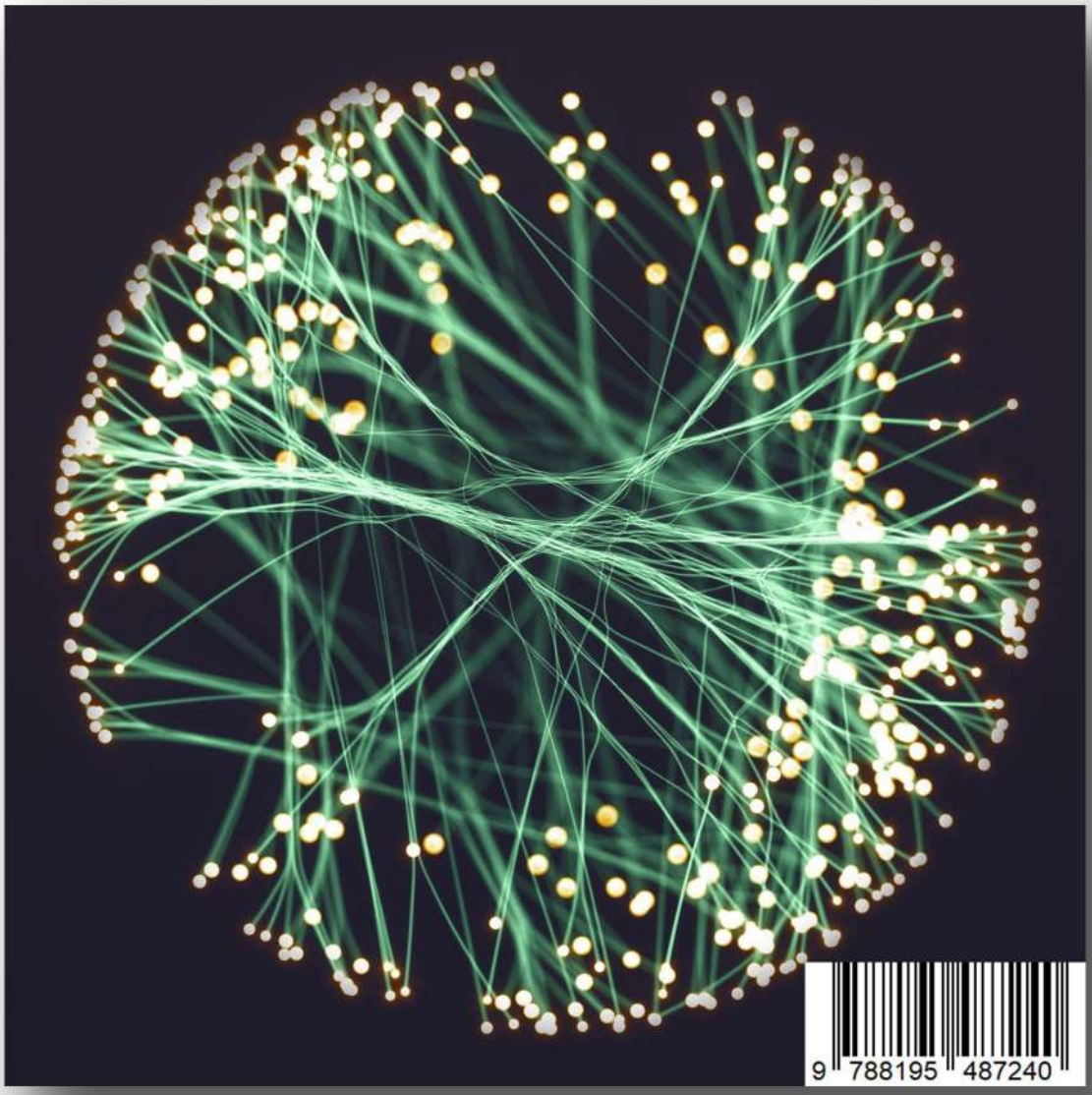

PROCEEDINGS OF

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MESSAGE

Greetings to all!

I am very glad to serve as chief guest for the 1st International Conference on Water, Energy & Environment Organized by ISET Research India in association with IEI Vietnam.

ISET Research is an organization committed to gather a significant number of diverse scholars for presentation in the conference. With its high-quality scholars, it provides an exceptional opportunity for students, academics and industry researchers to share experience and knowledge.

The aim of the International Conference on Water, Energy and Environment (WEECON) is one of the most relevant one, which is to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Water, Energy and Environment. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Water, Energy, and Environment.

I congratulate all the efforts taken by the WEECON 2021 organizing committees for the successful conduct of this conference. I wish all the very best and hope this conference will stimulate fruitful intellectual discussions during and after the days of the conference. Thank you.

Prof. Ir. Ts. Dr. Pau-Loke SHOW, 周柏乐, 博导
BEng (Process and Food), PhD (Bioprocess Engineering), PGCHE
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MESSAGE

It gives me great pleasure to welcome all of you to this 1th International Conference on Water, Energy& Environment (WEECON 2021). As you all know the theme of this conference is "Water, Energy and Environment" and this is very timely as we are facing quality problems in the subjects globally.

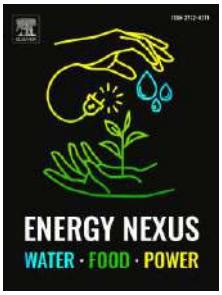
Water, Energy and Environment are some of the most critical factors in development. It has become one of the global priorities to ensure healthy lives and promote well-being for all. These global commitments are contained in the Sustainable Development Goal of the World Health Organization (SDG6, 7 and 15). WEECON 2021 creates a great platform to discuss the current landscape and next steps for Water, Energy, and Environment. The conference will bring together leading academicians, practitioners, educators, policymakers, social workers and other related professionals. WEECON 2021 global gathering with renowned speakers, presentations, panel discussions, and valuable networking opportunities.

Many volunteers have contributed to the organization of WEECON 2021. I would like to thank our Conference Chair Prof. Hwai Chyuan Ong, Co-chairs Prof. Luc Hens and Prof. Pietro Bartocci, Organising Secretary Dr. Deepanraj B, as well as technical committee members who peer-reviewed and selected the papers to be presented. Owing to their outstanding efforts, WEECON 2021 promises to be another exciting program. We would like to express our appreciation to other key members who quietly worked for the conference successfully.

Finally, we would like to thank the authors for choosing WEECON 2021 as the venue to present their research and all of the participants at the conference. We hope that the event fosters interaction among researchers and provides a stimulating forum for exchanging and developing new ideas in the rapidly changing field of distributed Water, Energy and Environment engineering.

Thank you very much!

Assoc. Prof. Dr. Bui Manh Ha,
Co-Chair, WEECON 2021,
Saigon University, Vietnam.



MESSAGE

I am here to give my humble contribution to the Two Days International Conference on Water, Energy and Environment (WEECON 2021) on December 23 and 24, 2021. I thank also the organizers: ISET Research India and the associated IEI Vietnam for inviting me to give a keynote
speech and explain my main research background and future research interests. With this respect,I would like to share with the audience of the WEECON 2021 the work done in developing the Energy Nexus journal, published by Elsevier. As the world population, and industrial production increase, so to does the use of finite resources. Water, food and power, both energy and societal, come together at a nexus of sustainability. The nexus is the heart of these intertwined and often competing tensions. As pressure on these limited resources grow, new and increasingly complex questions and problems emerge. We believe a standard methodology is needed, which should be based on the detailed analysis of the interrelationships between those resources and the Nexus, which links them all. Therefore, scientific methods have to be developed, together with adequate policies and governance. This is a key issue for a peaceful and long-lasting societal development. The main purpose of the Energy Nexus: Water, Food, and Power journal, is to develop adequate methodologies of analysis, and tools to describe, resources availability, use, and recyclability. The journal focuses its attention on the interrelationships between water, food, and power, where “power” recalls a strong link with the energy sector. Looking forward to hear comments on the ENERGY NEXUS at this conference.

I welcome all the participants to the conference and wish on long collaboration.

Dr. Pietro Bartocci,
Co-Chair, WEECON 2021,
Instituto de Carboquímica, Zaragoza,
Spain.

INDEX

PROCESS OPTIMIZATION OF ALKALINE PROTEASES BY *BACILLUS* SPECIES USING DESIGN-EXPERT SOFTWARE

Narendra Kumar S [1,*], Anuradha Koti [1], Deepali V Patil [1],
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Abstract:
Proteases are degradative enzymes having a catalytic activity to hydrolyze peptide bonds of polypeptide chains into peptides and amino acids and can be used to increase the digestibility of protein. Proteases alone constitute nearly 60% of the enzyme market. This enzyme acts on proteins in a higher pH range. They are essential enzymes in microbes and other living organisms. These proteases have a crucial function for maintaining a steady pH in industrial processes. Hence, there is a constant hunt to optimize enzyme production and its activity. Production parameters influence various aspects of the growth and enzyme production in microorganisms. The present study aims for optimizing the production of alkaline protease from *Bacillus* species using Design-Expert software. The production parameters were selected based on preliminary studies and meta-analyses. Central Composite Design in Response Surface Methodology generated 32 experimental trials for the optimization process. After analysis of the results it was found that pH had a positive effect and the incubation time had a negative effect on the enzyme production. Incubation time 48 hours and pH 10 were found as the optimized production parameters for alkaline protease.

Keywords: Alkaline protease, *Bacillus* species, Optimization, Central Composite Design, Response Surface Methodology

ESTIMATION OF RUNOFF OF HOSHANGABAD USING EMPIRICAL EQUATIONS – A CASE STUDY

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Abstract:
Water is a one of the basis necessity for sustaining the life and development of society. Water is a very precious gift of nature to the mankind. The Important source of water is precipitation and for most of the hydrological models, rainfall is used as one of the main elements to estimate the runoff process. Rainfall-runoff model is a mathematical model describing the rainfall-runoff relations of a river basin or watershed. Rainfall data is uncertain and Runoff is one of the important hydrologic variables used in the water resources management and planning. Rainstorms generate runoff and its occurrence and quantity are dependent on the characteristics

of the rainfall event. Still there are many watersheds or catchments which are un-gauged; hence empirical formulae were useful for estimating runoff volume. This paper describes the estimation of runoff using empirical equations like Khuzla's Formula, Inglis and Desouza Formula, Indian Irrigation Department, Khosla's Formula. For this purpose hoshangabad region is selected and the annual rainfall data from 1981 to 2017 has been collected. And suitability of the model has been evaluated by comparing the runoff data with each other.

Keywords: Rainfall, Runoff process, mathematical model

CONDUCTOMETRIC INVESTIGATION IN LIQUID FOODS

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Abstract:
Milk consists of proteins, unsaturated fatty acids, calcium salts, magnesium salts, phosphate salts, lactose, lipids, vitamins, glycerides and minerals. Milk possesses 90 percent water and 10 percent milk solids. Milk is used as the main constituent in many food industries. An attempt has been made in milk to throw a light on the interaction of various type of fat content milk in distilled water. Electrical conductivity is a cheaper and simple technique but provides accurate data in experimental methods. The fat molecules of milk occupy more volume and delay the mobility of sodium and magnesium ions. Total dissolved solids data helps in identifying the presence of soluble inorganic components and organic matter in the liquid samples.

Keywords: Electrical conductivity; interaction- fat molecules; TDS.

DEVELOPMENT OF ONLINE MONITORING DEVICE AND PERFORMANCE EVALUATION OF BIOGAS PLANTS USING ENHANCED METHANE PREDICTION ALGORITHM (EMPA)

P. Ilangovan[1, *], Dr.M. Sharmila Begum[2], Dr.P.K. Srividhya[3],

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Abstract:
The Biogas is an alternate renewable energy technology, by extracting energy from agricultural waste, animal manure and solid waste. There are a lot of potential opportunities and challenges for implementation of biogas in developing nations, but due to lack of adequate infrastructure, insufficient capital and appropriate automation in constructing, maintaining and monitoring the

process of the anaerobic digestion process have delayed the successful implementation of biogas plants. Since a small increase or decrease in organic matter of the feed stock, temperature and pH in the anaerobic digestion process may decrease in production of the acids and further results in less yield of gas. Barriers were therefore overcome by certain monitoring devices with an automation system to enhance the gas production. In this study, we propose a new model integrated with advanced gas analyzer representing its significant contribution towards online monitoring of the anaerobic digestion process and the performance of the gas productions are enhanced by methane prediction algorithm (EMPA). Finally, the enhanced algorithm developed was evaluated with the real time sensor data. The prediction accuracy and time complexity of the algorithm are compared with four machine learning algorithms. The prediction results proved that the enhanced methane prediction algorithm had obtained high performance and accuracy of 95% towards the production of biogas.

Keywords: Anaerobic digestion, Automating barriers, Organic segmentation, Prediction algorithm, gas analyzer, Online monitoring.

PARAMETRIC STUDY ON PERFORMANCE CHARACTERISTICS-BASED COMBUSTION CHAMBER FOR DIFFERENT COMPOSITION OF FUELS.

Pardha Satya Vighnesh Kella[1], *, Pranjul Garg[1], Thati Parthi Sai Shiva[1], Abhishek Ray[1], Likki Shiva Sai Tharun Kumar[1], Ankit Kumar Mishra[2]

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Abstract:
Commercial aircraft generally use gas turbine engines for mobility. Advancing the practical use of gas turbines has enticed the aerospace industry, where we focus on the different components that are engineered together to enlighten scientific use in the commercial field. This paper stretches on the physical properties with respect to various components of gas turbine engines in the research field. This paper presents diverse types of gas turbine engine and the detailed mathematical and analytical parameters as mentioned below. This paper also deals with various parameters related to gas turbine engines like atmospheric parameters, compressor parameters, fuel parameters, combustion chamber parameters as well as how biofuels can be used as an alternative fuel source while also providing environmental benefits. This paper gives a detailed analysis of different parts of a gas turbine engine and what are the challenges faced by all the compartments at different altitudes at various pressures and temperatures. There are six parts in a gas turbine engine, inlet section, compression section, combustion chamber, exhaust section: so, this paper deals with the detailed analysis of inlet section, compression section, and combustion chamber parts separately.

Keywords: Combustion Chamber, Aviation Fuel, Engine.

THE CARBON SEQUESTRATION POTENTIAL OF URBAN PUBLIC PARKS OF DENSELY POPULATED CITIES TO IMPROVE ENVIRONMENTAL SUSTAINABILITY

Saleh Shadman[1], Phahmee Ahanaf Khalid[1], Marlia Mohd. Hanafiah[2, 3], Apurav Krishna Koyande[4] , Pau-Loke Show[4] , Md. Atiqul Islam[5] and Shawkat Ali Bhuiyan[6]

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Abstract:
With a rapid increase in population followed by urbanisation and higher land-use demands, there is a shortage of green spaces and urban parks in densely populated cities worldwide. The rise in energy demand and use, especially fossil fuels in the residential and industrial sector, is the leading cause of higher GHG emissions globally. There are several decarbonisation methods and frameworks currently present; however, very few discuss urban parks' role in carbon capture and storage. In this study, the case of Shaheed Zayan Chowdhury Playground of Banani, Dhaka, has been studied in-depth to understand the carbon sequestration potential of the existing vegetation and the centre turf of the park. 156 trees of 21 different species alongside the centre turf were studied within the urban park with 1.73 acres or 17016 $m^2$of area. The total amount of CO_2 equivalent sequestrated over the entire life span of the urban park is equal to 660.8 tCO_2e with a rate of 33.24 tCO_2e annually. Moringa Oleifera, Mangifera Indica and Delonix Regia have the highest C storage potential and sequestration, while Cassia Fistula's lowest. This is a unique project in Dhaka with highly encouraging results towards decarbonisation through carbon sequestration in such multipurpose urban parks.

Keywords: carbon sequestration; carbon capture; decarbonisation; urban park; city planning

ADOPTION OF METHANOL COOKSTOVE – USABILITY, SAFETY AND SUSTAINABILITY STUDIES

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Abstract:

In recent years, the adoption of methanol cookstove for cooking is gradually increasing worldwide; however, their reliability in cooking has not been reported. In this perspective, a detailed analysis is needed in terms of stove attributes including performance factors and sustainability of fuels for better comprehending the adoption process and assess the impact of introducing methanol cookstoves on the LPG fuel usage. Hence, the present study is focused on the performance comparison of methanol cookstove with LPG cookstove based on usability and safety attributes. The results of performance analysis indicated a maximum thermal efficiency of 63.2% and a lesser CO/CO_2 ratio of 0.00047 were observed. Also, the methanol cookstove fulfils the requirement of a good performer in overall terms and the best performer in terms of maintenance, comfort and mechanical stability. Further, fuel sustainability analysis, challenges and safety instructions are presented for methanol cookstove. The fuel sustainability analysis revealed that with a 10% methanol penetration rate in India, 3.69 million metric tonnes of LPG import could be reduced by 2030. The present study assists in formulating a favourable policy and planned actions that encourages the use of methanol as a safer and cleaner alternative to the LPG.

GENE EXPRESSION PROGRAMMING FOR COMPUTING ENERGY DISSIPATION OVER TYPE-B PIANO KEY WEIR

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Abstract:

Computation of energy dissipation over weir (or spillway) structures is vital to solving numerous engineering problems, notably during floods. Therefore, an accurate estimation of the energy dissipation at the base of the spillway is essential. The spillways must be designed to spill large amounts of water at high efficiency with high structural performances without causing any damage to the structure or its surroundings. Energy dissipation over weir structures is difficult to predict using conventional formulas based on empirical methods. Consequently, new and accurate techniques are still highly demanded. In this study, Gene Expression Programs (GEP) were used to estimate the relative energy dissipation at the base of type-B

Piano Key Weirs (PKWs) by taking three non-dimensional parameters into account: headwater ratio, magnification ratio, and the number of cycles. The performances of the GEP model were compared with empirical equations based on statistical factors coefficient of determination (R^2), and root mean square error (RMSE). The computed values of the relative residual energy using the proposed models are within ± 5 % of the observed ones. Results indicate that the proposed *GEP* model predicted the relative residual energy satisfactorily with the coefficient of determination (R^2 = 0.9979 for training, 0.9980 for testing) and root mean square error (RMSE) of 0.0099, 0.0092 for training and testing datasets, respectively.

Keywords: Energy dissipation at base of PKW, residual energy, low head efficient structure, Gene Expression Programming

CORROSION INHIBITION OF COPPER USING ORGANIC INHIBITORS

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Abstract:

The inhibitive action of triazoles and thiazoles on the corrosion of copper has been studied using cyclic voltammetric and electrochemical studies. Results obtained show that these organic compounds are very good inhibitors. Potentiodynamic polarisation studies clearly talks about the type of inhibitor. The corrosion parameters such as corrosion current (i_{corr}), corrosion potential (E_{corr}), inhibition efficiency (IE), corrosion rate was found out. The adsorption of azole compounds on copper obeyed Langmuir's adsorption isotherm.In the present work, a study has been conducted on the effect of triazoles such as Benzotriazole (BTA) and Tolytriazole (TTA), and thiazoles such as "2-Mercaptobenzothiazole(MBT)" and "Benzothiazole(BZ)". The polarization and cyclic voltametric studies reveal that the increased efficiency of MBT is due to increased π electron density resulting in the formation of an adherent protective film on the copper surface. From the above studies it is evident that that the metal dissolution is reduced in the presence of inhibitors.

Key words: Copper, Corrosion inhibitors, Adsorption

IMPACT ANALYSIS

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Abstract:

Climate change is a major concern worldwide, it's a long-term shift of temperature and condition of weather patterns. Human activities are also playing a vital role in climate change. One of the most leading factors is carbon footprints. Five major sectors are mostly considered

for carbon footprint intensity measurements such as 1) Energy, 2) Agriculture3) waste4) Forest 5) Industry. These are the fastest-growing segments and major contributors to greenhouse gas emissions. This paper will focus on financial inclusions, disclosures, green bonds, tax benefits related to Environment. Financial inclusions, mostly serve disadvantaged and economically marginalized segments of society, that have greater contribution towards sustainable development and climate change adoption. Financial inclusion covers all segments of society, and for the effective usage of financial services. Green bonds are used for the eco-friendly or sound environment by sustainable investment decisions. Currently, carbon emission taxations have been spreading worldwide. Disclosures such as, Environmental, Social, and Governmental impacts are key to future business success by mitigating environmental hazards that are contributing to climate change and sensitivity analysis. Trade liberalization on sustainable development has been a value-added decision to address issues related to economic, social, and Environment. The circular economy is a new and growing trend to tackle climate change.

Keywords: Low carbon transition1, Financial Disclosures2, Financial Inclusions3

IMPACT OF CLIMATE SMART AGRICULTURE THROUGH CONSERVATION TILLAGE PRACTICES FOR MAIZE PRODUCTION

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Abstract:

Climate change is posing threat to food production and productivity. Among different cereal crops cultivated in Tamil Nadu, which is the southernmost state of India, Maize (*Zea mays L.*) ranks second in total production. At a higher temperature of 35°C, maize yield reduces by 9% with a one-inch reduction in rainfall. The aim of this paper is to evaluate the potential impact of Climate Smart Agriculture (CSA) techniques through conservation tillage practices for maize production, which incorporated the water and energy conservation concepts. The study area is located in the Upper Vellar Sub Basin (11°24′0.347″N to 11°5326.496″N latitudes and 78°13′55.211″E to 78°58′9.969″E longitudes). Data were collected through questionnaire survey administered with 208 farmers by using quota sampling technique. The yield obtained by adopting CSA technique as conservation tillage practices was analyzed using the SPSS tool. The result obtained through correlation test showed that there was a significant relationship between number of tillage operations and yield of the crop (r=.446, p<.001). In this study, the farmers who were practicing minimum tillage operations (up to 3 times) were considered as adopters of conservation tillage practices. On comparing the yield of the adopters and non-adopters, yield of adopters (4,850 Kg/Ha) was found to be 7% higher than the non-adopters. The cost of using the cultivators were low (Rs. 2,700/ha/day) as compared to other tillage implements (more than Rs. 3,500/ha/day). Thus adopting the minimum tillage operations saves energy and money. This meets out the Sustainable Development Goals 2 and 7.

Keywords: Climate Smart Agriculture (CSA), Tillage, Yield, Energy.

DESIGN OF AN IMPROVED ENERGY MANAGEMENT STRATEGY AND VIRUS FREE FOOD THROUGH A SOLAR POWERED INDUCTION COOKING BASED MOBILE FOOD COURT IN INDIA

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Abstract:

Electric vehicles with mobile food court (EVMFC) have increased enormous footing and other commercial business purposes in the course of the most recent couple of years in India because of the cheap cost of fuel and low maintenance costs and also because of its sustainability and manageable mechanics. Due to its vast mobility, quick service, nominal pricing and customer preference EVMFC have brought about a huge revolution in the travel/tourism industry, transportation of edible products and the system of food delivery due to low transportation costs and virus/germs free quality food around the globe. A battery charged with solar energy is used, which can be also charged from the electric grid. For these situations, partially charged EVMFC are most suited, since they diminish the heap on the national power grid while keeping up zero pollution levels. The climatic changes and serious health hazards are quite catastrophic and keeping in mind the needs to counter these, our rapidly increasing demand for energy needs to be switched over from the conventional and exhaustible sources such as coal and oil to their inexhaustible and cleaner counterparts such as solar, wind and hydro. The climatic changes and genuine well being risks are very cataclysmic and remembering the necessities to counter these, our quickly expanding interest for vitality should be exchanged over from the regular and modest sources, for example, coal and oil to their unlimited and cleaner partners, for to, wind, solar and hydro. Numerous private and government associations have been attempting their best to set up charging stations for the endurability of the EVs. Due to economical constraints, storage problems, all of these change solar powered vehicles to the most appropriate one. This paper brings forward a new form of food court station which employs induction cooking systems based on charging through a photovoltaic (PV), while maintaining hygiene and the quality again virus/germs (COVID-19 and others) free food and finally the overall performance investigation of the EVMFS in different conditions.

Keywords: PV array, EVMFC, Virus/Germs Free Induction cooking System, Practical Data,

Feasibility Study**.**

PERFORMANCE ANALYSIS OF PARABOLIC TROUGH COLLECTOR USING NANO FLUID AS AN ADVANCED HEAT TRANSPORT MEDIUM

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Abstract.
In the presented investigation, a mathematical model is applied to analyze the performance of a parabolic trough solar collector with an advanced heat transport medium. For this purpose, a parabolic trough collector has been used as a concentrator of solar radiation with naturally available varying solar intensity. The experimental observation was based on varying solar intensity during daytime and a constant mass flow rate at 13 lpm. The comparative analysis between water and ZnS/water-quantum dots with different volume concentration at 0.1%, 0.2%, 0.3% and .4%. Performance measurement parameters are chosen to investigate both quantitative and qualitative aspects of system performance. Thermal efficiency, heat removal factor, energetic efficiency, and sensible heat delivered by heat exchanger are these parameters. The highest rise in thermal and exegetic efficiency has been observed at 0.3%(wt.%) of ZnS/water-quantum dots. The experimental observation indicates the highest thermal efficiency is 57.81% at solar intensity,1210 W/m^2.Exergetic efficiency increment observed 0.64 for same intensity and concentration.

Keywords: Solar Intensity, Parabolic trough collector, Nanofluid, Thermal **efficiency, Exergy**.

SYNTHESIZING GREEN-INDUSTRY BY UTILIZING GREEN-HYDROGEN

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Abstract:

This work presents the procedure to form the green-hydrogen by using electrolysis, the electrolyzes are to be used to produce green-hydrogen for the preparation of steel, which is used in the production of steel-industry. In this paper, the green-hydrogen production process is explained by using electrolysis procedure. Generally using coke, the fossil-fuels are generated in the production process of steel and also these fossil-fuels are too effected in the nature of the environment. So, by this procedure fossil-fuels which are produced by coke are to be replaced by using green-hydrogen to produce steel in the steel-industry. The aim of

production process of green-hydrogen system has to bring the effected environment to zero-emission system. Suppose, the green-hydrogen is used as a synthetic fuel to produce green-steel in green-industry then there is a scope to bring net-zero emission system of the environment. The use of green-hydrogen in the production of steel making will reduce carbon-monoxide and carbon-dioxide emissions and controls the emission system.

Keywords: Green-hydrogen, green-industry, electrolyzes, zero-emission system, fine precipitation

PV BASED ELECTRIC VEHICLE BATTERY CHARGER USING RESONANT CONVERTER

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Abstract:

PV based electric vehicles battery charging voltage is regulated using converter to the desired range. The power is extracted from solar panel is stored in batteries using half bridge resonant converter. DC-DC converter with LC resonant converter is used to provide good voltage regulation. The soft switching operation of the circuit proves better efficiency at high frequency of operation. The mode of operation of the battery is decided by the charging state of the battery. Even under the condition of variable input voltage from the PV panel, the battery is charged in a regulated voltage level at constant current. A prototype of rating 24W has been developed to test its performance. The experimental results are obtained from the prototype to prove its performance for the battery charging states.

Keywords: Half bridge, resonant converter, battery charging, photovoltaic.

ON-SITE DOMESTIC WASTEWATER TREATMENT SYSTEM USING MICROPLASTICS AS BIOFILTER MEDIA: PILOT-SCALE STUDY

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Abstract:

This study, a 1000 L/d capacity one-off on-site wastewater treatment system was operated for over a year as a pilot alternative to the conventional on-site treatment as currently used in Bengaluru urban. An up-flow anaerobic sludge blanket (UASB) was used for blackwater treatment (to replace “septic tank followed by an anaerobic biofilter (ABF) (to replace soak pits) for the treatment of a mixture of greywater and UASB effluent. Shredded waste plastic bottles were used as the novel biofilter media in the ABF. During a yearlong operation, the

pilot system produced a final treated effluent from ABF with average BOD_5 28 mg/L, COD 38 mg/L, TSS 85 mg/L and 5 log units of Escherichia *coli*. These effluents met three out of four of the national effluent discharge limits of Bengaluru, but unsuccessful to meet the *Escherichia coli* standard over a yearlong operation. Further, process optimisation may enable more significant *Escherichia coli* removal. An economic analysis indicates that the total unit cost (capital and operating expenditures) of this alternative wastewater treatment system for more than 50 users range between USD 0.27–0.37/person/month comparable to USD 0.29–0.42/person/month for the current predominant on-site system, i.e., "septic tanks". This pilot study, therefore, indicates that this wastewater treatment system using shredded waste plastic (micro plastic) biofilter media has high potential to replace the current conventional treatment, i.e., "septic tanks", which are often overloaded with greywater and discharging effluents which does not meet the national standards.

Keywords: Up Flow Anaerobic Sludge Blanket, Biological Oxygen Demand, Chemical Oxygen Demand, Total Suspended Solid, Anaerobic Bio Filter.

ADVANCES IN PHASE CHANGING MATERIALS(PCMS) IN SOLAR ENERGY HARVESTING AND ENGINEERING APPLICATIONS: AN ANALYTICAL REVIEW

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Abstract:

Phase-changing materials (PCM) are used for the storage of solar and thermal energy (direct solar radiation or waste heat from thermal processes). Solar thermal energy can be stored in PCM in form of latent and sensible heat. This stored energy with PCM can be suitably utilized for secondary applications like space heating and cooling, water heating, and other industrial processing where low-temperature heat energy is required. The presented review is an attempt to evaluate how the use of advanced materials (nano-material) can enhance the efficiency of energy storage systems. Synergistic use of PCM with nano-micro material can further enhance the capacity of the energy storage system along with the charging and discharging efficiency of the system. Effect of size of the particle, concentration ratio, and shape of particle has been studied to find out their effectiveness in the enhancement of storage efficiency of the systems. Waste heat recovered and stored in an energy storage system can certainly enhance the total energy availability of the source thus it will enhance exergy efficiency and reduces entropy generation rate. Core-shell nanoparticles can further enhance optical absorptance spectra towards an infrared region of thermal energy.

Keywords: PCM, Energy storage, Storage efficiency.

A REVIEW ON DECENTRALIZED WASTEWATER TREATMENT SYSTEMS IN INDIA

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Abstract:

Pollution of water resources and a lack of potable water are two important issues that city dwellers in India encounter. The passage of untreated sewage down municipal drains is one of the most significant sources of water resource pollution. In densely populated areas, effective sanitation and wastewater management is becoming increasingly difficult. In many developing nations, centralized sewage and wastewater treatment facilities serve only a section of big cities, and on-site sanitation is frequently insufficient in heavily populated areas. There is a demand for intermediate and complementary solutions. DEWATS (community-managed anaerobic decentralized wastewater treatment systems) offer the possibility of relatively quick sanitation improvements in high-priority neighborhoods where the local authority does not yet provide a full sanitation service. The following technical treatment steps are normally implemented in typical DEWATS • primary treatment – in sedimentation ponds, settlers, septic tanks or bio digester • secondary treatment – in anaerobic baffled reactors, anaerobic and facultative pond systems or anaerobic filters • secondary aerobic/facultative treatment – in horizontal gravel filters • post-treatment – in aerobic polishing ponds. The experience of India in establishing community-managed DEWATS on a large scale is examined in this review.

Keywords: DEWATS, India, Pollution, Treatment, Wastewater

NUMERICAL ANALYSIS OF DESIGN MODIFICATIONS IN A NATURAL DRAFT BIOMASS ROCKET COOKSTOVE

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Abstract:

The current investigation focuses on the numerical analysis of a natural draft biomass rocket cookstove with design modifications (baffle and multi-direction fuel inlet). The purpose of this study is to assess the effect of design modifications on the stove's emission performance and to propose a possible combination of design modifications to enhance stove performance. To simulate the combustion phenomenon, non-premixed combustion and k-ε turbulence models are used. The baffle choke factor (BCF), a new design parameter that affects the performance of the cookstove, has been introduced. The optimal BCF is found to be 0.5. The study also

indicates that the baffle plate and multi-directional fuel inlet should be implemented independently rather than as a combined model. The use of Computational Fluid Dynamics (CFD) in this case proves to be a useful tool for understanding the thermal and emission behaviour of the cookstove.

Keywords: Natural draft biomass rocket cookstove, CFD, CO Emission, Baffle choke factor (BCF), Non-premixed combustion.

IOT ENABLED E-LIFE DEVICE FOR ELECTRICITY MANAGEMENT AND ENERGY EFFICIENCY

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Abstract:

Nowadays, when it comes to living in more sustainable lifestyle, energy saving is a major challenge. But, due to a lack of understanding and the impossibility to anticipate the lifespan of electrical or electronic products, it is often ignored. It is critical to all of us because we tend to think of energy in terms of all we accomplish each day. The most cost-effective way to deal with energy shortages is to practice energy conservation. It makes it possible to implement a product called “e-Life” to address this issue and makes people aware. Products that use a lot of electricity have their own power specs and lifespans, but most of the time, they last far longer than expected. However, they consume more electricity than they are advertised to. This is because of the phenomenon known as ageing. For instance,a 40-watt incandescent lamp is shown to use an extra 25% of its original power over its lifetime has expired, according to an experimental study. The e-life algorithm in an "IoT enabled tiny electronic device" embedded in any load to monitor and express product replacement time suggested to avoid such an issue and aware of excessive power consumption on all-electrical/electronic devices. According to the experimental analysis the proposed device saves over 37% of electricity in a month for limited loads.

Keywords: IoT, E-life, Electricity, Efficiency, Aging effect, Power consumption, Power saving.

TECHNO-ECONOMIC ANALYSIS AND LIFE CYCLE ASSESSMENT OF MICROWAVE CO-PYROLYSIS OF FOOD WASTE AND LOW-DENSITY POLYETHYLENE

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Abstract:

This paper presents the techno-economic analysis (TEA) and life cycle assessment (LCA) to evaluate the viability of commercializing (capacity of 100 kg/d) the microwave (MW) assisted co-pyrolysis (MAP) of food waste (FW) and low-density polyethylene (LDPE) to generate high-value end products such as bio-oil and biochar. At optimum conditions, viz., temperature - 550 ºC, LDPE -13 % of FW, and pyrolysis time - ~15 min), lab scale studies with a capacity of 1 kg/d yielded 42wt.% bio-oil along with 42 wt.% of biochar and 16 wt.% pygas. The fixed cost and monthly operating cost of lab-scale MAP was 13155.56 USD and 152.87 USD/kg, respectively. At the commercial level, the respective cost was estimated as 775.35 USD/kg and 3.50 USD/kg. additionally, TEA showed 7% of the internal rate of recovery (IRR) within 4 years of setting up the commercialized MAP plant. A Life cycle assessment (LCA) for modeled MAP plant has been conducted to evaluate the energy consumption and environmental impact of each unit process. The drying and pyrolysis unit consumed 91% of total energy and contributed most to environmental impact. MAP of FW and LDPE emitted 38.92 kg CO_2 eq, 0.048 kg SO_2 eq, 0.0077 kg PO_4^{3-} eq, 1.1 kg DCB eq, 0.0035 kg C_2H_6. The commercialization of the plant has great potential to generate an attractive economic return from the value-added end products. The LCA showed the plant provided higher conversion efficiency, lower energy consumption and reduced environmental risk.

Keywords: Food waste, Low-density Polyethylene, Fixed cost, Life cycle assessment.

END OF LIFE WASTE TIRES AS SUPPLEMENTARY FUEL IN AN OMAN CEMENT INDUSTRY FOR PROCESSING OF PORTLAND CEMENT

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Abstract:
Approximately 45000 tons of end-of-life waste tires are generated annually in Sultanate of Oman, a figure that is increasing year on year in line with the population growth and urbanization in the country. The increase in the end-of-life waste tires quantity has become a major environmental issue in Oman. Present work analyzes the utilization of these waste tires in an Oman cement industry for reducing the fuel consumption in the calciner firing system

while adhering to the standards and requirements of the Government of Oman with regards to the pollution standards. A simple arrangement is made in the preheater for introducing these tires in a safe way. The waste tires are fed by gravity to the kiln as a supplementary fuel through the chute before the burner and the feeding is done by manually dropping them into the calciner at point where temperatures are in the range of 850 - 900^{o}C. The number of waste tires dropped into the kiln are increased gradually till they do not interfere the kiln operation. During experimental trials, total 407 waste tires (each weighing 12 kg on average) were used at a rate of 33.4 tires/hr. This has saved on average 240 nm^3/hr of natural gas used in the rotary kiln inside the plant. Each tire could save 7.17 nm^3/tire (0.6 nm^3/kg of tire), of natural gas. There has been a reduction in fuel CO_2 and NOx emissions when natural gas is supplemented with these waste tires. The fuel Nox emissions has been reduced by almost 21% during and 10% post-trial respectively. The fuel CO_2 is reduced by 3% on average while fuel SO_2 emissions slightly increased by 2 mg/nm^3. The main achievement of the project is the utilization of end-of-life waste tires, which otherwise gets dumped in the environment causing environment pollution. Moreover, during the trial the natural gas consumption has been reduced by almost 30% and hence there has been a significant saving of conventional fuel reserve.

Keywords: Waste tires, cement industry, supplementary fuel.

A SURVEY ON ARTIFICIAL INTELLIGENCE FOR REDUCING THE CLIMATE FOOTPRINT IN HEALTHCARE

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Abstract:

The primary mission of the healthcare sector is to protect from various ailments with improved healthcare services and to use advanced diagnostic solutions to promote reliable treatments for complex diseases. However, healthcare is among the significant contributors to the current climate crisis. Therefore, researches are underway for identifying various measures to reduce the emissions from advanced healthcare systems. In addition, significant investments in renewable energy, efficient energy solutions, and intelligent technologies for climate cooling and control are observed in the healthcare sector. Furthermore, innovative technologies like artificial intelligence (AI) are proposed to enable automation in-patient health monitoring. With the advances in AI, there are green AI goals for potentially reducing emissions through data-driven and well-optimized models for healthcare. Furthermore, novel machine learning and deep learning techniques are continually proposed for improved efficiency to reduce emissions. Therefore, the scope of the research is to review the potential of AI in healthcare for quantifying emission rates and its methodologies, current approaches, metrics, challenges, and future trends to attain a straightforward pathway.

Keywords: Artificial Intelligence, Carbon footprint, Healthcare, Digital health, Decarbonization, Climate footprint

A NOVEL PROBIOTIC FERMENTED DRINK: OLIVE LEAF KOMBUCHA TEA AND ITS NUTRITIVE VALUES

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Abstract:

Probiotic intake encourages the growth of beneficial microorganisms while decreasing the number of pathogens, improving the host's intestinal microbial balance and lowering the incidence of gastrointestinal diseases. Olive (*Olea europaea* L.) leaf extract (OLE) contains a reservoir of secondary metabolites with nutritional, antimicrobial, anti-inflammatory and antioxidant activity. Kombucha is a probiotic beverage traditionally served by microbial fermentation black tea or green leaves with a symbiotic consortium of bacteria and yeasts (SCOBY). Aim of this study is to prepare an olive leaf extract probiotic beverage Kombucha and estimate its nutritional content and different probiotic bacteria associated in the beverage production. The secondary metabolite content and microbial profiling was also done. The results shows that the fermented drink have a potential health-promoting value due to the presence of active microflora *Bacillus cereus, Bacillus safensis, and Bacillus velezensis* isolated from the beverage. These isolated microorganisms showed sensitivity against antibiotics like Streptomycin, Gentamycin, Penicillin, Amikacin and Erythromycin. Thus, we observe the prepared beverage was formed when the SCOBY increased in size. On further examination we found that it had a mix of bacterial communities and was nutritionally rich. This research reveals that this type of fermented tea can be an alternative of a healthy drink with nutritional values.

Keywords: Kombucha, probiotic, fermentation, tea, nutrition

THERMO-STRUCTURAL ANALYSIS OF BANANA FIBER REINFORCED EPOXY COMPOSITES - COMPUTATIONAL AND EXPERIMENTAL STUDY

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Abstract:

In recent times, interest in natural fibre composites has increased significantly. Composites with fibers of banana, hemp, flax, bagasse, bamboo, coir, kenaf, cotton, jute, aloe vera, sisal, etc., have huge potential for a variety of applications. Among those, banana fibers are used in

present work. Also, epoxy resin is selected because of its very good mechanical properties. Several parts of banana plants are not utilized properly. The banana stem fibers are highly useful for manufacturing natural fiber composites. Additionally, the solid waste generated in the respective regions which could be utilized for developing composites which helps the farmers to convert waste to wealth. Detailed structural analyses of banana fiber reinforced composites (BFRC) are presented in this work initially. The computational and experimental analyses are performed. ANSYS software is used for simulation and vacuum assisted resin transfer method is used for experimental studies. Several, parametric studies using software and also several experimental tests including thermal effect are conducted on BFRC. Results from tensile test, flexural test, flammability test, etc. of BFRC are discussed. Present results thus discuss the detailed structural analysis of BFRC which has a high impact on social, environmental and economic levels. The scope of the present work is relevant due to the rising use of natural fiber reinforced composites supporting the global drive towards a more sustainable future.

Keywords: Banana fibre reinforced composite, waste to wealth, structural analysis.

INTEGRATION OF SOLAR AND FLEXIBLE RESOURCES INTO EXPECTED SECURITY COST WITH DYNAMIC OPTIMAL POWER FLOW PROBLEM USING A NOVEL DE ALGORITHM

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Abstract:

Numerous power systems are undergoing dramatic changes in their generation portfolios. Solar electricity generation capacity has increased significantly in response to global environmental and national energy security concerns, as well as rising fuel prices. Integration of these solar resources with limited dispatchability into existing power systems with varying levels of availability, demand and system flexibility is challenging. This article proposes an expected security cost dynamic optimal power flow (ESCDOPF) that integrates solar and flexible resources. The proposed model is formulated and implemented with a "Novel Differential Evolution (NDE)" optimization algorithm to obtain the global solution for the total expected system operating cost which includes contingency costs by satisfying the model constraints over a day. Solar output is predicted using the Beta probability distribution function with direct, under-estimation and over-estimation costs. Similarly, flexible resources such as demand response management (DRM), battery energy storage systems (BESS) and high-voltage direct current (HVDC) systems are modelled in order to manage the supply-demand portfolio at all times. To handle inequality constraints and feasible solution superiority, this NDE algorithm employs a penalty function method. To validate the proposed model and the solution process, illustrative cases of various scenarios are performed on an IEEE 30 bus system. Results show

that proposed NDE algorithm satisfies all of the model constraints and also provides cost savings from integration of solar and flexible resources into the power system.

Keywords: Dynamic optimal power flow; expected security cost; flexible resources; novel differential evolution; solar energy and modelling;

SUSTAINABLE PRE-FAB WALLING ELEMENTS FOR URBAN SLUM HOUSING IN DEVELOPING COUNTRIES

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Abstract:

Rapid industrialization produces large amounts of waste and utilization of these into the manufacture of building end-products is a sustainable solution. Given India's urban housing problem, the government has approved six innovative technologies to be deployed as light house projects at six different locations. One of these technologies that enables for cost and time savings in volumetric mass construction is prefabrication. This study focusses on developing a lightweight prefab walling material for the urban slum housing which is an alternate to the commercially available walling materials like red-clay and fly-ash bricks. Co-fired ash, an industrial by-product, is used in the manufacture of end-products, along with expanded polystyrene beads, for lightweight and insulation purposes. As major criterion, several mix designs were tested for density and compressive strength. The achieved final mix was compared to conventional materials and tested for physico-mechanical, durability, and thermal properties. Results show that the final end-product is 18% and 27% lighter, 0.7% and 8% stronger and 68% and 62% less conductive than the red-clay and fly-ash bricks respectively. A time study and an energy analysis were performed to evaluate the performance of the developed end-products. For the demonstration of a small-scale model house, lightweight prefab panels and concrete structural elements were cast. When compared to traditional building techniques such as fly-ash brickwork and cast in-situ concrete, they took around 20% less time to erect. When developed end-products were chosen over conventional technique for energy analysis, it resulted in a 52 percent reduction in peak cooling demand.

Keywords: Sustainability, lightweight, prefab elements, walling.

DEVELOPMENT OF COLORIMETRIC BASED MICROFLUIDIC PLATFORM FOR QUANTIFICATION OF FLUID CONTAMINANTS

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Abstract:

In this paper, a Microfluidic-based Platform for quantification of contaminants in water is proposed. The proposed system uses microfluidic channels with an embedded environment for contaminants detection in water. Microfluidics-based platforms present an evident stage of innovation for fluid analysis, with different applications advancing minimal efforts and simplicity of fabrication. Polydimethylsiloxane (PDMS)-based microfluidics channel is fabricated using a soft lithography technique. Vertical and horizontal connections for fluid dispensing with the microfluidic channel are explored. The principle of colorimetry, which incorporates the use of Griess reagent for the detection of nitrite, has been adopted. Nitrite has high water solubility and water retention, due to which it has a greater potential to stay in groundwater, endangering aquatic life along with human health, hence taken as a case study in this work. The developed platform also compares the detection methodology, containing photodetectors for measuring absorbance and image sensors for measuring color change for quantification of contaminants like nitrite in water. The utilization of image processing techniques offers the advantage of operational flexibility, as the same system can be used to identify other contaminants present in water by introducing minor software changes.

Keywords: Microfluidics, Colorimetry, Fluid, Contaminants, Analysis.

REPLACEMENT OF COARSE AGGREGATE WITH RECYCLED DEMOLITION WASTE

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Abstract:

Indian Urbanisation and Industrialisation expansion may increase the built-up area to almost five times by 2030 as compare to 2005. This surge in built up area is heading towards generation of large quantities of construction and demolition waste. As of 2020, India recycles only 1% of its construction and demolition waste. Scientists have proved that hazardous dust particles from the debris of construction and demolition activities pollute the air which causes

respiratory and other health complications. Currently, more than 90% of construction and demolition waste is left untreated. Due to high rate of construction, demolition, prefabrication, renovation etc, demand of virgin material is increasing; on the other hand, the amount of waste generated by deconstruction industry is also increasing at a rapid pace causing environmental pollution and global warming. With the help of high-quality machinery, it is possible to crush the waste into required size and shape and can be reused after the demolition of the structure. Replacement of coarse aggregate with C and D waste can be a substitute to virgin material, which intern reduces the demand of natural resources. Present study concentrates on replacing varying percentage of coarse aggregate with C and D waste material in M 20 concrete, aiming to reduce the optimal quantity of increased demand of natural coarse aggregate without compromising strength required for construction.

Key words: C and D waste, Coarse aggregate replacement, Concrete.

PERFORMANCE OF A NEW HYBRID APPROACH FOR DETECTION OF ISLANDING FOR INVERTER-BASED DGS

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Abstract:

This paper proposes a new hybrid method for the sensing of islanding and minimizes the Non-Detection Zone (NDZ), for an inverter-based grid connected distributed generation system. The proposed hybrid method is an integration of the modified active Sandia Frequency Shift (SFS) method and the passive reactive power variation technique. The modified active SFS method is obtained by adaptive tuning of the gain parameter K_{sfs}, using the Adaptive Particle Swarm Optimization (APSO) technique. The proposed hybrid method produces a significant reduction of NDZ and suitable for a more accurate detection of islanding condition. The effect of NDZ for the proposed hybrid method has been derived analytically and the system performance has been assessed, under various power mismatch conditions for a DG-grid interface. The overall system performance has been found to be superior under the presence of constant power control strategy, the effect of frequency and voltage variations at the common coupling point during islanding have also been considered. Finally, the performance of the proposed method under the IEEE standard 1547 islanding test condition has been investigated for different load factors and load variations. The simulation results presented for a three-phase grid connected 120 KVA DG, using MATLAB presents the capability of the proposed method.

Keywords: Non-Detection Zone, Sandia Frequency Shift, Distribution Generation, Adaptive Particle swarm optimization

EFFECTIVE UTILIZATION OF WASTE COOKING OIL AS A FUEL IN CI ENGINE BY EMPLOYING DIFFERENT TECHNIQUES- AN EXPERIMENTAL INVESTIGATION

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Abstract:

Environmental pollution and fossil fuel depletion are the major concerns in the present situation. Researchers have tried various biofuels for compression ignition (CI) engine to overcome these problems. Waste cooking oil (WCO) was found suitable alternate fuel for CI engine because of their huge availability, biofuel, economically cheaper and renewable fuel. However, WCO has poor fuel properties led to inferior combustion in CI engine. Due to inferior combustion, engine performance was poor, engine exhaust emissions were higher. In this present experimental work, different techniques were adopted to improve the performance of CI engine using WCO as the base fuel. WCO was collected in bulk from a restaurant and used for the entire research work. A single cylinder, four stroke, direct injection, water cooled CI engine was used for this research work. In the first phase of work, experiments were conducted using diesel and WCO as fuels and kept as baseline data. WCO was converted into waste cooking oil biodiesel (WCOB) through transesterification process and conducted experiments using WCOB in the second phase of this work. In the third phase of work, copper oxide nanofluids were prepared by wet chemical method in four mass concentrations, blended with WCOB and experiments were conducted. Finally, all the experimental outputs from various techniques were compared and analyzed. It was observed that WCO produced lower brake thermal efficiency (BTE) and higher exhaust emissions than diesel. In the second phase, BTE was improved while using WCOB as compared to WCO. HC, CO emissions and smoke opacity were reduced. But Nitrogen Oxide (NO) emission was found increased as compared to WCO. It was noted that BTE was improved further while using copper oxide nanofluids blended with WCOB. Emissions and smoke were drastically reduced as compared to WCOB and WCO.

Keywords: Waste cooking oil, Waste cooking oil biodiesel; copper oxide nanofluid; diesel engine performance and emission

BIOGENESIS AND CHARACTERIZATION OF ZINC NANOPARTICLES FROM *PIPER NIGRUM* HERBAL EXTRACT

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Abstract:

Green nanoparticle synthesis is becoming more popular these days due to its low toxicity as compared to chemical methods. To investigate the structure and morphology of nanoparticles, a zinc nitrate solution might be used for the Zinc nanoparticle (Zn-NP) synthesis of *Piper nigrum*. The dried seed extract of *Piper nigrum* was utilized in the biogenesis of the Zinc nanoparticles to assess its potential as an effective antimicrobial agent. Observing the surface plasma resonance (SPR) band at 274 nm revealed the production of Zn-NPs. Fourier transform infrared (FT-IR) detected the presence of different functional groups viz. 3296 cm^{-1}, 2929 cm^{-1}, 1578 cm^{-1}, 1380 cm^{-1}, 1028 cm^{-1}, 600 cm^{-1} that were like *Cubebin*, the secondary metabolite of *Piper nigrum*. Energy dispersive X-ray analysis showed elemental makeup of 89.4% Zinc content in the nanoparticle. *Cubebin* in *Piper nigrum* seed extract may be the ecofriendly *green factor* responsible in aqueous medium as a reducing and capping agent. This green biogenic method was quick and easy to implement, and it could quickly replace chemical production. The antimicrobial activity of Zn-NP of *Piper nigrum* was pronounced against *Pseudomonas aeruginosa, Bacillus subtilis, Staphylococcus aureus* and *E.coli*. The research demonstrated that the secondary metabolites of the dried seed extract can be a suitable capping agent in the green synthesis of the nanoparticles as well as responsible antimicrobial activities.

Keywords: Antimicrobial, capping, cubebin, *Piper nigrum*, zinc nanoparticles.

SUPPORTED IONIC LIQUID MEMBRANE WITH 1-BUTYL-3-METHYLIMIDAZOLIUM CHLORIDE IONIC LIQUID FOR CO_2/CH_4 SEPARATION

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Abstract:

The world's growing population creates a need for natural resources for energy, which might become a major contributor to global climate change. Carbon dioxide is one of the key components of the greenhouse gas effect, as we all know. CO_2 capture and storage (CCS) methods have piqued academics and researchers attention in recent decades. In comparison to other methods, membrane separation has some excellent outcomes in CO_2 capture. Ionic liquid supported membranes were developed in this work. For the gas separation investigation, PEBAX® 1657 was synthesized with ionic liquid 1-Butyl-3-methylimidazolium chloride concentrations of 5%, 10%, and 20% (based on polymer). According to the gas separation data, the inclusion of ionic liquid enhances mixed gas selectivity (CO2/CH4) at high-pressure values. Membranes with a 20% concentration of ionic liquid (based on polymer) have greater permeability and CO_2/CH_4 selectivity.

Keywords: Ionic Liquids, Supported ionic liquid membranes, gas, Separation, CO_2 separations.

EFFECT OF TEMPERATURE, HUMIDITY AND TRAFFIC LOADS ON PZT-5H DISK USED FOR ENERGY HARVESTING APPLICATION

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Abstract:

In order to combat energy crisis, researchers explore alternative energy technologies that can be harvest from the ambient environment. Piezoelectric transduction is the prominent mechanical energy harvesting mechanism owing to its high electromechanical coupling factor and piezoelectric coefficient compared to electrostatic, electromagnetic and triboelectric

transductions. This paper presents experimental study of the effects of temperature, humidity and strain impacts on the voltage generation of PZT-5H piezoelectric panel in real time environmental condition. The PZT panel was placed on highway and data were recorded with the help of indigenously fabricated real time data logger.

Keywords: Energy harvester, PZT, voltage, traffic state, temperature, humidity.

INVESTIGATING THE INFLUENCE OF REDOX PROCESSES DURING THE ADSORPTION OF HEXAVALENT CHROMIUM ON FE_3O_4 NANOPARTICLES

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Abstract:

Heavy metal pollution monitoring is hampered by multi-valent pollutant species due to the varied levels of toxicity and the need for multiple analytical tools to monitor the different species. Fe_3O_4 nanoparticles are capable of reducing or oxidizing pollutants on the surface while providing high affinities making them uniquely suited for the remediation of multi-valent pollutant ions. Their magnetic properties provide easy retrieval by the application of a magnetic field. The study was aimed at investigating the mechanisms involved in the adsorption of chromium ions onto Fe_3O_4 nanoparticles through spectroscopic, kinetic and thermodynamic methods. Fe_3O_4 nanoparticles were synthesized via the co-precipitation method and applied in the adsorption of hexavalent chromium from synthetic wastewater. Reduction-coupled adsorption as well ion exchange with the adsorbent surface were determined to be responsible for the reduction of chromium concentration in solution. The Langmuir maximum adsorption capacity was determined to be 14.3 mg g^{-1} and XPS analysis indicated the presence of both Cr^{6+} and Cr^{3+} on the adsorbent surface confirming the reduction-coupled adsorption mechanism. The spent adsorbent was reused and retained >90 % of its initial adsorption capacity after three cycles. The as-synthesized adsorbent was determined to be a promising adsorbent for the remediation of multi-valent ion polluted water due to its capacity to reduce the toxic Cr^{6+} to the less toxic Cr^{3+} species and its ability to sequester both species on the surface. The retention of its properties after several cycles allows it to be reused thereby reducing the cost of the adsorption process.

Keywords: Adsorption, Fe_3O_4 nanoparticles, hexavalent chromium, multi-valent pollutants, wastewater treatment.

MODELING OF ION EXCHANGE PROCESS FOR CU (II) ERADICATION FROM ACID MINE DRAINAGE USING ARTIFICIAL NEURAL NETWORK (ANN)

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Abstract:

The cation exchange process using Indion 730 resin was studied and modeled for the eradication of Cu (II) ions from acid mine drainage waste (AMDW) by an artificial neural network (ANN). The effective forecasting was done by the three-layered ANN module for the ion exchange process and was validated with 252 experimental observations in a column study. The model design for the ion exchange process focuses on the major constraints of the process such as initial flow rate, initial concentration of Cu (II) ions, and residence time of AMDW in the column for the effective fitting to the working environment. The backpropagation (BP) algorithm of the ANN module of three layers was capable of forecasting the adsorption effectiveness with a sigmoid transfer function at a concealed layer with 6 neurons and the outer layer equipped with the linear transfer function. The simple linear approach to develop the correlation between dependent and independent variables was demonstrated. The coefficient of correlation for the BP-ANN module was obtained as 0.99 with accurate forecasting of dependent variables. The present study gives an excellent prediction of the optimal conditions for the extraction of Cu (II) ions in a feedforward neural network by the ANN module.

Keywords: Artificial neural networks (ANN), Ion Exchange, Modeling, Indion 730, Cu (II).

ELECTRICAL PROPERTIES OF CHICKEN MEAT AS THE STORAGE FRESHNESS INDICATOR IN CORRELATION WITH ITS PHYSICO-CHEMCIAL PROPERTIES.

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Abstract:

The postmortem changes observed in chicken breast and thigh meat were studied via electrical properties such as Impedance, Resistivity and Conductivity. These electrical properties were compared with physico-chemical properties such as pH, Water Holding capacity (WHC), Thiobarbituric acid value (TBA), Tyrosine value (TV), Warren Bratzler shear force (WBSF) and Total viable count (TVC) at 0, 24, 48 and 72 hours at room temperature and refrigeration temperature (4±1°C).Impedance and resistivity decreases as the storage time increases whereas the conductivity increases. Good correlations were found in between the electrical properties and physicochemical properties of chicken breast meat stored at the room temperature whereas the moderate correlations were found at the refrigeration storage temperature. In case of Chicken thigh meat, the correlations were found less comparatively with the chicken breast. Hence it is concluded that the Electric properties can be related with its postmortem glycosis to assess the chicken meat freshness status and the condition of the meat at given time.

Keywords: Chicken meat, Impedance, Freshness.

PERFORMANCE EVALUATION OF SOLAR PHOTOVOLTAIC PCM-BASED COLD STORAGE SYSTEM FOR MANGO AND TOMATO FRUIT STORAGE IN SUB TROPICAL COUNTRIES

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Abstract:

Conventional cold storage is an inevitable and effectively used post-harvest method employed to prolong and maintain the quality attributes of fresh produce. However, growing concern on energy consumption and GHX emission of (VCR) -based cold storage systems in developing countries encouraged the integration of renewable resources in conventional cold storage systems. In the present work, a binary PCM mixture was developed and integrated with a solar cold storage system. A set of parameters including prototype cold storage, PV capacity and inverter requirements parameters were designed for the prototype solar photovoltaic PCM-based cold storage (PSCS) unit. Experimentation on temperature variation, relative humidity, quality changes of mango and tomato fruit, energy consumption and economic calculation was investigated under several periodic operations. The results show that the solar PV - PCM-based cold storage system maintains a temperature of 12 ± 0.5 °C under continuous operation (P24) and periodically operating conditions show a minimal energy conversation and thereby maintain quality attributes. The quality attributes of progressive ripening of mango and tomato fruit under several periodic operated storage conditions were concurrent with conventional cold storage and within the acceptable range. A minimal energy saving of 39 % is observed for continuous operation (P24) and energy-saving under different operational conditions was summarized. These results also suggest that periodic PCM-based cold storage systems with suitable PCM mixtures can be effectively used as an energy-saving cold storage technology to maintain the fresh produce quality under power failure and off-peak load conditions.

Keywords: Cold storage systems, Phase change material, Solar Photovoltaic, Temperature, Energy consumption, Fruit quality attributes

PERFORMANCE ANALYSIS OF A PHYSICALLY DECOUPLED NANOSTRUCTURE IN SOLAR-POWERED DESALINATION SYSTEM

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Abstract:

Water is the basic necessity of life on earth. However, most of the water available on the planet is brackish, saline, and unfit for drinking and domestic purposes, giving rise to a global challenge of water scarcity. In order to address this water scarcity problem, solar desalination by the use of solar still can be one feasible solution to purify the water. Researchers recently developed thermal absorption materials that are fully and partially submerged in water and floating. These thermal absorption materials transfer their absorbed solar energy to water through thermal conduction. However, a direct contact of these thermal absorption material with water will damage the material, resulting in reduced life. Here we developed a novel physically decoupled nanostructure that is not in contact with water. The physically decoupled nanostructure will first absorb the solar energy and then re-radiate the absorbed energy to water, resulting in water heating, followed by evaporation and condensation. Experimental results showed that the use of a vertical mirror of size 75 × 50 × 0.5 cm could able to enhance the productivity by 42.8% when synthetic saline water (3.5 % Wt. NaCl) with 1 cm water depth was used inside the physically decoupled nanostructure solar still (PDNSSS) compared to without mirror. Salt deposition is completely prevented owing to the physical de-coupling of the nanostructure from water, resulting in a long lifespan of the nanostructure that can be used for years.

Keywords: Physically decoupled nanostructure, desalination, lifespan, synthetic saline water.

ANALYSIS OF TEXT-TO-SPEECH SYNTHESIS WITH PROSODY GENERATION FOR INDIAN LANGUAGES

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Abstract:

The most important and effective means of information exchange for human being is using speech. There are a few literature works that supports the development of vocally interactive computers to realize text to speech synthesis. In order to get more benefits using various applications to make interactive computers in various fields of communications, this proposed work is focused to synthesize text into speech form. Text-to-speech synthesis is helpful for various kinds of people like illiterate or visually impaired in various situations in their day-to-day life activities. The proposed text-to-speech work is implemented using Python where the system provides the speech output in the form of mp3 file format for the given text file. The proposed system also considered the use of prosody generation in order to obtain proper pronunciation for the given input text file. The parameters considered in this work are execution time for audio file generation with and without considering prosody, and the audio file size generated for the given input text with and without prosody generation. The Indian languages considered for evaluation are Tamil, Telugu, Malayalam, Bangla, Gujarati, Hindi, Kannada, Marathi, Nepali, and Punjabi. The various languages based on execution time and audio file size and which language is having less execution time and which language generating audio file with less memory are analyzed.

Keywords: text-to-speech synthesis, execution time, audio file size, Indian languages, prosody generation

PREDICTION OF SOIL ORGANIC CARBON USING VISIBLE NEAR INFRARED REFLECTION SPECTROSCOPY

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Abstract:

Soil organic carbon is an important indicator of soil fertility and soil quality as it has a great influence on soil physical, chemical and biological processes. Soil Organic Carbon (SOC) plays a significant role in maintenance of ecosystem of biosphere-atmosphere carbon circulation. Decline in soil organic carbon content is considered as one of the most important causes of land degradation. In this work, we investigated the applicability of Vis-NIR spectroscopy in rapid prediction of soil organic carbon in black cotton soils of Nagpur district, Maharashtra. Spectral reflectance of the soil samples between 350- 2500 nm was measured under controlled laboratory environment using FieldSpecPro FR spectroradiometer. Reflectance spectra and 1st derivative reflectance spectra of soils showed prominent absorption features around 1400, 1900 and 2200 nm. These absorption features were more prominent when the spectra were transformed to first derivative because first derivative reduces the impact of linear or low frequency background noise on target data. The best SOC model was selected based on high coefficient of determination (r^2) and the lowest root mean square error (RMSE).The calibration model obtained for SOC explained about 78 per cent variations in soil organic carbon in the calibration datasets with 6 PLS factors with RMSE of 0.273gkg^{-1}. The application of the developed model on the independent validation datasets explained reasonably good variations (r^2 = 0.64) in the independent datasets with RMSE of 0.294 gkg^{-1}.

Keywords: Soil Organic Carbon (SOC), Spectroscopy, Spectral reflectance

WASTE WATER TREATMENT USING PLANT EXTRACT AS NATURAL COAGULANTS IN NHCE CAMPUS:AS A CASE STUDY

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Abstract

Bengaluru, one of the fastest growing and developing city in Karnataka. Hence the risk of water contamination increases in many folds. In light of that, the study area selected for investigation is the waste wate and water from New Horizon college of Engineering campus. The collected samples of water were analysed for parameters like pH, Nitrates, Chlorides, Sulphate, Carbonates and Bicarbonates, Total dissolved solids, Hardness etc. Seed powders of jack fruit, Tulsi, and jamun seed powder as natural coagulant and environmentally friendly antimicrobial agent is used for purification of wastewater for various purpose. In present study various doses of jack fruit, Tulsi, and black grapes seed powder like 2.5, 5, 7.5, 10, 12.5 mg/l were taken and checked for the efficiency dose on raw wastewater. After treatment of waste water samples with jack fruit, Tulsi, and jamun seed powder were analysed for different parameter like pH, turbidity, TDS, TS, hardness, chlorides, alkalinity, and acidity. Application of this low-cost seeds is recommended for eco-friendly, nontoxic, simplified water treatment where rural and peri- urban people living in extreme poverty are presently drinking highly turbid and microbiologically contaminated water.

Key words: water contamination, municipal wastewater, Total dissolved solid, total solids

DESIGN AND IMPLEMENTATION OF A NOVEL COST-EFFECTIVE ANN BASED MPPT USING REAL-TIME HARDWARE ARDUINO AND MATLAB/SIMULINK

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Abstract:

Owing to the crouch outlay, uncomplicated performance and recital, definite conclusion and devoid of any replenishment- the MPPT algorithms by means of a mishmash of techniques have witnessed the incredible hastening in terms of expediency in the most recent research in scrupulous for solar photovoltaic power production. MPPT is having such an impact as optimizing position for the solar power system. The purposes of MPPT is to bonus up and optimize the use of the solar power system and to attain the maximum out of the solar collection efficacy to initiate the paramount power output. The solar power production in harmony with the unhinged, idiosyncratic atmospheric state of affairs, temperature and stellar irradiance variations, the solar panel distinctiveness exhibit a non-linear graphical interpretation thus upsetting the efficiency and competence of the whole system. In order to accomplish the

supreme effectiveness, it demands the utilization of the vital of the available stellar radiations from a location by the function of the sundry maximum power point techniques. The effectiveness of a solar panel with MPPT algorithm show a better deal of prospective due to its squart demand price and simple implementation and presentation irrespective of any sort of equipment updating. The achievement of conventional algorithm gets distorted especially when there is a hasty adaptation of weathering conditions. The current exertion focuses mainly the erratic ANN algorithm in association with modeling and simulation of distinct equipped situation. The ANN network working out is completed with inaccuracy back propagation line of action. This method earns the eminence of being very rapid and exclusively getting the MPP. Though, this is moderately suitable method to lay down the reference voltage of MPPT especially underneath different and speedily shifting weather state of conditions. By the proper control of a dc to dc boost converter, the detection of the MPP is enormously doable. At last, the theoretic analysis, simulation results are got by the relevance of MATLAB/SIMULINK. The concluding consequences were confirmed by the real-time hardware arduino microcontroller. The simulation model is being dumped on the arduino hardware. The assorted trends related to the simulation and hardware tentative tactics are obtainable in a comprehensive approach. The proportional investigational and the output obscure the usefulness of the anticipated MPPT algorithm for the speediness and exactness of the MPP system is also represented at length and comprehensively.

Keywords: Artificial Neural Network, Solar Photovoltaic, DC-DC Converter.

ECO-RESTORATION OF RIVERS - A CASE STUDY OF KARAMANA RIVER, KERALA, INDIA

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Abstract

The Karamana river, with a catchment area of 449.45 sq.km, is the main source of drinking water tothe people in Thiruvananthapuram city. Its total length is 61 km ,out of which 21 km length flows within the Thiruvananthapuram city limits. The National Green tribunal has listed this river among 21 polluted rivers in the state.

In order to arrive at a holistic solution to this long lasting problem of pollution and to develop an Eco-restoration plan for the river, a study was initiated based on the watershed approach .The data included the glorious history, habitation and culture associated with the Karamana river, cross- sectional data, flow data and water quality in river and the major tributaries/streams, pollution sources, local bodies through which river passes, institutions and the key stakeholders etc. The data collection was followed by analysis of key factors contributing to pollution and reduction in E-flow.Four approaches were used for analysing the pollution and identifying the pollution zones namely (i) CCME Water Quality Index of each

river stretch (ii) Pollution loading to river due to high BOD concentration in incoming drains (iii) Pollution loading to river due to high Total coliform concentration in incoming drains and (iii) Influence of other key pollution sources . For analysing the E-flow, the hydrologic method and hydraulic method was adopted. For arriving at a holistic action plan, an integrated approach on the basis of the different analysis was taken into account and appropriate action plans (long term and short term) for the various stretches were suggested. By implementing the various actions proposed ,it is presumed that Karamana river can be brought backto its past glory , alongwith preserving the flora and fauna associated with the water system ,thereby bringing in an overall improvement in the Ecosystem.

Keywords: Water quality index, Pollution, BOD

DESIGN AND FABRICATION OF HIGH-PRESSURE PIPE BENDING TOOL

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Abstract:

As the name suggests this project is about design and fabrication of a tool that is used for bending high pressure pipes. This tool is mainly used to bend high pressure stainless steel pipes used in automobile, oil and gas industries to get the required shape. The size of the tool is very convenient and portable. Moreover it is easy to be carried and used at any time and any place. The aim of this project is to design and construct a portable manually operated bending machine which is used to bend pipe in desired shape. It requires less skill to operate this machine. Our objective is to maintain accuracy at low price without affecting the pipe and the bending tool

Keywords: Bending, Stainless steel, High Pressure pipe, Tool.

EFFECT OF ENERGY MATRICES ON LIFE CYCLE COST ANALYSIS OF PARTLY COVERED N-PVT-CPC ACTIVE DOUBLE SLOPE SOLAR DISTILLER WITH HELICALLY COILED HEAT EXCHANGER USING CUO NANOPARTICLES

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Abstract:

At present, the application of nanotechnology for the production of pure water is increasing. It is a new approach in which nanoparticles are being optimized for active solar distiller units with the helically coiled heat exchanger of the effect of the payback period. Thermal modeling has been developed. The thermal exergy, cost of distillate, and productivity are 7.3% higher, 3.58% lower, and 3.45 % higher, respectively, for double slope N-PVT-CPC-DS-HE (system-A) to N-PVT-FPC-DS-HE (system-B). However, the efficiency of life cycle conversion and energy payback factor at 10% interest rate is 13.62% and 5.93% high, respectively, with nanoparticles. It is found that system-A performs better than system-B based on yield and production cost. The proposed system-A, an active double slope solar distiller unit, meets potable water requirements on a commercial basis, and power developed by 25% PVT can be used to drive the pump. Additional 97.6% excess electricity can be utilized for other supportive applications. The optimum mass flow rate achieved by proposed system-A is 0.02 kg/s from 0.03 kg/s of prior research system-B, i.e., it is decreased by about 33%, which reduces pump work.

Keywords: Energy matrices, energy payback factor, life cycle cost analysis, productivity, heat exchanger, CuO nanoparticles.

DESIGN ANALYSIS AND PERFORMANCE TESTING OF EJECTOR AIR CONDITIONER USING HC-290 AS AN ALTERNATIVE REFRIGERANT TO HCFC-22

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Abstract:

Isenthalpic expansion is one of the major source of irreversibility in a typical split air conditioners (SAC). This study presents the design analysis and experimental results of an ejector split air conditioner (ESAC). An ejector is employed in the SAC instead of a standard expansion device to recover expansion losses while also improving cooling capacity and minimizing energy usage. A 5.2 kW nominal capacity SAC that was originally designed for HCFC-22 was used for performance testing. Initially, a baseline performance test was conducted in a psychrometric test chamber as per Indian standard IS 1391 part 1. The COP of the original SAC using HCFC-22 was 3.2, while the COP of modified ejector split air conditioner (ESAC) was increased by 28.13 % and found to be 4.1. With drop-in test, HC-290 gave the COP of 4.6 which is 43.75 % higher compared to original SAC. Thus, use of HC-290 is an energy efficient and climate friendly alternative to HCFC-22 in Ejector split air conditioner.

Keywords: Split air conditioner, HC-290, Ejector air conditioner, Energy efficiency, IS 1391, Alternative refrigerant.

POWER QUALITY IMPROVEMENT OF DOUBLY FED INDUCTION GENERATORS BASED WIND TURBINE USING HYBRID TECHNIQUES

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Abstract:

Nowadays, power systems facing more challenges in maximizing renewable energy sources. In those issues, voltage stability becomes more challenge due to the establishment of Doubly Fed Induction Generators (DFIG's) during faulty conditions. In this paper, the wind farm with DFIG's is stabilized using Flexible AC Transmission System (FACTS) devices

named Static Synchronous Compensator (STATCOM) during grid fault. Here, three types of fault measures are analyzed such as a single line to ground fault (L-G), a double line to ground fault (LL-G) and three lines to ground fault (LLL-G). The simulation test cases utilizing MATLAB are introduced a 9 MW which transferred to a 120 KV power grid. So, in this paper, Particle Swarm Optimization based Fuzzy Logic Controller (PSO-FLC) is implemented to improve the power quality features and performance of the proposed system is analyzed and evaluated with an existing method named as Static Voltage Compensator (SVC). The simulation results, clearly show the wind farm with the STATCOM model gives 0.9925 per unit voltage stability with a reactive power injection of 1.65Mvar which is better than the existing SVC which gives 0.94 per unit only with reactive power injection of 1.85Mvar.

Keywords: Doubly Fed Induction Generators, Flexible AC Transmission System, Real and Reactive Power, Static Synchronous Compensator, Static Voltage Compensator.

ESTIMATION OF CROP WATER REQUIREMENT FOR BARGI LEFT BANK CANAL COMMAND AREA-JABALPUR M.P. INDIA

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Abstract:

Effective water management methods are needed to maximize crop yield that required calculating crop water requirement correctly. Evapotranspiration is the main component of hydrological cycle, so it is important to estimate this component in an accurate manner which is necessary for many hydrological studies. The water requirement of any crop can be estimated by multiplying reference crop evapotranspiration with crop coefficient values. Various method of estimation evapotranspiration is available at present. However, in this paper the best method is focused to compute evapotranspiration for crop water requirement. It was found that the wheat has the highest water requirement whereas maize has the minimum water requirement throughout the periods and the February month requires the maximum supply of water. The Gross water requirement is found out to be 16082177.24 m^3 per year and 5064098.5 m^3 per year by Blaney Criddle Method and modified Penman method respectively.

Keywords: Irrigation water requirement, Evapotranspiration, Crop Water Use, Crop coefficient.

BITUMINOUS PAVEMENT SUSTAINABILITY IMPROVEMENT STRATEGIES

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Abstract:

Transportation systems have enormous challenges in terms of sustainability since they deal with issues like economic, environmental, and social factors, and pavement sustainability is unavoidably one of these problems. This study investigates pavements' sustainability potential, and in doing so, it looks at both global practices and personal experiences. Both standard design criteria and critical pavement features are explained, while design ideas emphasizing using large quantities of sustainable materials are offered. Additionally, preservation is seen as extremely important, and in-depth research on preservation and rehabilitation is reported. This research implies long-term possibilities and solutions for the sustainability issue. Despite these possible benefits, additional field investigation and adoption of sustainability standards might also be helpful from a prospective aspect. In sustainable decision-making, it is essential to consider several elements, such as economic, environmental, and societal factors. Concerns about sustainability have been brought up several times in engineering conferences and discussions, and in recent times the topic has received more attention. New measures have been put in place recently to evaluate sustainability's impacts quantitatively, and new methods for incorporating sustainable practices have been developed in a more orderly and systematic way.

Keywords: Pavement, Sustainability, Concrete, Sustainable Materials, Environment.

PRODUCTION OF XYLANASE BY *FUSARIUM OXYSPORUM* USING LIGNOCELLULOSIC WASTES AS SUBSTRATE IN SUBMERGED FERMENTATION

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Abstract:

Xylanolytic enzymes are receiving increasing attention because of their potential applications in improving digestibility of animal feed, bioconversion of lignocelluloses into feed-stocks, fuels, paper and pulp industry for bleaching. The targeted microorganisms were filamentous

fungi due to higher extracellular release of xylanases, in addition to production of several auxiliary enzymes that are necessary for debranching of the substituted xylans, non-pathogenic nature and ease in cultivation under fermentation. To date, the production of xylanases has been widely studied in submerged culture processes, but the relatively high cost of enzyme production has hindered the industrial application of xylanases. The majority of previous studies on xylanase were concentrated mainly on enzyme production and characterization rather than economics of the process. For any commercialization of enzyme, it should be cost effective. Hence, the use of low cost lignocellulosic materials as substrates rather than opting for the expensive pure xylans is an attractive approach to reduce the cost of xylanase production, especially for fungal cultivations.

With a view to replace xylan, a costly substrate for xylanase production, various cheap and abundantly available sixteen lignocellulosics (banana peel, corn cobs, cotton shells, green gram husk, ground nut shells, jowar stalks, maize stalks, oat meal, orange peel, paddy husk, paddy straw, pomegranate peel, sugar cane pulp, wheat bran, wheat straw and wood husk) have been tried as carbon sources. The use different lignocellulosic hydrolysates in submerged fermentation by *Fusarium oxysporum* which is a filamentous fungus resulted in different xylanase activities. The best xylanase activity (440 U/ml) was obtained when pure xylan was used as the sole carbon source on 14^{th} day of incubation at an ambient temperature 28±2^{o}C and pH of 5.5. The next best source for secretion of xylanase was maize stalks (420 U/ml), followed by corn cobs (342 U/ml), wheat bran (290 U/ml), rice husk (234 U/ml) and jowar straw (184 U/ml) in their 14^{th} day of incubation. The lignocellulosic wastes such as wheat straw (166 U/ml), orange peel (129 U/ml) and paddy straw (126 U/ml) showed moderate xylanase. Cotton shells and sugarcane pulp (105 U/ml) were showing lesser xylanase production while very poor xylanase induction was achieved by green gram husk (13 U/ml) and wood husk (9.9 U/ml). The pH change range in the fermentation broth was 5.5-8.0 after 7^{th} day and 5.0-11.5 on 14^{th} day of incubation. It was observed that very less or negligible amount of cellulase activity was shown by *F. oxyspourm*. Cellulase activity was not detected wheat bran and wheat straw. Cellulase activity ranged from 0.06-0.76 U/ml. The maximum cellulase activity was observed in banana peel and ground nut shells (0.76 U/ml) and rice husk (0.66 U/ml) on 14^{th} day of incubation. The amount of soluble protein was determined which ranged between 0.130-0.38 mg/ml on 7^{th} day and 0.38-1.380 mg/ml on 14^{th} day of incubation. Highest soluble protein content was observed in paddy straw (1.380 mg/ml) followed by sugar cane pulp (1.360 mg/ml). Very less protein was observed in the broth containing pure xylan (0.38 mg/ml). Fungal growth in terms of mycelia dry weight was in the range of 0.120-2.23 gm on 14^{th} day of incubation. The highest biomass was obtained in sugarcane pulp (2.23 gm) and less biomass in wood husk (0.120 gm).

Keywords: Xylanolytic enzymes, xylanases, lignocellulosic wastes, filamentous fungus, cellulase, submerged fermentation

CONFIGURING THE MUNICIPAL SOLID AND LIQUID WASTE TREATMENT PLANTS INTO BIO-REFINERY TO ACHIEVE SUSTAINABLE DEVELOPMENT GOALS

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Abstract:

Increased population and per capita consumption resulted in an increase in the generation of municipal solid waste (MSW), municipal liquid waste (MLW) and CO_2 emission whose disposal causing land pollution, water pollution and global warming respectively. The current focus of MSW and MLW treatments are only on the waste reduction and disposal, which has become an economic burden for the civic corporations. Development of waste to energy technologies (WTE) have gained importance to process these wasted resources into energy products, in order to address the sustainable development goals and energy security. Efficacy of wet waste to energy technologies viz. hydrothermal liquefaction (HTL), anaerobic digestion (AD) and microbial electrolysis cell (MEC) have been demonstrated for the raw MSW, MLW and for their treated intermediates both at large scale and pilot plant level. But there is no report on the integrated approach to convert both MSW and MLW into energy products. This paper analyzed the discrete research reports of HTL, AD and MEC and proposed their deployment in an integrated conceptual bio-refinery for processing the MSW and MLW combined. The proposed bio-refinery involves the deployment of AD, HTL and MEC to synergize their potential and produce a wider energy mix comprised of solid char, liquid bio-oil and gaseous fuels, substitute for coal, petroleum and natural gas respectively.

Keywords: biorefinery municipal solid waste, municipal liquid waste, waste to energy.

LULC CHANGE DETECTION USING REMOTELY SENSED DATA: A CASE STUDY IN A SEMI-ARID REGION IN NORTH KARNATAKA, INDIA

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Abstract:

Land use and land cover change (LULC) has transformed into crucial understanding and regulating changes in natural resources alongside natural issues. Kalaburagi district is well known for most extensive producer of pigeon peas (toor dal) in the Karnataka state. However,

in recent years there has been substantial growth in the industries such as cement, and chemical. This growth has led to depletion in the surrounding environment as a result of this urbanization. The study has been done to understand the land use and land cover (LULC) changes over Kalaburagi district, Karnataka, India for a period of 20 years (2000 -2020). A combination of remote sensing and GIS approach was considered in this study. Satellite images of Landsat 7 (ETM+) and 8 (OLI) for 2000, 2005, 2010, 2015, and 2020 were analyzed using a pixel- based classification technique for producing LULC maps and detecting the associated changes. The dynamic nature of waterbody, forested areas, agricultural lands, increase in build-up land, and barren lands were analyzed during the study.

Keywords: Landsat image, LULC, classification classes, change detection

GROUND WATER POLLUTION ASSESSMENT STUDIES IN ERODE WEST REGION

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Abstract:

Water is the most treasured resource and plentiful compound on Earth's surface. In the earth surface , over 68 percent of fresh water is found as icecaps and glaciers and the 30 percent is present as groundwater. The largest reservoir of fresh water is readily accessible in groundwater. Groundwater is contaminated due to chemical spills from industrial or commercial operations. The proposed project Ground water pollution assessment studies in erode covers the west region. Erode district naturally occupy a place for industries and trade for the economy. The continuous waste disposal from industries leads to groundwater contamination. Assessment of groundwater quality is essential for the safe drinking purpose. In this project thirty groundwater samples were collected from various location on western part of erode region and the samples are tested for various water quality parameters. By using the different water quality parameters, the overall quality of the water is rated using the Water quality index (WQI) and Statistical method by comparing the parameters with IS 10500-2004, MOEF and WHO standards. Based on the overall quality of the water obtained from the results, the precautionary measures are taken to the lower rated area to control groundwater contamination.

Keywords: Groundwater, Waste disposal , Water quality paramets, WQI, Statistical method.

PERMANENT MAGNET SYNCHRONOUS MACHINE: A DESIGN PERSPECTIVE

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Abstract:

Permanent magnet synchronous machine is a versatile and a robust machine. It has shown its presence in almost all the fields of science and technology. There are numerous different designs of permanent magnet machine which is a result of modification in its design. While seeing the importance of permanent magnet machines, it has been intentionally done that the review must be primarily focused on the various types of permanent magnet machines, modification in stator, rotor, type of excitation and type of windings etc. This review also point towards different applications and various factors that affect the design of permanent magnet as reported in the literature. The basic design methodology of rotating machine has also been discussed to give a brief idea of the important design parameters of the machine. A design formulation and its optimization has been performed for 500 kVA, 3.3 kV, 50 Hz permanent magnet synchronous machine using newly adopted optimizing artificial intelligence techniques. Almost 100 papers are rigorously reviewed in this research which will surely be helpful and give a deep insight to the design engineer and researchers those working on design of electrical machines.

Keywords: Permanent magnet synchronous machines, design of electrical machine, factors affecting the design parameters, application of permanent magnet machines.

DESIGN AND IMPLEMENTATION OF AN ON-GRID INVERTER USING H BRIDGE SCHEMATIC WITH PWM TECHNIQUES AND LOSS ESTIMATION AND HARMONIC ANALYSIS

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Abstract:

Due to an increase in the fuel cost and also with several concerns about world-wide change in climatic conditions and increased electricity consumptions, it has become important in utilizing renewable sources of energy, due to which solar power infrastructure has been quite evident source of alternative energy. Multiple solar cells connected to a photovoltaic module are the simplest PV system. An inverter is connected to one or more of these modules which

transforms direct current into alternating current. Grid Tie and off grid inverters are the major players in the solar inverter market and seem to be commercially available products. Grid Tie is a particular inverter type that converts the DC current and feeds it into the electrical grid. On-Grid or Grid Tie are also available commercially in a wide range of power rates. This paper focuses on choice of solar energy for utilization of a grid tied application on the receiving end. Solar energy being surplus and available free of cost in the nature can be utilized for its maximum extent. It also includes methodology involved in design and simulation, challenges faced and overcome to get required levels of output as per the desired requirement.

Keywords: MPPT (Maximum Power Point Tracking), Perturb and Observe, Grid Tie Inverter, PWM.

PREPARATION AND ANALYSIS OF MUNICIPAL SOLID WASTE BRIQUETTES WITH COW DUNG AS BINDER

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Abstract:

Energy is an essential ingredient for the survival of mankind. The different sources of biomass like palm oil waste, agricultural waste, cow dung, sewage waste and landfill sites, which can be used to produce biogas and as a source of energy. The Corporation of Chennai (City in India) is collecting an estimated quantity of 4500MT of Municipal Solid Waste which is presently disposed as open landfill at two sites viz. Kodungaiyur and Perungudi. Since storage and disposal of Municipal solid wastes has becoming major problem, this research article will provide solution by producing briquettes with raw material as municipal solid waste and binder as cow dung. The municipal solid waste is collected and segregated to remove the non-biodegradable materials. Then the segregated waste is dried in the sunlight for two weeks in order to dry completely. The dried municipal solid wastes are grinded to fine powders and mixed with cow dung (binder) at various proportions. The samples of various proportions are briquetted by using simple briquetting machine prototype fabricated through this project. The simple briquetting machine prototype consists of cylinder, piston and handle. All the linkages are mechanical and without any use of electrical energy. The required force to make the briquette is provided manually. The produced briquettes are heated in the Oven at 105°C for about one hour. The produced briquettes are analyzed on various characteristics such as % volatile matter, % moisture, ash content, fixed carbon and calorific value in order to check its performance and efficiency. Additionally water boiling test has been done on the briquette to strongly suggest it for domestic cooking. The outcome of this research work is i) Green Fuel, ii) Home Briquette Extruder iii) Eco-friendly stove (under design). Green fuel can be used as a replacement for any bio fuel. Home briquette extruder also led to self-employment.

Keywords: Solid Waste Management, Briquettes, Caloric value, Landfill reduction.

GROUNDWATER POLLUTION ASSESSMENT IN SANKARI TALUK, SALEM DISTRICT, INDIA

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Abstract:

One of the inevitable resources which is required for mankind is water resources. Among all the water sources, groundwater plays an important role as it is needed for socio-economic development and the proper functioning of eco-system. One of the major problems in India is the degradation of this precious groundwater. The main reason for this problem is because of the lack of implementation of groundwater quality protection measures. As groundwater is a major source of water for all day-to-day purposes, it has to be ensured that the groundwater is of drinking quality by preventing it from various pollutants which are causing the contamination. In this proposed project, water samples were collected from various locations of Sankari taluk of Salem district, Tamil Nadu, India. The water quality parameters of the collected samples were checked in laboratory. After tedious research on various literatures, the suitable methods for analysing the samples were to be identified. The degree of degradation of water caused by the pollutants were identified and the obtained results were compared with the standards in order to ensure the safety of drinking water.

Keywords: Groundwater pollution, Water Quality Index, Statistical method, Pearson correlation.

PLANNING NEW AREA OF NAVI MUMBAI BASED ON ENVIRONMENTAL SUITABILITY AND ACCESSIBILITY

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Abstract:

Many cities worldwide are at the frontline of social and environmental challenges. The city of Navi Mumbai presents many challenges and opportunities to move a city towards sustainability. The land is scarce for development purposes in Mumbai, which has resulted in the creation of the new suburban area of Navi Mumbai. As the latter has numerous water bodies and drainage channels, which lies in the eco-sensitive zone, hence, to stop organic

development, Environmental Suitability Index along with Accessibility Index needs to be assessed to promote future organized growth.

The study investigates the planning of the new areas and assesses environmental suitability and accessibility for various areas seeking future development. The calculation of the environmental suitability index is based on the parameters, sub-index, and attributes of environmental issues in that area. The entire area was divided into five zones. The parameters include (i) soil permeability, (ii) water holding capacity, (iii) porosity, (iv) properties of groundwater and marine water, (v) properties of air, and (vi) noise. The analytical framework is a developed methodology of indices calculated from five monitoring stations obtained from CIDCO. The accessibility parameters of the whole transportation network were measured using Alpha indices (α). Finally, a non-dominated sorting algorithm was used to obtain final suitability based on the Pareto optimality condition. The approach was used for developing dimension-wise suitability indices for Navi Mumbai, which is expected to contribute to the design of policies, tools, and approaches essential for planning to attain the goal of sustainable development of Navi Mumbai.

Keywords: Sustainability, Environmental suitability, Accessibility, Attributes, Indices.

AN ANALYTICAL STUDY TO ESTIMATE THE COOLING LOAD OF PROPOSED BUILDING (BI-LEVEL) USING CLTD METHOD

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Abstract:

Continuous increase in atmospheric temperature because of global warming has caused reduction in human comforts and to cope up with increasing global temperature or to achieve previous level of comforts huge spending has to be done in form of Air conditioning devices. To solve the above aforementioned problem, we have two alternatives Electrical air conditioning and Central air conditioning but electrical air conditioning will further increase the monetary spending because of its non-central air conditioning high-power consumption unit and its shorter duration of life. On the other hand, the efficacious blueprint of centralized system of air conditioner or chilling section will provide low consumption of electricity, minimal capital cost and will improve comeliness of a building. Central air conditioning can even solve the problem of over sizing and under sizing of cooling system. So, with the help of a proposed building layout and taking into account all possible heat source such as heat gain

by individual, heat gain by fluorescent lamp, infiltration and heat gain by ventilation and with all possible heat source all types of heat is taken into account. At the end of this paper, we can determine the results of cooling load of two prominent Indian seasons for a dual-stored proposed construction structure which will be part of our educational institution by using Cooling Load Temperature Difference (CLTD) method. And results obtained by aforementioned method are at par level when comparison is made with the standard data obtained from various fundamental books, such as handbook by ASHRAE (American society of Heating, Refrigerating and Air Conditioning engineers) and CARRIER handbook of air conditioning system design and the results are of very much satisfactory nature. In the end it came to our observation, through this paper that the cooling requirement of monsoon is about 3 % less in comparison to summer climatic condition.

Keywords: CLTD method, CARRIER handbook, cooling load

INNOVATIVE MODEL DEVELOPMENT FOR ENHANCING THE SERVICEABILITY OF FLEXIBLE PAVEMENT USING FEA

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Abstract:

In most, urban cities rigid pavement is getting applicable but it has certain disadvantages like the use of more concrete creating a bad impact on the environment and human health. As when cement is manufactured the calcining process is the major source of emission of SOx, CO2, NOx and particulate matter. Those gases and particulate matter emissions from cement manufacturing plants are degrading air quality and thus produce air pollution. The cement industry is one of the major contributors to global warming and climate change. So it concluded that cement concrete causes harmful effects on the environment and human health. The aim of the research is to find out a cost-effective structural solution for the serviceability improvement of flexible pavement. Estimate design features requirements of precast panel i.e., (Length, width, height and shape) as per IRC specifications and makes the large precast elements model and validated by Finite Element Analysis. The model has to be analysed and designed as a homogenous open-ended rectangular element subjected to a combination of compressive and lateral live loads. To carry out a comparative analysis of flexible pavement with and without using the precast panel.

Keywords: - FEA1, Flexible Pavement2, Precast Panel3, Cost-effective4

DESIGN CALCULATIONS FOR FIXED FOCUS TYPE 16 M^2 SCHEFFLER CONCENTRATOR AND ITS RECEIVER FOR SOLAR OPERATED ESSENTIAL OIL DISTILLATION UNIT IN OMAN

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Abstract:

Fixed focus type Scheffler concentrators introduced by Wolfgang Scheffler are popularly used for different low to medium industrial process heat applications. These concentrators are available in the standard sizes of 8 m^2 and 16 m^2 from the manufacturers. The present paper provides detailed stepwise procedure for design of a 16 m^2 Scheffler concentrator and its receiver used for a solar essential oil distillation unit at our institute. The dome type receivers of boiler steel grade material, SS-304, are selected for the present application. The diameter and the total volume capacity for the receiver are estimated as 0.5 m and 15.5 liters respectively based on the thermal analysis of the system and the error analysis for the reflector. The optical and geometrical concentration ratios at equinox for the Scheffler dish and receiver system are calculated as 81.48 and 57.63 respectively for the present application. The design procedure presented in the paper can be used for designing of any suitable size Scheffler concentrator and its receiver as per the energy requirement of the application.

Keywords: Scheffler concentrator, receiver, essential oil.

A COMPARATIVE ANALYSIS ON DEGRADATION EFFICIENCIES USING ALUM AND ORANGE PEEL WASTE AS COAGULANTS FOR THE TREATMENT OF TANNERY WASTEWATER

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Abstract:

The tannery wastewater effluent (TWE) consists of a variety of complex organic and inorganic compounds requiring a series of treatment processes to meet the desirable effluent discharge standards. Coagulation and flocculation method is one of the conventional methods being used to treat highly contaminated wastewater. Current study deals with the comparison of degradation efficiencies obtained in terms of turbidity, total suspended solids (TSS) and chemical oxygen demand (COD) by using alum, orange peel powder (OPP) and activated orange peel powder (AOPP) respectively for treating the TWE. The physical and chemical

properties responsible for degrading the TWE have also been analyzed using X-Ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), Scanning Electron Microscope (SEM), Brunauer–Emmett–Teller (BET) and Total organic carbon (TOC). From the experimental study it was observed that the coagulant dosage, pH and the reaction time influenced the removal efficiencies. The pre-treatment using coagulation and flocculation method resulted in 98.43% removal in turbidity and 98.80% removal in TSS using AOPP and alum respectively. However, AOPP resulted in 49.85% of COD removal efficiency higher than the removal efficiency obtained through OPP and alum. From the study it can be concluded that the AOPP can be used for pre-treatment of TWE and also a cost efficient alternative to alum.

Keywords: Tannery wastewater effluent, chemical oxygen demand, turbidity, total suspended solids and coagulation-flocculation

STUDIES ON ENZYME BASED BIOSENSOR FOR THE DETECTION OF FORMALIN ADULTERATION IN PRESERVED FOODS

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Abstract:

Formalin is a 37% solution of formaldehyde. It is classified as a human carcinogenic agent but it is fraudulently added in food to prevent food spoilage. The present work aims at developing a sensitive, selective, cost effective and as well as user friendly biosensor for the detection of formalin adulteration in preserved foods. For this purpose, an Electrochemical and an Electro-optical biosensor were developed. The Electrochemical biosensor comprised of a graphene sheet as working electrode (WE) coated with enzyme formaldehyde dehydrogenase (FDH) immobilized in chitosan and calomel electrode as the reference electrode in 0.05mM potassium phosphate as supporting electrolyte at pH 7.6. Graphene sheet was synthesized by combining chemical synthesis and mechanical exfoliation methods. The Electro-optical biosensor is Photovoltic which gives output in the form of voltage by converting some amount of incident light into voltage. The voltage is then converted to digital values by an ADC. This digital voltage values are then fed to a microcontroller, which is programmed to convert the voltage values to optical density which is displayed on the LCD. at limit of detection is 0.5 ppm of formalin and a response time less than 30sec. The proposed biosensors have potential advantages owing to its rapid response, high selectivity and real time procedure for analysis.

Keywords: Electrochemical sensor, electro-optical sensor, formalin

COMBUSTION, PERFORMANCE AND EMISSION CHARACTERISTICS OF DIRECT INJECTION DIESEL ENGINE USING WASTE PLASTIC OIL

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Abstract

Waste plastics are perfect source of energy due to their energy content. Plastics utilization is growing daily although it now not environment friendly material but not found the suitable alternative for it. The disposal of after use plastic is a major task and quality of oil obtained has properties similar to fuel. The main of the advantage of conversion to gasoline is not the best disposal however additionally allow fuel to be derived from the disposal of after use plastics. The plastic oil received from pyrolysis rejects its usage as direct gas but blend of conventional fuels and plastic oil can be used without affecting much on engine overall performance. Therefore blends of plastic oil are preferred for diesel engines. In this context catalytic pyrolysis of waste plastic oil is done with at temperature of 380^0C having properties similar to petroleum fuels. Physical homes of plastic oil were analyzed. Four different proportions of 10, 20, 30 and 40% plastic oil with diesel in mixture were applied as fuel in diesel engine to decide the Combustion, Performance and Emission Characteristics. The plastic oil will increase the brake thermal performance and reduces fuel consumption. With increase in blending ratio there may be longer ignition delay, higher heat release rate. Oxides of nitrogen (NOx), carbon monoxide (CO), Hydrocarbon have been increased as compared to diesel. The result suggests that the plastic pyrolysis oil is a possible alternative fuel for some engine with suitable working situations. The utilization of PO with diesel as much as 30% inside the combination may be utilized in diesel engines with a mild increase in emission at higher masses.

Keywords: Blends, Diesel Engine, disposal, Plastic oil, Pyrolysis.

LIFE CYCLE ASSESSMENT OF LPG COOK-STOVE WITH POROUS RADIANT BURNER AND CONVENTIONAL BURNER – A COMPARATIVE STUDY

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Abstract

Technological innovations of the energy conversion products and systems lead to the ecological contribution thereby increasing the environmental sustainability. The present article aims to compare the environmental impact of 1-3 kW LPG operated Porous Radiant Burner (PRB_{LPG}) based domestic cook-stove with that of a Conventional Burner (CB_{LPG}) based domestic cook-stove available in the Indian market. This study is a "cradle-to-grave" Life Cycle Assessment (LCA) with eighteen midpoint and three endpoint levels under the ReCiPe method of SimaPro database. The functional unit considered is both the fabrication and operation phases of LPG cook-stoves (PRB_{LPG} and CB_{LPG}) with life-span of 10 years. Life Cycle Inventory (LCI) is considered for the quantitative representation of the embodied energy involved in the material requirement. Life Cycle Impact Assessment (LCIA) is performed for minimum 1 kW and maximum 3 kW fuel inputs. It is observed that all the midpoint and endpoint impact categories are considerably driven by the operation phases of cook-stoves than fabrication. It is also observed that the PRB technology is potentially more viable in terms of all the endpoint impact categories for all the fuel inputs. The PRB_{LPG} compared to CB_{LPG} cook-stove has the potential of reducing the impacts on human health (DALY), ecosystem damage (species.yr) and resource depletion ($) by 15%, 14.7% and 14.6% respectively for 1 kW input. Whereas, the respective values for 3 kW fuel input are 15.6%, 15% and 14.9%. This study could serve as a source of scientific information for decision-making on environmental sustainability in cooking applications.

Keywords: Porous Radiant Burner; Life Cycle Assessment; Environmental impacts; energy efficient cook-stoves; Life Cycle Impact Assessment

MODEL FOR CALCULATING WATER RISE THROUGH TOP OF GROUND DAM OF HYDROELECTRIC POWER STATIONS

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Abstract:

Ground dams of hydroelectric power stations are one of the most common dams. In the history of hydraulic engineering construction, many catastrophic cases have been observed in ground

dams. Some of them have resulted in many catastrophic events, serious economic, environmental and social losses and damages. One such catastrophic event is the rise of water from the top of ground dams of hydroelectric power stations. A calculation model for this problem was developed and the process of water overflow from the top of ground dams was modeled using the multi-phase method of liquids. An analytical law of change in the thickness of the water layer in the corresponding areas of the flow (upper and lower slopes of the dam, upper and lower slopes, top) was obtained.

Keywords: hydroelectric power stations, ground dams, hydraulic engineering construction, catastrophic, environmental, model.

WATER QUALITY ANALSIS OF GROUND WATER FROM RURAL AND URBAN AREAS IN BENGALURU, KARNATAKA: A REVIEW

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Abstract:

Anthropogenic activities of humans are the primary causes of water and environmental contamination. Groundwater is the water found underneath the soil or in pores and crevices in rock, its contamination occurs when artificial contaminants seeps through the cracks or crevices or due to naturally present contaminants like fluoride and arsenic. Groundwater dependence of Bangalore is very high. Since surface water recharges groundwater and about 85% of surface water is contaminated, this results in contamination of ground water, furthermore the wastes from hospitals and industries also contaminate groundwater. When groundwater is polluted, it can be rendered useless or even dangerous for decades, if not millennia. Contaminated groundwater may lead to serious health issues therefore, disinfection of groundwater is required to prevent environmental and health issues. This study aims to study groundwater quality of Bangalore by collecting samples from different urban and rural areas of Bangalore and subjecting them to various tests such as BOD, COD, pH, hardness, fluorides etc and analyze the results for its possible sources, the state of contamination and required low cost disinfection methods of groundwater with respect to the contaminants present. The result of this study will be helpful in groundwater disinfection.

Keywords: Groundwater, Contamination, Sources, Urban, Rural

SODIUM SILICATE BONDED WASTE FOUNDRY SAND - A POTENTIAL MATERIAL FOR CONSTRUCTION INDUSTRY

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Abstract:

Recent research trend in construction materials involve utilization and blending of different industrial byproducts, waste materials to solve the environmental problems. Natural sand availability is of major concern. On the other hand, casting processes in ferrous alloy industries is generating Waste Foundry Sand (WFS), which is difficult to recycle and dispose. The situation demands replacement for natural sand and bulk utilization of WFS to resolve the issues. Present study was carried out with a basic objective of utilization of sodium silicate bonded WFS as a replacement for fine aggregates in concrete. Experiments were carried out by replacing fine aggregates with WFS in varying percentage of 0%, 10%, 20%, 30%, 40% and 50% by weight. The 30% replacement showed better compressive strength compared to control samples. Further, these samples also passed the durability tests like rapid chloride penetration, water absorption, sorptivity, rebound hammer and ultrasonic pulse velocity. Both the strength and durability results can be attributed to the property of the sand in terms of its size, shape and its reactivity. To prove this hypothesis further fine WFS (less than 45µm) was mixed with calcium carbonate in appropriate molar proportions. The mixture was calcined at 1400^{o}C. This mixture was analyzed using XRD and the results revealed that alite and belite phases were generated during the reaction. This gives new dimension to utilize waste foundry sand in concrete or as source of silica in cement industry.

Keywords: Waste foundry sand, Cement Industry, Concrete, Fine aggregates, Alite, Belite.

MODELING OF CHLORINE DECAY RATES IN A WATER DISTRIBUTION SYSTEM

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Abstract:

It is necessary to disinfect the drinking water obtained from the treatment plant before it enters the water distribution system. Overdosing on disinfectant causes severe health problems such

as respiratory problems, congenital abnormalities, bladder and rectal cancer, and so on, and underdosing on disinfectant causes stomach aches, vomiting, and diarrhoea, so the dosage of chlorine should be optimised with respect to the disinfectant's permissible limit. An attempt was made to investigate the optimum way of determining chlorine decay rate in water distribution systems while taking into account the following parameters: water quality, pipe age, pipe maintenance, and water age. The fluctuating hydraulic circumstances will have a negative impact on the chlorine concentration and residual chlorine maintenance in the water distribution system. As a result, the models of chlorine decay based on the initial chlorine dose are reviewed, and the softwares used to simulate the hydraulic and water quality behaviour of the water supply distribution system are investigated. The study demonstrates that most authors depend on first and second order kinetic equations in the modelling of chlorine, and it is acknowledged that, in practise, first order kinetic models and EPANET results fit the field data better. According to the studies, plastic pipes are negatively affected by decay rate and have a low maintenance cost. This study examines residual chlorine behaviour, chlorine decay rate modelling, and optimising the chlorine decay rate in the distribution system.

Keywords: Chlorine decay, Water Supply distribution System, optimization, disinfectant

EXPERIMENTAL INVESTIGATIONS ON THE EFFECT OF PRIMARY AIR FLUX IN A CO-CURRENT BIOMASS GASIFIER

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Abstract:

Careful and parametric studies are experimentally carried out in a co-current (bottom-lit) downdraft biomass gasifier. Flame front propagation rates in the packed bed are measured for different species of biomass having different physical properties. It is found that the peak propagation rate to be around 0.10 mm/s at an air mass flux of 0.15 kg/m^{2}s. The flame propagation rate has shown strong dependence on the primary air mass flux. The influence of moisture in the biomass on the flame propagation rate and the product gas composition is measured and analyzed. It has been observed that both biomass consumption and bed movements are strongly and linearly related parameters for a given air mass flux. The propagation rate shows up a trend of rising initially and to fall at higher air mass flux, but the biomass consumption and bed movements have only increased trends concerning air mass flux. The propagation rate does not have a symmetric profile with respect to its peak point. The gradient on the lower flux side is higher as compared to that of the other side, with higher flux. The propagation rate does not appear to have a dependence on the bed movement.

Keywords: Primary air, Co-current, Gasification, flame propagation

PREDICTORS OF THE PERSONAL FACTORS WOMEN EMPLOYEES IN THE INSURANCE SECTOR

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Abstract:

The personality factors have to do with individual differences among people in behavior patterns, cognition, and emotion. personality can be conceptualized using personality traits. personality traits are enduring personal characteristics that are revealed in a particular pattern of behavior in a variety of situations. personality has a significant impact on behavior so on the performance of the individual in any domain. the survey was conducted using life insurance private sector of the Cuddalore district experience, with results based on 650 women employees' responses interviews and a questionnaire-based were survey used in this research. There are many organizational parameters like social support, work-family conflict, work-life balance, intention to quit. The where personality traits plays a significant role. This paper attempts to study the previous literature on the association of personality traits to these performance parameters and understand these relationships. the first results show that, as assumed, the personal factors lead to performance. This woman is understood to the social support, personal factors, work-family conflict, and work-life balance clear pattern of the organization furthermore, exploration using structural equation modeling shows that performance orientation mediates the relationships between the personal factors and intention quit, as well as between the intention to quit and the not balance between work and private life. The findings of this study imply that organizations need to understand that employees with a strong personal factor can prove costly from multiple dimensions.

Keywords: Social Support, Personal Factors, Work-family Conflict, Work-life Balance, Intent to Quit

SOCIO-ECONOMIC AND ENVIRONMENTAL ANALYSIS ON SOLAR THERMAL ENERGY BASED POLYGENERATION SYSTEMS FOR RURAL LIVELIHOODS APPLICATIONS THROUGH INTERVENTIONS IN ENERGY-LAND-WATER-FOOD NEXUS.

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Abstract:

Rural livelihoods require energy to source water, while decentralized renewable energy require land, the use of which is key to production of food. Thus a nexus exists between energy, land, water and food. Power for rural livelihoods is constrained by grid extension infrastructural cost, isolated low rural populations, lack of anchor loads and repayment potential of villagers. Decentralized renewable energy power is constrained by high capital cost, low reliability and non-workable business models. Solar thermal energy can produce electricity, heating, cooling, water and fuel and has the potential to storage. This makes solar thermal energy based cogeneration and polygeneration processes a potential intervention in rural livelihoods with focus on energy-land-water-food nexus. However standalone solar thermal systems are capital intensive and shadowed by photovoltaic.

An island in Indian Ocean is considered for solar thermal energy interventions with focus on energy-land-water- food nexus. Two solar thermal hybrid polygeneration systems are designed for probable intervention in nexus for socio-economic benefits and evaluated using renewable energy assessment model. The financial analysis along with socio-economic and environmental analysis of the polygeneration system is done. The sensitivity analysis on key parameters shows that appropriate pricing for electricity, heating and cooling can make a polygeneration system economically viable with social and environmental benefits. The work concludes that decentralized energy systems should consider multiple benefits useful for rural livelihoods to make the system economically and environmentally sustainable. This can be possible only through polygeneration energy systems which focus the inherent nexus between, energy, land, water and food.

Keywords: Livelihood nexus, Economics of Polygeneration systems, Socio-economic analysis.

DESIGN AND ANALYSIS OF GAS SENSOR BASED ON FLOATING CONTACT BOTTOM GATE ORGANIC TRANSISTOR

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Abstract:

Environmental pollution especially the air pollution has proved to be a threat to life on earth. Due to various anthropogenic activities toxic and ozone depleting gases are released in our environment (ammonia, Sulphur di oxide, carbon monoxide, nitrogen di oxide etc.). To check the prevalence of such gases in the atmosphere we need sensors to accurately detect their presence in our surroundings. To detect these gases various type of sensors like metal oxide-based gas sensor, optical gas sensor, electro-chemical gas sensor etc. are used. All these gas sensors are based on inorganic electronics which make them rigid, expensive, and exclusive in nature. With advent of organic electronics such sensors have become incompatible with modern electronic devices like smart watches, smart fabrics etc. Therefore, a new Floating Contact Bottom Gate organic transistor-based gas sensor is proposed in this article that can operate at low power and could readily be integrated with the modern personal electronic gadgets like smartphones and smart watches. This will give portability to the sensor and toxic gases could be detected wherever the user is present rather than at particular points in a city where gas sensors are installed.

Keywords: Floating Contact Bottom Gate, organic electronics, gas sensors, organic transistors.

EXPERIMENTAL STUDIES OF DEFORMABILITY OF NON-WOVEN MATERIALS UNDER AXIAL TENSION

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Abstract:

The regularities of the deformation of the nonwoven material when it is stretched along the length and width is non-linear. It was found that the manifestation of the nonlinear properties

of the nonwoven material is associated with a change in its structure when stretched to failure. A change in the structure of the material, therefore, leads to changes in the mechanical characteristics of the nonwoven fabric. From the stretching diagrams of the nonwoven material, changes in the deformation modulus of the nonwoven are determined depending on the change in the values of deformations during stretching of the material along the length and width. It was found that the change in deformation moduli depending on the values of the deformation itself is substantially nonlinear.

Keywords: Nonwovens, stretching, deformation, secondary materials, breaking load, elongation, breaking force.

PERFORMANCE OF T-TYPE MULTI-LEVEL INVERTER BASED OPEN-END WINDING INDUCTION MOTOR DRIVE FOR ELECTRIC VEHICLE APPLICATION

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Abstract:

Electric vehicles (EVs) plays a vital role to meet global demands on climatical variations.All EVs in today's market uses the classical two-level inverter as the propulsion inverter.To overcome constraints of conventional two-level inverter like electromagnetic interference,common mode voltage etc.,. Multi-Level Inverters topologies revolutionized in the industry because of its smart features over the conventional inverters.Now a days pulse width modulated voltage source inverters are used widely in applications like variable speed control drives in order to control magnitude and frequency of output voltage by using these VSI.But often in conventional two-level inverter fed induction motor drive operated at high frequency it yields to the production of common mode voltage (CMV) which leads to the production of shaft voltage and high bearing currents damages motor bearings.MLIs have emerged to reduce CMV.In multi-level inverters with increase in levels of output it results in high dv/dt stress on individual switching devices and high switching losses.To getrid flow of bearing currents and to reduce dv/dt stress on individual switching devices open end winding induction motor drive can be implemented.This work proposes the operational strategy of multi-level inverter and T-Type inverter fed open end winding induction motor drive using MATLAB/SIMULINK environment.

Keywords: Common Mode Voltage (CMV), Multi-level Inverter (MI),Open-End Winding Induction Motor (OEWIM).

A REVIEW ON WATER QUALITY ANALYSIS OF LAKES IN URBAN, SUB-URBAN AND RURAL AREAS OF BANGALORE, INDIA

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Abstract:

The surface water is most vulnerable to pollution due to its easy accessibility for disposal of pollutants and wastewaters. Present study, aims to assess the spatial and temporal variability of surface water quality parameters of a lakes. Selected surface water quality parameters of the lake namely, temperature, pH, total dissolved solid, conductivity, salinity, biochemical oxygen demand(BOD), chemical oxygen demand(COD), dissolved oxygen(DO), Nitrogen(NH_3), Nitrate and total phosphorous were measured. Management strategies of pollution reduction are proposed for the point sources which create clustering pattern of pollution, in combination with systematic real time monitoring, in order to upgrade the eco system of the lake. The goal of this study is to serve as a database for the least and most pollutes Lakes in India. Site selection is a key factor in any aquaculture operation, affecting both success and sustainability. An effort has been made to develop a method by integrating water quality index with geographic information system (GIS) for an effective interpretation of a lake by many researchers. Based on results of analysis, a spatial distribution map of selected water quality parameters may be prepared using GIS.

Keywords: Surface water quality, analysis,Geo Information System(GIS), Mapping.

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ENVIRONMENTAL SUSTAINABILITY THROUGH AGRICULTURAL PRACTICES: ROLE OF RURAL SMALLHOLDERS

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Abstract:

Agriculture is an integral part of global food security, but the challenge has always been feeding a growing global population while trying to decrease the environmental impacts and conserve natural resources. Since the agricultural sector is the backbone of the economic systems in developing countries, rural smallholders make a significant contribution to environmental

sustainability through their farming practices. Encouraging the adoption of sustainable agricultural practices among rural smallholders not only increases the quality of the produce, it also benefits biodiversity, the climate, and the environment. However, when it comes to encouraging sustainable practices for smallholders, many factors come into play. Therefore, the purpose of this paper is to identify the sustainable agricultural practices mainly practiced by rural smallholders and to discover the factors that influence their adoption. The data for this study was gathered through a review of past literature and in-depth interviews with agricultural officers and extension agents in Johor. Content analysis was used to investigate the outcomes. Findings from this study have suggested that practices such as using improved crop varieties, organic fertilizer, crop diversification, and intercropping were widely used by rural smallholders. Meanwhile, factors such as sources of information, market governance, and institutional support have an influence on adoption. The results from this study can be used to improve future guidelines and policies that serve to target the increase in adoption of sustainable agricultural practices among rural smallholders.

Keywords: Sustainability, Sustainable Agriculture, Adoption, Rural Smallholders.

NICKEL MODIFIED ONE-DIMENSIONAL TIO_2 NANOSTRUCTURES FOR ENHANCED PHOTOCATALYSIS UNDER VISIBLE LIGHT

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Abstract:

In our modern era, we have been going through two main problems i.e. environmental pollution and energy crisis. Though a significant number of researches, which has been going on to tackle them using pure solar energy whose availability is free of cost. But we are still far from their practical applications. One of the problems in their applications is the generation of excitons, whose redox potentials, which are generated under sunlight, are not sufficient to degrade the pollutants and/or for the electrolytic generation of hydrogen as one of the greener energy source for electricity obtaining through burning the fossil fuels. Titanium dioxide (TiO_2) is one the perfect examples for such a material in the form of different nano-structures. But, the synthesis of one-dimensional nanostructures in the form of nanotube, nanorods, *etc*. draws more attention as compared to nanoparticles due to the greater ratios of surface area to volume along with the movements of the excitons through one-dimensional nanostructures. Another major problem associated with TiO_2 is its bandgap of ca. 3.2 eV, which only can be activated under the UV light illumination. In addition, high charge carrier recombination is also another issue. Therefore, modification of TiO_2 nanostructures as well as its bandgap is essential to extend its light absorption toward the visible region of the sunlight, keeping in mind that the redox potentials of the photo-generated electrons and holes are effectives for the degradation of pollutants and/or electrolysis of water. To fulfil the above purposes, pure TiO_2 and Ni-modified

TiO_2 nanorods were synthesized and characterized using PXRD, FTIR, UV-Vis in DRS method and photoluminescence techniques. UV-Vis spectra showed enhanced visible light harvesting upon Ni modification of the TiO_2 nanorods as compared to the same for the pure one. On the other hand, lower intensity of the photoluminescence spectrum for the Ni-modified TiO_2 convincingly proves minimized recombinations of the photo-generated electron-hole pairs.

Keywords: Ni-Modified, Nano-catalyst, Nanostructures, One dimentional, Titanium di oxide.

PRODUCTION AND EXPERIMENTAL INVESTIGATION OF ETHANOL FROM SUGAR BASE

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Abstract:

The demand for energy consumption is growing faster due to rapid industrialization and population growth. Conventional energy sources, such as coal, oil, and natural gas have limited reserves that are not expected to fulfil energy consumption of upcoming generation. The biofuel like ethanol plays vital role as an alternate renewable energy source. Molasses one of the renewable biomass resources, a main by-product of the sugar industry, represents a major fermentation feedstock for commercial ethanol production. This research aims to give an overview of the Ethanol fermentation from molasses and processes applied for the improvement of ethanol production by various parameters like temperature, pH, concentration. This study aims to find the optimum condition for fermentation. After conducting various analysis tests on sugarcane molasses, fermented wash and rectified spirit, from that test results the total reducing sugar as invert sugar is 51.18%, organic volatile acid for molasses is 10284 ppm and fusel oil in spirit is above 500 ppm. Also the inoculation process by using microorganism *saccharomyces cerevisiae* for fermentation by varying process parameters were carried out and the optimum alcohol % is obtained as 7.93 at 1.080 specific gravity of molasses.

Keywords: Biofuel, Ethanol, Molasses, Fermentation, Total Reducing Sugar, inoculation, Organic Volatile Acid.

IMPROVEMENT OF DYNAMIC PERFORMANCE IN SEIG WECS BY USING ANFIS CONTROLLER

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Abstract:
A new hybrid controller for the Self-Excited Induction Generator (SEIG) driven by the Wind Energy Conversion Scheme (WECS) was proposed in this paper. The dynamic stability of the control grid is essential for both user protection and system performance. There must be a full grasp of the effects of power system volatility to research and govern power systems. The suggested control systems were examined using frequency-domain approaches that focused on the nonlinear design of a device that is subjected to severe faults on a related bus, which was tested using time-domain strategies. In this paper, a novel 3-level inverter is designed and controlled by the ANFIS control for the Dynamic Response of the system at load side. The ANFIS approach can be used to regulate a self-excited induction generator in this study. The design incorporates wind power to give on-grid electricity access. SEIGs are used to power wind turbines in this project, which generates alternating current (AC) for the grid. The system model uses a rotor reference frame and dynamic vector control for the machine reference model. Wind power voltage and active power are controlled by an ANFIS controller in the converter. The ANFIS controller's performance is evaluated in all abnormal scenarios, including the worst-case scenario. System modeling and simulation in Simulink-Matlab allow it to be used in SEIG configurations. Wind power system quality and stability are both improved by the ANFIS control unit, according to simulation results.

Keywords: Self-Excited Induction Generator "SEIG", Wind Energy Conversion Scheme "WECS," Adaptive Neuro-Fuzzy(ANFIS), Frequency, Dynamic Performance.

A REVIEW OF: QUALITY ASSESSMENT OF STP'S AND CHARACTERIZATION OF TREATED WATER QUALITY PARAMETERS TOWARDS ACHIEVING SUSTAINABLE WATER SOLUTIONS

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Abstract:

Water is essential for all forms of life and the quality of the water is also a concern. Clean water is essential key factor in meeting the sustainable development. STP treated waters are

extensively being used for non-drinking purposes. STP treated water are polluted with heavy metals content, antibiotics, dissolved organic matter. Vegetables cultivated in soil irrigated with untreated groundwater and municipal-waste-dominated (MWD) stream can elevate the concentration of heavy metals (Cd, Fe, Zn, Hg, Cr, and Ni) in edible parts of the crop, affecting food safety and public health worldwide Water quality analysis is essential even for treated waters. The main challenge of the STPs is to remove the chemical components in the effluents.STPs should have proper maintenance and operation to work effectively. Considering the above the present paper highlights and reviews on the different possible chemical content, antibiotics etc. in the STP treated water and discusses the performance of the STP in various cases.

Keywords: water quality analysis, STP Performance1, sustainable water solutions, effluents of STP

EXPERIMENTAL INVESTIGATION ON THE FLEXIBLE PAVEMENT FRICTION FOR PERFORMANCE OPTIMIZATION

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Abstract:

Monitoring skid resistance is a crucial part of sustaining driving safety. Therefore, improvement in pavement friction is the most important parameter to maintain adequate skid resistance in reduction of road accidents. Several factors such as material characteristics, construction methods, climatic conditions, surface texture and moisture condition creates an unique impact on skid resistance of various types of pavement further it aggravates due to progressive wearing and polishing pavement surface, hence it is recommended to adopt specific friction coefficient to enhance driving performance and road safety.

This study summarize the key research studies on the pavement friction measurement and describe various methods for measurement and evaluation of skid resistance to provide a comprehensive overview of the pavement surface friction measurement techniques.

The main aim of the study is to evaluate the impact of several operational characteristics on the friction measurements using a field experiment. Friction measurements were obtained with the Via-Friction device at two different pavements has been used. The friction coefficient values with location and position values were calculated by using the Via-Friction device. The

relationship between the friction coefficient values and the location and position values were investigated at average speeds of 58.72 and 58.38 km/h for two different stretches. From the acquired values the impact of different pavement location to measured values of the coefficient of friction was resolved. The results indicated a strong positive correlation between most used location of pavement and friction data.

Keywords: Coefficient of Friction1, Skid resistance2, Texture3, Via-Friction device4.

ENHANCEMENT OF CEMENT PROPERTIES THROUGH ENGINEERING OF PSD – AS SUSTAINABLE AND ECONOMICAL APPROACH

Shraddha Chakurkar, Dr. K.G. Guptha

Abstract

Cement is a binding material dominantly used in the construction industry. Production of cement releases equal amount of CO2. The total amount of CO2 produced due to cement can be reduced by enhancing the quality of cement and reduction in requirement of cement or by implementing sustainable method of production. Various parameters of cement affect strength. Many researchers have made an attempt to enhance strength and durability of cement by modifying their chemical and physical parameters. However due to variation in quality of raw materials and method of production the method of enhancement of strength varies over the world. Cement is generally classified and standardized based on its compressive strength. However many parameters of cement do affect its performance such as fineness, quality of raw materials, method of production. Fineness of cement is generally defined in terms of specific surface area however with advancement of technology determination of precise particle size distribution of cement is possible. With the help of Laser diffraction technology accurate PSD of cement samples can be found.

It was studied and observed by the authors that modification of PSD alone can help to achieve increased strength and durability. The paper presents the effect of modification of PSD on various parameters of cement. Correct amount of micro particles of cement can yield encouraging results. The PSD of various cement samples was studied for its shape and percentage of fine particles lying in the range of particle size was validated. Precisely percentage of particles in the range of 3 to 25 microns governed the early strength however contribution of coarser particles was observed at later stage. Particles coarser than 60microns would just act like filler. Synergetic effect of micro as well as macro particles would help to achieve enhanced properties of cement.

Keywords: Cement, Particle Size Distribution, microparticles, macro particles etc.

CARBON DOTS FROM ALDOPENTOSE RICH AGRICULTURAL WASTE VIA PYROLYSIS AS OXYGEN REDUCTION CATALYST

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Abstract:

This study reports the synthesis of 0-Dimensional (0-D) Carbon nanomaterial (CN) from pentose rich agricultural waste using thermal pyrolysis approach. The carbonization temperature fixed in the synthesis was able to govern the conversion of bulk aldopentose rich biowaste to 0-D material. The X-ray Diffractogram exhibited a broad peak centered around ~ 19° with FWHM (full width half maximum) of 6.67. The dispersed 0-D CN in aqueous media was found to exhibit green fluorescence under irradiation of UV lamp of 254nm can be observed by naked eye. The arrival of green fluorescence is crucial for bioimaging since it do not harm deoxy ribonucleic acid and considered to be safe. Fluorescent Carbon dots are new class of biocompatible and economic materials and their fluorescent nature is due to surface state and quantum confinement effects. The synthesized 0-D material can be well explored for fuel cell applications due to its Oxygen reducing property. This study successfully demonstrated the convenient and economical approach for converting pentose rich agricultural waste into high value Oxygen Reduction Catalyst.

Keywords: Oxygen reduction, green fluorescence, Carbon dots, Pyrolysis, agricultural waste

INFLUENCE OF NONMETAL DOPED GRAPHENE BASED NANOMATERIALS SYNTHESIZED USING POLYSACCHARIDE AS PRECURSOR TOWARDS CATALYTIC AND LUMINESCENCE ACTIVITY

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Abstract:

Over the past few decades, Graphene based nanomaterials (GBNs) have attracted broad research interest because of their diverse physicochemical properties and considerable attributes like low cost, non-toxic, electron mobility with abundant functional groups. The study comprehensively summarizes the effect of doping element (S, O, N) with corresponding functional groups in the structure of graphene and analyze the optical and surface properties specifically towards fluorescence, metal sensing and the catalytic ability for the removal of organic/inorganic pollutants in the wastewater. The non metal heteroatom's doped graphene nanomaterials were synthesized using saccharide units as a precursor by hydrothermal method and characterized using some analytical tools. The structural evidence of doping elements of

Sulphur and Nitrogen in the structure of graphene were provided by Micro Raman and Powder X ray diffraction analysis (PXRD), X-ray Photoelectron Spectroscopy (XPS) and microscopic images. The results confirmed the enhanced layer structure with reduced number of layers while doping with Sulphur and Nitrogen. Based on the observations, the adsorption and photocatalytic efficiency of the synthesized samples were analyzed for the decolorization of organic dyes. The results indicated the experimental conditions under which Sulphur doped graphene oxide is a good photocatalyst for the treatment of industrial wastewater. The observed microstructural defects have enhanced the fluorescence intensity of the synthesized sample of Nitrogen doped graphene nanomaterials (N-GO) than Sulphur and Oxygen doped graphene. The results provide the design and development of polysaccharides as novel graphene structures which are multi-functional to explore the toxicity towards bioimaging application on normal and cancer cells.

Keywords: Functionalized graphene based nanomaterials, Polysaccharide, Tunable fluorescence, Photocatalyst.

IMPACT OF CLIMATE CHANGE ON THE WATER BALANCE CONDITION IN NORTH EAST REGION OF INDIA

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Abstract:

Rainfall and evapotranspiration change directly influence the change in water balance dynamics of any region. Present study explores the spatial-temporal changes of climatic water balance (computed on the basis of rainfall and evapotranspiration) by using a wide range of meteorological data recorded in the North East region of India in the period 1990 to 2020. The reference evapotranspiration was computed using the FAO-56 Penman-Monteith Method. Highest average monthly rainfall was observed in the month of July (469.19 mm) and lowest in the month of December (10.83 mm). The ETo of the region was found to be highest in the month of April (131.40 mm/month) at an average ETo rate of 4.38 mm/day followed by May (126.90 mm/month) at an average ETo rate of 4.23 mm/day. The lowest ETo was found to occur in the month of December (55.74 mm/month) at an average ETo rate of 1.91 mm/day. Furthermore, the highest monthly water balance of 353.68 mm occurred in the month of July and the average annual water balance was found to be 1141.97 mm. November to March suffered from water deficit because of negligible or very low rainfall less than the evapotranspiration rate leading to negative trend in the water balance of the region. This raises water management issues in the study region to mitigate hydrological disasters as well as optimal use of water for irrigation purposes.

Keywords: Climatic Water Balance, Rainfall, Reference-Evapotranspiration, North-East India.

EXPERIMENTAL EVALUATION OF PERFORMANCE AND EMISSION CHARACTERISTICS OF DIFFERENT BLENDS OF ECOFRIENDLY HIBISCUS AND COCONUT OIL MIXTURE ON CRDI ENGINE

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Abstract:

Since previous two decades, India is facing deficiency of natural resources to fulfill energy demand in the country. Therefore, it is required to go for alternative renewable sources so that there is minimum gap between supply and increasing demand of energy. Much of research work is carried out in this respect to develop best possible alternative fuel in diesel engines. Present work deals with experimental study of hybrid biodiesel which is a mixture of Hibiscus and Coconut oil. Different blends of this biodiesel along with diesel are used as fuel in (Common Rail Diesel Injunction) CRDI engine to study various engine performance as well as emission parameters. Engine used for this experimentation is single cylinder, four strokes, water cooled, CRDI engine. The experiments are performed on engine using pure diesel, blends of 5%, 10%, 15%, 20% and 25% hybrid biodiesel and diesel by volume denoted as BD00, BD05, BD10, BD15, BD20, and BD25 respectively at different load conditions at two different compression ratios viz. 16 and 18. The performance evaluations parameters like brake thermal efficiency, brake specific fuel consumption, brake power, exhaust gas temperature, air-fuel ratio are considered. The engine exhaust emission monitoring parameters hydrocarbon, oxides of nitrogen, carbon monoxide, carbon dioxide, and smoke are monitored during tests. The outcome of this study revealed that blend B20 has given promising results as that of pure diesel for engine performance parameters and has less emissions compared to that of diesel.

Keywords: Biodiesel, Coconut Oil, CRDI, Ecofriendly, Emission Characteristics, Hibiscus

IMPACT OF MIXED FOREST COVER CHANGES ON SURFACE RUNOFF: A CASE STUDY OF UPPER SABARMATI RIVER BASIN

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Abstract:

Flood risks are generally induced with high intensity of rainfall over any catchment area which in turn results in increasing surface runoff. The surface runoff which also depends on topography and land use pattern is a significant parameter causing flood disasters. However to overcome this situation, an eco-friendly natural way is introduced to reduce the surface runoff by increasing the mixed forest cover in the ARCSWAT model study. The main objective of the paper is to assess the impact of mixed forest cover changes on surface runoff in Upper Sabarmati river catchment area. In order to achieve these objectives, three hypothetical scenarios are generated in ARCMAP by changing mixed forest cover percentages (3%, 6% and 9%) in the original Land use Land cover map of 2017 of the study area using ARCGIS software. Also decadal maps LULC 1985, LULC 1995, LULC 2005 are compared with LULC 2017 and other model scenarios. The results indicate that with just 3% increase in mixed forest cover area, the surface runoff declined by 4.5% and thus flood risks reduced. Hence, mixed forest cover can be increased based on the model study as one of the parameters for the flood management.

Keywords: Land Use Land Cover, mixed forest cover, surface runoff, flood management

WEED SPECIES FOR HYPERACCUUMULATION OF THE HEAVY METALS (Mn, Zn and Cd) FROM CONTAMINATED SOILS – A COMPARATIVE STUDY

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Abstract:

A large number of native plants growing naturally in the fields have the potential to accumulate heavy meals from contaminated soils. Weed species are a good choice for this purpose as they grow over large areas with high biomass and are tolerant to harsh climate. Plants that accumulate high amounts of metal concentrations in the aboveground biomass

without any phytotoxic symptoms are called as 'Hyperaccumulators' and the process is called as 'Phytoextraction', a sub process of 'Phytoremediation'.

A study was carried out to identify the hyperaccumulator characteristics of weed species from the natural vegetation. Field studies were carried for the heavy metal accumulations of Zn, Mn and Cd in the test species *Vinca rosea (Catharanthus roseus)* and *Eupatorium odoratum (Chromolaena odorata)* at different sites viz., industrial site, residential site and a control site in different seasons. The results of the weed species *Vinca rosea* have shown shoots uptakes of upto 2488 µg/g for Zn, 116.7µg/g for Mn and 31.16µg/g for Cd. The root uptakes have shown upto 9604 µg/g for Zn which is very high, 250.1µg/g for Mn and 9.558µg/g for Cd. *Eupatorium odoratum* has shown shoot uptakes of upto 1505 µg/g for Zn, 257.3µg/g for Mn and 16.45µg/g for Cd. The root uptakes have shown upto 453.29 µg/g, 208.2µg/g and 14.89µg/g for Cd.

The weed species have grown with no phytotoxicity effects and have shown good growth with a high biomass which is an indication that they are hyperaccumulators and are suitable for phytoremediation of heavy metal contaminated soils using phytoextraction. The study shows that both the species have high tolerance for the heavy metal accumulations and a good potential for remediation of contaminated soils with Zn, Mn and Cd. But the comparative study shows that the test species *V. rosea* is a better hyperaccumulator for Zn and Cd than E. odoratum and can clean up soils contaminated with Zn and Cd more efficiently. Whereas *E. odoratum* is a better hyperaccumulator of the test metal Mn than *V. rosea* and can remediate soils contaminated with Mn more efficiently. The BCF, TF and statistical analysis were also carried out which have shown positive results.

Keywords: Phytoremediation, Zn, Mn, Cd, Hyperaccumulators, *E. odoratum and V. rosea*

EXPERIMENTAL SCRUTINIZATION ON SYNTHETIC WASTEWATER TREATMENT USING NEEM BARK AND DATE PALM FIBER AS AN ADSORBENT

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Abstract:

Industrial activities are the major causes of water contamination worldwide as they contain heavy metals with a high concentration leading to environmental threat and health issues. Neem bark and Date palm fiber were established in this research work as low cost adsorbents for the elimination of copper (Cu) from synthetic wastewater. Batch studies were conducted for a particle size of 1.18 mm and 0.6 mm for each of the adsorbents and the influence of pH, contact time, adsorbent dosage, speed, temperature and initial concentration were scrutinized. The

smaller particle size (0.6 mm) was found to be more efficient than the bigger particle size for both the adsorbents. The optimum conditions for neem bark of size 0.6 mm were at an adsorbent dosage of 0.3 g, pH of 6, 30 minutes of contact time, initial concentration of 100 ppm, and stirring speed of 1000 rpm for a copper reduction of 97%. The date palm fiber of 0.6 mm resulted in copper reduction of 91% at optimum conditions of pH 5.5, contact time 45 minutes, stirring speed 1200 rpm and an adsorbent dosage of 0.3 g. The adsorbents were characterized using Scanning Electron Microscope (SEM)-EDS and Fourier-transform infrared spectroscopy (FTIR) in which the SEM-EDS analysis displayed a carbon content of 64.1% in neem bark and 58.9% in date palm fiber. The FTIR analysis presented the functional groups in the adsorbent that are responsible for adsorption of copper as carboxyl and hydroxyl groups. In addition, the equilibrium adsorption data of Neem bark well fitted the Langmuir and Freundlich isotherm models having the correlation coefficients (R^2) respectively as 0.9815 and 0.9024. Experimental data with date palm fiber fitted the Langmuir isotherm model with an R^2 value of 0.9601.

Keywords: Adsorption isotherms, Copper, Date palm fiber, Neem bark, Synthetic wastewater.

EXTRACTION AND STUDY OF CINNAMON AND ROSEMARY ESSENTIAL OIL BY USING SOLVENT EXTRACTION

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Abstract:

Essential oils are used in a wide variety of consumer goods such as soaps, cosmetics, pharmaceuticals, perfumes and many fields. In this research paper Cinnamon stalk and Rosemary leaves are extracted for essential oil using soxhlet apparatus. Characterization impacting compounds; α-pinene & Linalol were monitored during this optimization study using Gas Chromatography. Based on maximum extraction of these compounds, the optimised operating conditions were a temperature of 100°C for cinnamon and 130°C for rosemary, a pressure of 1 atm and a static time of 10 hours for Cinnamon and 8 hours for rosemary. The quality of extract was comparable with the amount of raw materials used. The proposed method was found to be better in term of quantity of the targeted character impact compounds. The chemicals used were hexane for extraction of cinnamon oil and ethanol for extraction of Rosemary oil.

Keywords: Essential oil, Cinnamon stalk, Rosemary leaves, Soxhlet Extraction, analysis Gas Chromatography.

EXPERIMENTAL STUDIES ON TREATMENT OF ORGANIC AND INORGANIC EFFLUENTS USING ADSORPTION PROCESS

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Abstract:

Wastewater treatment has become one of the most significant sources for irrigation and other activities in arid and semi-arid countries. There are many conventional methods to deal with the different organic and inorganic materials that are present in wastewater, one of the most common being using activated carbon through an adsorption process to treat wastewater. Adsorption is a process whereby the contaminants present in waste water are removed using activated carbon as an adsorbent. This project is an attempt to remove organic and inorganic material using activated carbon prepared from waste tyres, banana trunk, tea leaves and date seeds. Moreover studies state that activated carbon has strong affinity for binding organic substances, even at low concentrations. Thus, it has become the premier method for treating organic-laden wastewater. Various experimental tests were carried out to determine the adsorption capacity of the different activated carbon indicated as percentage removal of Chemical Oxygen Demand, Total Suspended Solid and Total Dissolved Solid including the effects of pH, contact time and dosage. The experimental data showed that these are parameters that need to be considered in adsorption given their influence in the removal of the above. The surface area of the adsorbent, pore volume and an isothermal graph of the adsorbent were determined using BET Surface Area. Waste tires (WT), date seeds (DS), tea leaves (TL) and banana trunk (BT) have 1260, 1144.52, 163.8 and 115.4 m^2/g surface area with 1.62, 0.656, 0.066088 and 0.4566 cm^3 of total pore volume, respectively indicating the likely use of waste tyres as an adsorbent. The moisture and ash content percentage were also determined and it was found that the above adsorbents have 2.6%, 6.4%, 7.4% and 9% moisture content, with 3.6%, 6.2%, 6.9% and 12% ash content, respectively. This project reveals an innovative method to deal with contaminants in wastewater which is very effective.

Keywords: Activated carbon, adsorption, banana trunk, date seeds, tea leaves, tires, wastewater.

SUITABILITY ANALYSIS OF IMPLEMENTING WASTE-TO-ENERGY (WTE) METHODS FOR MUNICIPAL SOLID WASTE MANAGEMENT IN CHENNAI CITY, TAMILNADU.

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Abstract:

Chennai is the fourth largest corporation of India, analyzing for alternatives to land filling in order to handle increasing waste quantities. With the advent of technology, waste-to-energy become an emerging technology practiced throughout in developed countries which includes (i) Biochemical conversion (bio-methonation), (ii) Thermo-chemical conversion (incineration, pyrolysis and gasification) and (iii) Thermo-mechanical conversion (refuse derived fuel). But physical, chemical and biological properties of solid waste are time dependent and site specific. Successful implementation of one method in particular location may not assure for another location. In Chennai, MSW is disposed off in low lying catchment areas in open dumps create environmental issues. In Indian scenario, the waste generation rate is 0.34 kg/capita/day and it is assumed to reach 0.70 kg/capita/day by 2025. The waste generation rates of Chennai shows that 3036, 4500 and 6800 TPD during the period of 2004, 2011 and 2021 respectively. The major factors affecting the implementation of energy processes are organic content, high moisture content, high density, low calorific value and income level of the country. Considering the above issues and energy demand of present scenario, this study made an attempt to conduct field measurement to quantify the gas emission during summer and winter seasons. To validate the field measurement empirical models such as IPCC default method, German EPER method, First order model (TNO) and LANDGEM version 3.02 models are used. An analysis carried out with thermo-chemical methods like pyrolysis, gasification, incineration and refuse derived fuel for effective energy generation process. The results shows that emission rate is high in summer season compare to winter season due to high percentage of organic fraction, low moisture content and high temperature which affects the methanogenesis process. Finally, due to high organic fraction, solid waste of Chennai is suitable only for composting and additional fuel is required for incineration process which will affect the cost of the project.

Keywords: Waste-to-Energy (WtE), organic matter, moisture content, incineration.

EXPERIMENTAL AND EMPIRICAL ANALYSIS OF PERFORMANCE, COMBUSTION AND EMISSION CHARACTERISTICS OF DIESEL ENGINE FUELED WITH PYROLYSIS WASTE ENGINE OIL UNDER SINGLE AND SPLIT INJECTION STRATEGY

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Abstract:

The present investigation studies the effects of single and split injection strategies on a diesel engine fueled with diesel and microwave pyrolysis oil (MPO). Engine characteristics were predicted using an artificial neural network (ANN). The engine study was conducted using different nozzle opening pressures (NOP: 200 to 500 bar) and fuel injection timings (FIT: 17 to 27^{o} CA bTDC). Further, this work was extended to investigate the effect of a split injection strategy for MPO at 400 bar NOP under full load. In split injection, different split ratios (90:10, 80:20, and 75:25), start of main injection time (SOMIT: 17 to 30^{o} CA bTDC), and start of post-injection time (SOPIT: bTDC 3^{o} CA to aTDC 3^{o} CA) were studied. The results showed that the brake thermal efficiency (BTE) of MPO increased by 2% at 400 bar NOP compared to 200 bar NOP. Unburnt hydrocarbon and CO emissions of MPO were similar to diesel at higher NOP. NO and soot emissions of MPO were 10% and 27% lower than that of diesel at 400 bar NOP and bTDC 21 CA FIT. Split injection strategy improved BTE by 1.4% and reduced NO and soot by 21% and 58% compared to single injection strategy. The ANN model predicted the experimental results with a higher correlation coefficient (R) in a range of 0.98-0.99. Overall, the study inferred that split injection strategy reduces exhaust emissions of MPO without affecting engine performance.

Keywords: Waste to energy, Split injection, Combustion, Emissions, Artificial neural network.

CHANGES IN LAND-USE LANDCOVER PATTERN AND ITS EFFECT ON FLASH FLOOD IN BENGALURU, KARNATAKA.

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Abstract:

Bengaluru is facing flash flood problem in many places due to improper planning and increase in impervious layer. Change in land use land cover pattern over past few decades caused unpredicted rainfall and contributed to climate change. Forecasting rainfall has become the most difficult task because it is significantly affected by climatic changes. The main objective of the study is to find the changes in land-use land cover pattern over the past decades due to urbanization and its impact on increase in the number of flash floods. It is observed that even though there is a decline in the amount of rainfall over the past few years, the number of floods is increasing due to urbanization and over built-up area. In last decade, built up area increased about 38.5% in urban Bengaluru. Rural built-up area increased almost twice in last decade. Also, agriculture land, forest land and grass land decreased by three times in last decade. Urbanization results in the conversion of pervious area to non-pervious concrete and asphalt surfaces like pavements, which serve as a medium to accumulate water in turn losing its ability to infiltrate water leading to increased runoff about two to six times than that would occur on natural terrain, resulting in flash floods. Poor drainage pattern and construction on drainage (Raja Kaluve) results in accumulation of discrete pockets of runoff water, also contributes to flash flood. Present study concentrates on studying rainfall variation, changes in land use and land cover pattern over last decade and correlating with the increase in flash floods in Bengaluru.

Keywords: Rainfall, Runoff, Flash Flood, Urbanization, Land-use Land cover.

INFLUENTIAL ROLE OF CLIMATE CHARACTERISTICS ON GROUNDWATER VULNERABILITY IN CHITTAR SUB BASIN OF TAMIRABHARANI RIVER BASIN – ITS IMPACT, RISK AND FUTURE SCOPE IN SOCIO- HYDROLOGY

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Abstract:

This research paper emerged with the research question “How does Climate change affect groundwater availability and how does it impact the community?” This paper explores

Vulnerability Index as a basic tool for estimating the groundwater vulnerability to Climate Change in Chittar sub-basin of Tamirabharani Basin in Tamil Nadu. The sub basin was stratified into 3 zones based on categorization of blocks as per Groundwater Resources Assessment Report of Tirunelveli District. The trend analysis, extreme analysis and statistical analysis of rainfall, temperature and groundwater well data were done for the three zones using SPSS software. The fluctuations in groundwater recharge were estimated using Water Table Fluctuation method. Survey has been carried out in 105 farm households in each zone to collect data on natural disasters, climatic variability, socio-demographic profile, land holdings, source of irrigation, groundwater use, cropping pattern changes, irrigation facilities, awareness on schemes and health using questionnaire. The indicators such as exposure, sensitivity and adaptive capacity were grouped and aligned with available data. The statistical analysis of the questionnaire data were done using SPSS software. Data were aggregated using composite index and groundwater vulnerability was compared zone wise. Vulnerability Spider diagram suggests that Zone 1 is more vulnerable in terms of socio-demographic profile, economic status and health profile, Zone 2 is more vulnerable in terms of groundwater level, natural and climatic variability and groundwater management factors and Zone 3 is more vulnerable in terms of livelihood strategies and groundwater recharge.

Keywords: Climate change, Chittar Sub-basin, Socio-hydrology.

APPLICATION OF REMOTE SENSING AND GIS IN CONTROLLING AIR POLLUTION EFFECTS

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Abstract:

Air pollution is a significant environmental health concern that causes premature mortality and is responsible for more than seven million deaths worldwide each year. It's frightening to realize that India is home to thirteen of the world's top twenty most polluted cities. A change in air quality that may be detected by chemical, biological, or physical pollutants in the atmosphere is referred to as air pollution. According to the World Health Organization, Delhi has become the most polluted city in the world. Exposure to air pollution leads to decreased immune response thereby it facilitates viral infection and replication. Air quality index (AQI) is a scale used to measure the air quality of an area. Rise of AQI represents increase of public health risks. Remote sensing has been widely used for environmental applications including air quality assessment. Spatial distribution of air pollutants over the particular area can be easily mapped and display using the RS and GIS technique. In the present study an attempt is made to compare Air Quality Index (AQI) of Metro Cities in India before, during and post covid lockdown, during the year 2019 to 2021. This study gives comprehensive overview of effects of air pollution on human health and its spatial distribution in metro cities of India before,

during and after covid lockdown using RS and GIS technique. This is reliable and modern technology in online and continuous monitoring of air quality parameters and intern air quality index, which can be interpreted in preventing air pollution effects on health and environment.

Keywords: Air Quality Index (AQI), remote sensing and GIS, Covid19 pandemic, Human Health, metro cities.

EXPERIMENTAL ANALYSIS FOR THE REMOVAL OF TOTAL DISSOLVED SOLIDS USING BIO FLOCCULANTS IN DISTILLERY EFFLUENT

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Abstract:

Distillery effluent contains high amount of COD, BOD & dissolved solids, removal of these dissolved solids is necessary. In this article bio flocculants (chlorophyll, egg solutions, and banana stem) is used for removal of total dissolved solids and compared with inorganic flocculants (iron chloride, alum) by varying the concentration from 200ppm to 1000ppm. At 1000ppm concentration, maximum removal of total dissolved solids has been found for iron chloride, alum, banana stem, egg shell and chlorophyll which was 12934ppm, 4187.8ppm, 4018ppm, 3400ppm and 3514ppm respectively. This paper presents the feasibility of using Chlorophyll as flocculant because of its biodegradability. The optimization studies were conducted for the bioflocculant choosing Response surface methodology in design expert software. From the optimization studies, R^2 value is found to be 88.69%. At temperature 40°C, pH 9, concentration 1000ppm, the removal of total dissolved solids found to be 3853.253ppm. The experimental studies show the feasibility of using chlorophyll as bioflocculant which could be further taken to use as composite flocculant to make the treatment in better way.

Keywords: Bioflocculant, Chlorophyll, Distillery effluent treatment, Response surface methodology.

MODELLING AND SIMULATION OF WASTE MANAGEMENT

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Abstract:

In face of the population and economic growth of the 20th century, waste management has become one of the most critical public policy issues challenging state and local governments. Although some developed countries are advanced in this matter, the regulatory acts that rule solid waste management in some developing countries is very recent. Public managers should have modelling and simulation tools at hand in order to make sound decisions, grounded on data and projections. This paper presents a System Dynamics (SD) model for waste management which provides a comprehensive view of the involved resources, the destinations of waste and the cost structure of the service/system. Existing similar studies do not provide this extensive view, including the various resources involved (staff, fleet, other assets), the different destinations for waste, the different recycling streams and associated revenues and, specially, the cost structure, altogether, in the same model. Another branch of models concerns the assessment and optimization of specific policies, such as waste disposal charging fees (WDCF), which is not the aim of this study. Its main contribution is to present a financial planning tool for managers, allowing a scenario analysis to support strategic or tactic decisions, such as capacity expansions, investments in operational improvement, and so on. The modular design of the model aims at providing capability of generalization and application to different contexts and regions.

Keywords: Modelling, Simulation, Optimisation, Waste reduction, Strategies.

PROPERTY ANALYSIS OF A FUEL THROUGH SOFTWARE

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Abstract:

The Fuel Property Characterization and Prediction effect with the Co-Optimization of Fuels and Engines (Co-Optima) initiative is focused on the measurement or prediction of key fuel properties. Recent research have focused on understanding how fuel evaporation phenomena can impact autoignition, mixing, and pollutant formation by studying the most important azeotropic

interactions between alcohols and gasoline components utilizing a novel Differential Scanning Calorimetry/ Thermogravimetric Analysis instrument coupled to a Mass Spectrometer. In another effort, Nuclear Magnetic Resonance (NMR) measurements were utilized to understand how oxygenate clusters and networks contribute to vapor pressure effects. This is critical for predicting fuel droplet evaporation and effects on combustion. A method was developed on the Advanced Fuel Ignition Delay Analyzer (AFIDA) to rapidly measure the Research Octane Number (RON) and Sensitivity (S) of samples utilizing small volumes, which will aid in the pace of development of new fuels having targeted properties.

Keywords: Fuel production, Characterisation, Properties, Analysis.

MECHANICAL PROPERTIES TESTING OF POLYHYDROXY BUTYRATE

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Abstract:

This work considers the application of eco-friendly, biodegradable materials instead of conventional polymeric materials, in order to prevent further environmental endangerment by accumulation of synthetic petro-materials. This new approach to the topic is focused on analyzing the processing properties of blends without incorporating any additives that could have a harmful impact on human organisms, including the endocrine system. The main aim of the research was to find the best ratio to obtain materials with desirable mechanical, processing and application properties. The prepared blends were analyzed in terms of thermal and mechanical properties as well as miscibility and surface characteristics.

Keywords: Polyhydroxybutyrate, Blend, Bioplastic, Mechanical Properties.

ENERGY AND EXERGY ANALYSIS OF A FUEL

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Abstract:

In this paper, the fundamental overview of theoretical and practical aspects of thermodynamics analysis for fuels are presented. In first part, governing equation of mass, energy, entropy and

exergy are presented according to first law of thermodynamics (FLT) and second law of thermodynamics (SLT), more specifically energy and exergy analysis are covered for fuels. Basic criteria of energy and exergy analysis of flowing and non-flowing system, energy and exergy efficiencies, analysis procedure and models of reference environment are discussed in detail.

Keywords: Fuel, Energy, Energy, Analysis, Properties.

AGRO WASTE UTILIZATION FOR POWER GENERATION THROUGH CO-FIRING IN COAL-BASED POWER PLANTS

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Abstract:

The severity of climate change and the urgency of ecological environment protection make the transformation of coal power imperative. In this paper, the relevant policies of coal-biomass cofiring power generation are combed, and the technical and economic evaluation of coal-biomass cofiring power generation technology is carried out using Levelized Cost of Electricity (LCOE) model. The result is that the LCOE of coal-biomass indirect co-firing power generation project is significantly higher than that of the pure coal-fired unit, with the LCOE rising by nearly 8%. Through sensitivity analysis, the LCOE will increase by 10.7% when it combusts 15% biomass, and increase by 19.1% when it combusts 20% biomass. The LCOE corresponding to wood chips increased by 5.71% and the LCOE to rice husks decreased by 6.06%. Finally, this paper puts forward some relevant policy suggestions, hoping to provide some reference for the promotion of coal-biomass co-firing power generation.

Keywords: Agrowaste, Power generation, Co-firing, Coal, Power plants

OPTIMIZING PROCESS PARAMETERS FOR BIOFUEL PRODUCTION

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Abstract:

An experimental study has been carried out to produce biodiesel from different kinds of feedstock. Operating parameters have been optimized with respect to percentage yield of production and viscosity. The most common method for production of biodiesel is transesterification. Palm, karanja, mahua, linseed and castor oil are among the few of the non-edible oils. Along with this waste cooking oil can also be considered as non-edible oil as it is mostly thrown away. The process of transesterification depends on various factors like reaction temperature, stirring rate, molar ratio, amount of catalyst and reaction time. Depending upon the acid value, the number of steps of transesterification was determined. If free fatty acid is greater than 2.5% then two step transesterificaton is carried out. Karanja and mahua oil undergo two-step process because of high FFA content. The main objective of the study was to optimize the reaction parameters for production of biodiesel from different kinds of oil based on kinematic viscosity and percentage of yield obtained.

Keywords: Biodiesel, Production, Process parameters, Optimisation.

ENERGY AND EXERGY ANALYSIS OF A FUEL

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Abstract:

In order to evaluate the energy utilization efficiency of gasoline engine and predict the recovery potential for waste heat energy, energy distribution and waste heat energy characteristics of a naturally aspirated gasoline engine have been studied by combining the methods of energy and exergy analysis. During the research processes, engine energy balance tests were conducted under mapping characteristics, and the parameters required for calculating the energy balance and exergy balance were measured. On this basis, waste heat recovery potential and gasoline engine total exergy efficiency were studied by using the method of exergy analysis. Research results show: at low-speed and low-load, waste heat energy mainly focuses on cooling water; at high-speed and high-load, exhaust gas energy is larger than cooling water energy not only

in quantity, but also in exergy percentage and exergy efficiency; the highest exhaust gas exergy efficiency appears in highspeed and high-load area, while the highest cooling water exergy efficiency appears in lowspeed and low-load area; theoretically, total fuel efficiency of this gasoline engine can be nearly improved by a time through waste heat recovery, and the maximum total fuel efficiency can reach 60%.

Keywords: Gasoline engine; Energy balance; Waste heat recovery; Energy grade; Exergy analysis.

PHYSICAL MUTATION OF OLEAGINOUS MICROBE FOR ENHANCED LIPID BIOSYNTHESIS

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Abstract:

Oleaginous yeasts represent promising candidates for large-scale production of lipids, which can be utilized for production of drop-in biofuels, nutraceuticals, pigments, and cosmetics. However, low lipid productivity and costly downstream processing continue to hamper the commercial deployment of oleaginous microorganisms. Strain improvement can play an essential role in the development of such industrial microorganisms by increasing lipid production and hence reducing production costs. The main means of strain improvement are random mutagenesis, adaptive laboratory evolution (ALE), and rational genetic engineering. Among these, random mutagenesis and ALE are straight forward, low-cost, and do not require thorough knowledge of the microorganism's genetic composition. This paper showing mutagenesis as a screening methods to effectively select for oleaginous yeasts with enhanced lipid yield and understand the alterations caused to metabolic pathways, which could subsequently serve as the basis for further targeted genetic engineering.

Keywords: Physical Mutation; Microbe; Modification; Lipid; Biosynthesis.

ISOLATION AND SCREENING OF MICROALGAE FOR POLY-BHYDROXYBUTYRATE PRODUCTION

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Abstract:

Poly-β-hydroxybutyrate (PHB) can be used as an effective thermoplastic and has many characteristics similar to those of standard commercial plastics like polypropylene. PHB based plastic substitutes are less flexible than traditional plastics; they are completely biodegradable

and leave behind no residue. Algae are used for the production of PHB, for bioplastic production which offers an opportunity in economic efficiency by reduced costs. Microalgae was isolated from different freshwater sources and screened for PHB production using Sudan black B and Nile Blue Stain.

Keywords: Microalgae; Screening; Poly-β-hydroxybutyrate; Characterisation.

MODELLING AND SIMULATION OF WASTE WATER TREATMENT PLANT

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Abstract:

The introduction of the ASM model family by the IWA task group was of great importance, providing researchers and practitioners with a standardised set of basis models. This paper introduces the nowadays most frequently used white-box models for description of biological nitrogen and phosphorus removal activated sludge processes. These models are mainly applicable to municipal wastewater systems, but can be adapted easily to specific situations such as the presence of industrial wastewater. Some of the main model assumptions are highlighted, and their implications for practical model application are discussed. A step-wise procedure leads from the model purpose definition to a calibrated WWTP model. Important steps in the procedure are: model purpose definition, model selection, data collection, data reconciliation, calibration of the model parameters and model unfalsification. The model purpose, defined at the beginning of the procedure, influences the model selection, the data collection and the model calibration. In the model calibration a process engineering approach, i.e. based on understanding of the process and the model structure, is needed.

Keywords: Modelling; Simulation; Waste water; Treatment

MODELLING AND SIMULATION OF WASTE WATER TREATMENT PLANT

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Abstract:

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Keywords: Modelling; Simulation; Waste water; Treatment

STRATEGIES FOR EFFECTIVE WASTE REDUCTION AND MANAGEMENT

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Abstract:

Waste management refers to the activities and actions that handle waste materials. It includes collection, transportation, processing, and disposal of waste. Waste prevention, recycling, reuse, and recovery are important waste management strategies that eases the burden on landfills, conserves natural resources, and saves energy. This helps utilize resources more

effectively and sustainably. The world is besieged with growing pressure of waste management. The amount of waste has been increasing along with expanding population and rising human activities. The World Bank estimated that there were approximately 1.3 billion tons of municipal solid waste generated globally in 2012and the volume is expected to reach 2.2 billion tons by 2025.

Keywords: Waste; Reduction; Management; Strategies

DEVELOPMENT OF ECO-FRIENDLY CERAMIC MEMBRANE INCORPORATED WITH MONTMORILLONITE AND ACTIVATED CARBON FOR THE ENHANCEMENT OF MFC PERFORMANCE

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Abstract:

Ceramic materials are identified as an alternative to the high cost polymer based proton exchange membrane (PEM). Thus, in this study, composite ceramic membrane was prepared by incorporating cation exchangers such as montmorillonite (MMT) and activated carbon (AC) from pistachio shell for the enhancement of the microbial fuel cell (MFC) performance. Synthesised composite membranes were characterized for its physico-chemical, mechanical, thermal and morphological characteristics. From the results it is found that ceramic composite membranes exhibited better membrane characteristics in comparison to the unmodified ceramic membrane. Surface characterization and surface morphological studies conforms the uniform dispersion of cation exchangers into the ceramic membrane. Water uptake capacity (35.26%) and ion exchange capacity (IEC) (1.99 meq/g) values of the composite membrane have been increased with the addition of cation exchanger's which is responsible for the higher proton conductivity. Among the different composite membrane prepared, 20% MMT and 7.5% AC incorporated ceramic composite membrane showed good performance in MFC in terms of power generation (1.56 W/m^2) and wastewater treatment efficiency (87-90%). Results suggest that composite ceramic membrane has the potential to be used in MFC system as an alternative to commercial PEM membranes.

Keywords: Ceramic membrane; Proton exchange membrane; Montmorillonite (MMT); Microbial fuel cell; Activated carbon.

THE TOXIC WASTE MANAGEMENT TOWARDS CORPORATES' SUSTAINABLE DEVELOPMENT: A CAUSAL APPROACH IN VIETNAMESE INDUSTRY

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Abstract:

Toxic waste management in corporate caused by production and consumption plays an essential role in sustainable development due to its severe impacts on ecosystems and human health. However, toxic waste management and its impacts on firm effectiveness and sustainable development's aspects are still unclear due to the lack of previous studies to address those attributes' interrelationships under uncertainty, especially in emerging countries. This study presents the mechanisms to address perceptions of toxic waste management and its influences on changes in Vietnamese industry practices by using a cause-effect model with qualitative information and linguistic preferences. The fuzzy Delphi method addresses the attributes' reliability and validity and combines the fuzzy set theory to transform qualitative information and linguistic preferences into crisp numbers. This study applies the decision-making trial and evaluation method to address the interrelationships among the proposed attributes. A set of 6 aspects and 24 criteria were selected from previous documents and experts' valuations. The results indicate that environmental protection regulations, firms' environmental perceptions, and financial resources promote changes in corporate prospects in sustainable development, corporate social responsibility, and changes in choices of technology and policies in toxic waste management. Theoretical and practical meanings are discussed based on significant findings.

Keywords: Toxic waste, Sustainable development, Fuzzy, Dematel, Vietnamese industry.

MIXOTROPHIC CULTIVATION OF MICROALGAE ON SUGARCANE BAGASSE: FAMES PROFILING AND BIODIESEL QUALITY

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Abstract:

Biodiesel production from microalgal feedstocks attained attraction these days and for its commercial acceptance it must have to comply with the international biodiesel standards of ASTM and EN. FAMEs were analyzed qualitatively in the present study while growing microalgae mixotrophically in sugarcane bagasse hydrolysate under two concentrations and compared with biodiesel international standards. In the present study *Scenedesmus dimorphus* and *Nannochloropsis* sp. showed high FAMEs content of 138.7 and 170.5 µg mg^{-1} when cultivated mixotrophically then their autotrophic conditions. *Nannochloropsis* sp. and *Scenedesmus dimorphus* showed high 72% and 40% of saturated fatty acids respectively during mixotrophic cultivations. Mixotrophy enhanced the biodiesel quality in *Chlorella vulgaris* but decrease its FAME contents. Cetane number increased to 50, 57 and 47 in *Scenedesmus dimorphus, Chlorella vulgaris* and *Nannochloropsis* sp., respectively, whereas iodine value decreases in all the three strains during mixotrophic cultivations and values found in accordance with the standards.

Keywords: Biodiesel properties; FAME contents; Mixotrophic cultivation; Sugarcane bagasse.

EFFICIENT UTILIZATION OF MELON PEELS TO PRODUCE ETHANOL: A STEP TOWARDS SUSTAINABLE WASTE MANAGEMENT

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Abstract:

Cellulosic material like melon peels can be a potent source of bioethanol and it can be exploited to combat the increasing energy demands. In the current study, dried and powdered melon peel waste (MPW) was hydrolyzed by dilute sulphuric acid into monomeric sugars and then fermented by different yeast strains to produce bioethanol. The parameters for dilute sulphuric acid hydrolysis of substrate were optimized by response surface methodology (RSM) for three variable factors, i.e., X1 (acid concentration), X2 (hydrolysis temperature) and X3 (hydrolysis time). The responses were reducing sugars and total sugars. According to the results of biochemical tests, 89.6 ± 0.03 g/L were the highest reducing sugars with significant values of F (3.98), p (0.0258) and R^2 (0.7994). Maximum total sugars were recorded as 225.90 ± 0.09 g/L having significant F, P and R^2 values of 3.23, 0.0477 and 0.7849, respectively. The optimum conditions for maximum yield of reducing and total sugars were X1 6 %, X2 50 °C and X3 60 min. For ethanologenensis, one standard yeast *Saccharomyces cerevisiae* K7, while two experimental yeasts belonging to the genus *Metchnikowia* were used. Maximum ethanol yield (0.39 ± 0.006 g/g) with 78.21 % fermentation efficiency was estimated on 6th day by *Metschnikowia cibodasensis* Y34. Our findings will be helpful for valorizing cellulosic wastes into energy.

Keywords: Bioenergy; Biofuel; Fruit waste; Optimization; Response surface methodology; Waste management

TOWARDS NON-ASEPTIC CO-FERMENTATION OF ETHANOL AND HYDROGEN BY *CLOSTRIDIUM THERMOCELLUM* DSMZ 1313 EMPLOYING SUGARCANE BAGASSE

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Abstract:

Research addressing exploration of environmental friendly and efficient fuel reservoirs substituting depleting fossil fuels is at-work worldwide. For this purpose, it is of ultimate requirement to establish cost-effective biofuel fermentative processes using renewable lignocellulosic bio-wastes as feedstock. The present investigation compacts the employment of *Clostridium thermocellum* DSMZ 1313, for bench-scale co-production of bioethanol and biohydrogen under non-aseptic thermophilic conditions. In our previous study, the fermentation kinetics have been studied aseptically in bench-scale stirred-tank bioreactor with same fermentative bacterium under optimized levels of the key fermentation factors employing sugarcane bagasse (SCB) in the fermentation medium. In the current investigation, for co-production of bioethanol and biohydrogen, batch fermentation were carried as free cell approach in subsequent bioreactor's modifications that resulted in enhanced biofuels' yields aseptically. These include the incorporation of immobilized cells fibrous bed bioreactor (FBB) that caused 20.465 % enhanced ethanol and 27.27 % higher level of hydrogen, followed by substrate addition (fed-batch fermentation) resulted in 61.79 % increased ethanol and 74.074 % better hydrogen production. Selective stripping of the inhibitory metabolites by in-situ gas stripping was also performed that resulted in 94.58 % increased ethanol and 105.38 % elevated hydrogen level. Finally, under non-aseptic thermophilic fermentation conditions, 16.07 % reduced ethanol whereas 14.7 % elevated hydrogen levels were obtained in comparison with aseptic fermentation conditions. The simultaneous production of bioethanol and biohydrogen using SCB as biofuels' feedstock by *Clostridium thermocellum* DSMZ 1313 under non-aseptic conditions has appeared a potentially sustainable recourse to produce environmentally friendly energy sources. To overcome the non-aseptic fermentation processes' inefficiencies, further studies might prove useful for active large scale deployment of waste biomass-to-biofuel.

Keywords: Biofuel; Biohydrogen; Sugarcane bagasse; Sustainable energy; Waste management

INFLUENCE OF IRON, ZINC AND ALUMINUM AS ANODE IN COMBINATION WITH SALT BRIDGE ON MICROBIAL FUEL CELL PERFORMANCE

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Abstract:

Microbial fuel cell (MFC) is a green technology and does not harm the environment. It can be used for wastewater treatment, hydrogen production and power generation. There are lot of avenues need to be investigated to increase the efficiency of MFC and in order to make it acceptable publicly. Efficiency of MFC depends on many factors. In this study, the influence of anode material (Fe, Al and Zn), size (12 cm^2, 16 cm^2 and 20 $cm^{2)}$ and shape (square, rectangular and circular) were investigated on MFC efficiency. Dual chamber microbial fuel cell setup was prepared in which *Rhodobacter capsulatus* was used as biocatalytic agent. Results revealed that Zn anode gave highest voltage of 1.56 V with corresponding 0.23 A of current. Size of 20 cm^2 of anode gave maximum voltage of 1.66 V with corresponding value of 0.08 A current while anode size of 16cm^2 gave maximum current of 0.75 A with corresponding voltage of 1.65 V. Regarding tried shapes, circular shape anode gave highest voltages of 1.69V. Salt bridge plays an important role in internal resistance of the fuel cell. The results were checked by changing the diameter and length of the salt bridge. The best results were noticed with 16 cm^2 circular Zn anode electrode and Fe as cathode electrode. Salt bridge with 7.5cm length gave highest voltages of 1.65 V while 4 gauge diameter salt bridge gave highest current of 0.85 A.

Keywords: Anode material; Green technology; Microbial fuel cells; *Rhodobacter capsulatus*; Salt bridge.

MICROBIAL BASED SEPARATE AND SIMULTANEOUS SACCHARIFICATION AND ETHANOL FERMENTATION OF POPLAR (POPLUS EURAMERICANA) SUBSTRATE

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Abstract:

The present study reports a simple all microbial based consolidated bioprocess for conversion of poplar parings into ethanol. The bacterium Bacillus cereus G9241 CP 026376 and the yeast Candida tropicalis MF 289181 were employed for this purpose. The ethanologenic yeast was found compatible for co-culturing with the Bacillus cereus and also grew best at 37oC. Potential of the cellulolytic B. cereus for saccharification of the substrate and bioethanol fermentation was unveiled by employing the separate hydrolysis and fermentation (SHF) as well as simultaneous saccharification and fermentation (SSF) processes. The bacterium B. cereus grew successfully in a medium comprised of 2% substrate (poplar), 0.5% yeast extract, 0.03% peptone and 0.09% MgSO4 with 2% inoculum at 37oC with agitation of 120 rpm for 24 h. The bacterium as well as yeast grew well in the substrate hydrolyzate and the cell counts reached upto 19701x107 and 852x106 /ml at 96 h. For the bacterially fermented saccharified substrate the HMF content reduced from 489 ±38.1 µg/L at 24 h to 232µg/L (52.56%) at 96 h. In case of the yeast fermented poplar hydrolyzate the HMF content dropped down to 351.3 ±48.6 µg/L right at first sampling point and thereafter became un-detectable. In case of SSF, the HMF could appear only at 72 and 96 h of fermentation with respective values of 260.3 ±25.8 and 243 ±8.66 µg/L. Acetic acid content amongst the differently fermented substrates ranged from 460 ±230 to 5360 ± 503 mg/L. The highest acetic acid contents were encountered in case of SSF. The bacterial cellulases yielded upto 6.742 and 8.561 mg/ml of glucose and xylose of 2% substrate, respectively. In case of yeast monoculture the glucose and xylose contents reduced down to 34.17% and 85.28%, respectively at 24 h post-inoculation with concomitant ethanol production of 634 ±159 mg/L. Following 24 h of co-culturing of the microbes in the substrate hydrolyzate the glucose and xylose reduced down to 39.69% and 82%, respectively with accompanying ethanol fermentation level of 501.38 ±46.7 mg/L. Glucose content of 24 h incubated SSF fluids were 1568 ±226 mg/L, whereas the xylose remained non-detectable throughout the study period. Ethanol productions at 24, 48, 72 and 96 h of incubations for the SSF experiment were 140.43 ±44.8, 60.18 ±13.5, 177.78 ±23.9 and 83.48 ±10.3 mg/L, respectively. The simple experiments reported here provide a workable model to assess the potential of suitable microbes for bioethanol production from plants' biowastes by a simple consolidated bioprocess without any pretreatment.

Keywords: Consolidated bioethanol production, Simultaneous saccharification and fermentation, Separate saccharification and fermentation, Bioethanol from Poplar.