Technical Magazine

CHEMICAL ENGINEERING

(AY-2022-23)

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TECHNICAL MAGAZINE –CHEMICAL ENGINEERING

ACADEMIC YEAR 2022-23

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Editorial Team

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Faculty Editor: Prof. Nitish D. Galande

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Vision of the Chemical Engineering Department:

"Produce employable graduates through a multidisciplinary approach, equipping them with chemical engineering knowledge and research skills, for the welfare of society."

Mission of the Department

M1: Impart knowledge and understanding of the diverse fields of chemical engineering profession through curriculum.

M2: Develop chemical engineering professional and research skills to become technically competent professionals.

M3: Inculcate the importance of social and life-long learning.

Program Educational Objectives (PEOs)

PEO1: Graduates of the program will apply chemical engineering principles in engineering practice.

PEO2: Graduates of the program will have technical or professional careers in chemical engineering or in the diverse fields of chemical engineering such as biochemical engineering, energy and environmental engineering etc.

PEO3: Pursue higher study and / or continuously upgrade the knowledge with Personal and professional growth for collective advancement of society.

Programme specific outcomes (PSOs)

POS1: Create Chemical Engineering solutions for problems and processes while taking into account separation operations, reaction kinetics, environmental issues, and waste treatment and, modelling and simulation.

PSO 2: Foster the industrial chemical production process through efficient design and modifications by applying the principles of Chemical Engineering.

PSO 3: Demonstrate responsible professional behaviour by integrating ethical considerations, promoting safety, communicating effectively, and engaging in lifelong learning for societal and Environmental well-being.

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Program Outcomes (POs) as per NBA

Program Outcomes (POs) are as follows:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, and engineering fundamentals to solve complex chemical engineering problems.

2. **Problem Analysis:** Identify, formulate, and analyze complex engineering problems to reach substantiated conclusions using principles of mathematics, natural sciences, and engineering sciences.

3. **Design/Development of Solutions:** Design solutions for complex engineering problems that meet specified needs with appropriate consideration for public health, safety, and environmental concerns.

4. **Investigation of Complex Problems:** Conduct research-based investigations, including designing experiments, analyzing data, and synthesizing information to provide valid conclusions.

5. **Modern Tool Usage:** Select, apply, and adapt appropriate techniques, resources, and modern engineering tools, including prediction and modeling, to solve complex engineering activities.

6. **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to professional engineering practice.

7. **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.

9. **Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and society at large through reports, presentations, and documentation.

11. **Project Management and Finance:** Demonstrate knowledge of engineering and management principles to manage projects in multidisciplinary environments.

12. **Life-long Learning:** Recognize the need for, and engage in, independent and lifelong learning in the broadest context of technological change.

Message from the Principal

It gives me great pleasure to present the Technical Magazine of the Chemical Engineering Department for the academic year 2022-23. This magazine is a testament to the academic excellence, research contributions, and innovative mindset of our students and faculty members.

Chemical Engineering is a dynamic field that continuously evolves to address global challenges in energy, sustainability, and advanced materials. Our department has been at the forefront of fostering technical skills, critical thinking, and industry collaborations to prepare students for future challenges.

I congratulate the entire team of faculty, students, and editors for their dedication in curating this insightful publication. I encourage all students to actively participate in research, technical events, and industrial collaborations to enhance their knowledge and professional growth.

Best wishes to all for continued success in academic and professional pursuits.

Dr. Sachin K.Patil

I/C Principal

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Message from the Head of the Department

It is with immense pleasure that I present the Technical Magazine of the Chemical Engineering Department for the academic year 2022-23. This magazine serves as a platform to showcase the academic, research, and extracurricular achievements of our students and faculty, reflecting their dedication and passion for the field of chemical engineering.

The world is witnessing rapid advancements in technology, and chemical engineers play a crucial role in sustainable development, innovation, and problem-solving across industries. Our department is committed to nurturing young minds with technical knowledge, research aptitude, and industry-relevant skills.

I extend my heartfelt appreciation to the faculty, students, and editorial team for their unwavering efforts in bringing this publication to life. May this magazine inspire and motivate our students to explore new avenues of learning and innovation.

Wishing you all continued success and excellence in your endeavors.

Dr. Shyam Tekade

Head of the Department

Chemical Engineering

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Message from the Faculty Editor

It gives me immense pleasure to present this edition of the **Technical Magazine** from the **Chemical Engineering Department** for the academic year **2022-23**. This magazine serves as a platform to showcase the technical acumen, innovative ideas, and research contributions of our students and faculty.

Chemical engineering is a constantly evolving field, and staying updated with the latest advancements is essential. Through this publication, we aim to highlight remarkable student achievements, research endeavors, industry collaborations, and extracurricular activities that foster holistic development. The dedication and enthusiasm of our students in participating in technical events, research conferences, and industrial projects are truly commendable.

I extend my heartfelt gratitude to our faculty members, students, and contributors for their unwavering support in making this magazine a success. May this edition inspire our budding engineers to push boundaries and strive for excellence in their professional journeys.

Prof. Nitish D. Galande

Faculty Editor

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1. PYROLYSIS OF WASTE POLYETHYLENE UNDER VACUUM AND ATMOSPHERIC CONDITIONS

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ABSTRACT

Pyrolysis is the thermal cracking of organic and synthetic material, elevated temperature in the absence of oxygen. Pyrolysis is one of the most important methods for the disposal and treatment of waste plastics as waste plastics can be converted to three product slates viz. liquid, gas and solid. The experimental work on the pyrolysis of waste plastics under vacuum and atmospheric conditions in batch reactor has been thoroughly discussed in present study. The batch time was set to 1.5 hours and maximum temperature reached was 287°C and 347°C under vacuum and atmospheric conditions respectively. The yield of most important product i.e., pyrolysis oil was observed as 49.28% in vacuum conditions whereas it increases to 66.22% for the atmospheric conditions. Interestingly, the yield of uncondensed gases was found to be 44.72% under vacuum against 27.78% in atmospheric conditions. The char yield was similar for both conditions. The quality of pyrolysis oil obtained during atmospheric conditions was also found to be better than that under vacuum conditions. The insufficient residence time for the gas phase pyrolysis reaction during vacuum conditions may have caused decrease in oil yield. The composition analysis of liquid product using gas chromatography mass spectroscopy has also been discussed.

Keywords: Waste plastics, Pyrolysis, Atmospheric condition, Vacuum Conditions, Pyrolysis oil yield and composition

2. TREATMENT OF THE AGROCHEMICAL INDUSTRY EFFLUENT USING HYDRODYNAMIC CAVITATION AND ITS COMBINATION WITH PROCESS INTENSIFYING ADDITIVES (OZONE AND H_2O_2)

Aakash S. Velankar [1*], Pavan V. Prasad[1], Manoj K. Gawade[1] Dr. Sudesh D. Ayare[1]

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ABSTRACT

Treatment of Agrochemical industrial effluent is investigate using hydrodynamic cavitation (HC) and when it is combined with advanced oxidation reagents such as air, oxygen, hydrogen peroxide, and ozone to intensify degradation. The cavitating mechanism in the HC reactor consisted area contraction devices such as venturi and orifice. We optimize the effect of various parameters like inlet pressure, effluent concentration, air flow rate, H2O2 loading, and ozone loading on the basis COD reduction and decolorization. It was observed that the maximum reduction occurs at 5 bar inlet pressure and a constant temperature of 25℃. The results show that the combination of HC with ozone can be effectively used as a fast and highly efficient for wastewater treatment.Hydrodynamic cavitation is one of the best treatment method for reduction of Agrochemical industrial wastewater.

Keywords:-Hydrodynamic cavitation, Venturi, Dozing, COD reduction, Advanced oxidation process, Agrochemical

3. UTILIZATION AND COMPARISON OF PAPER WASTE IN COMBINATION WITH FLYASH, SAND AND CEMENT TO DEVELOP ECO-FRIENDLY AND LIGHTWEIGHT BRICKS.

Prof. VikramsinghJadhav[1], ShubhamKamat[1], Yash Bhatkar[1], Dharmaraj Bhoi[1], Akhilesh Kalekar[1]
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Abstract: Brick plays very important role in the field of civil engineering. Bricks are used as an alternative of stones in construction purpose. Clay brick is the oldest building material in the field of construction industry. Now-a-days, brick is one of the most common masonry units used as building material in the construction industry. With growing industrialization and development of the country, the demand for bricks has increased to a large scale. India is thesecond largest brick manufacturer in the world after china. India produces bricks using the traditionalmethods. The traditional methods consume 350 million tons of fertile soil and 25 million tons of coal annually for production of bricks and burning process respectively. The waste paper produced are either incinerated or dumped in landfills and dumpsites.In terms of sustainable development and environment friendly production, the utilization of paper waste and fly ash in the manufacturing of eco-friendly and lightweight building materials has attracted attention in recent years.The intention of this research is to find out the weight, compressive strength, water absorption, thermal conductivity, cost of brick by using waste papers and fly ash in combination with cement and sand in order to verify their suitability for use as a building construction material. The self weight of bricks made by using paper pulp, cement, sand and fly ash is comparatively less than conventional clay bricks. Due to less weight of paper pulp bricks,the total dead load of the building will be reduced.The bricks cannot be used for load bearing walls because it absorbs more water. It can be used in interior location of structures like partition walls.

Keywords: Waste paper, Fly ash, Lightweight brick, Thermal insulation, Recycled material, Sustainable construction

4. STUDY AND DESIGN OF FLEXIBLE PAVEMENT USING STEEL SLAG

H. S. Bate[1*], K. M. Potbhare[1], P. P Apange[1], H. D. Mate[1],V. D. Kamble[1]

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ABSTRACT

Abstract: This paper represents the use of steel slag in the bituminous mixtures. Steel Slag is the byproduct of various steel industries. The steel slag is chosen on the basis of its engineering properties and its utilization for road construction in different ways. In this study, steel slag was used, as a replacement for natural aggregates in various percentage in the bituminous mixture. The Marshall Stability Test was taken on the different grade specimens which having 0%, 25%, 50%, 75% and also 100% replacement of natural aggregates with Steel Slag. The 3 specimens where prepared of each percentile to get accurate reading and minimizing the errors. Then the results of each percentage specimens where compared with each other to see whether the steel slag fulfilled the characteristic of natural aggregate in the mixture and at what percent it shows the best result. At last the test provided the satisfactory results.

Keywords: Steel Slag,Bituminous Mixture, Aggregates, Stability, Utilization

5. DEGRADATION OF COD OF BOYS HOSTEL SEWAGE WATER AT GHARDA INSTITUTE OF TECHNOLOGY, LAVEL.

Chavhan Prasad R*[1]., Gharat Vickrant V., Sawant Shivani P.,Ayare Sudesh D.

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It is common practice to use hydrodynamic cavitation for the treatment (cleaning) of water and wastewater. However, it has only lately been proposed and used to use hydrodynamic cavitation as a stand-alone approach or in conjunction with other techniques like ultrasound. In the present study, we looked at a broad overview of methods that use hydrodynamic cavitation to clean the water and trash produced at the boy's hostel at the Gharda Institute of Technology in Lavel. We took 20–20 liters of sewage water per day from the chamber of the sewage water pipe line in the boy's hostel to test a sample.In this study, we focused on our own most recent work using hydrodynamic cavitation to remove all cleaning chemicals, surfactants, and pathogens from hostel waste water. For analysis, the Chemical Oxygen Demand method has been chosen. As according experimental data, the COD was reduced by 59.5% using individual treatment of HC at the ideal conditions of 4.5 bar inlet pressure, ambient temperature, and pH 4. As comparison to using solely HC, the implementation of various hybrid HC-based techniques, such as HC + H2O2, resulted in a larger COD reduction. The COD decrease reached a maximum of 87.2%.

We will demonstrate that different contaminants must be successfully removed using a different sort of hydrodynamic cavitation and dosing, such as Ozon (different removal method). Although there is still a long way to go before hydrodynamic cavitation is used as a regular water cleaning technique, recent findings have already demonstrated considerable promise for optimization, which could result in a low-energy instrument for water and wastewater cleaning.

Keywords-Sewage water treatment, COD, H_2O_2 Dosing.

6. CALCIUM BASED EGG-SHELL WASTE CATALYZED BIODIESEL SYNTHESIS FROM WASTE COOKING OIL

Chavhan Prasad R*[1]., Patil Anurag R., Panchal Rutik R., Chaudhari Prashant S.

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ABSTRACT

Being a renewable and environmentally benign alternative to traditional petroleum fuel, biodiesel has been called the best option. The amount of non-renewable energy consumed keeps rising. Most countries use a lot of biodiesel fuel because it is safe, environmentally friendly, and emits fewer greenhouse emissions (GHGs). The high cost of raw materials and processing due to the high cost of catalysts and biodiesel feedstocks is the drawback of marketing biodiesel. In order to lower the cost of raw materials, waste cooking oil (WCO) may be successfully utilized in the production of biodiesel. Also, it helps in lowering WCO disposal, which could otherwise lead to environmental damage.The purpose of this research is to evaluate the efficacy of the used eggshells as a heterogeneous CaO- based catalyst for the transesterification process that produces biodiesel. Waste eggshell may be removed using a straightforward heat treatment method since it includes the heterogeneous catalyst CaO. In this work, catalyst loadings of 1, 2, 3, 4, and 5 wt.% were utilized. The reaction's variables, such as the quantity of catalyst utilized, are influenced by the biodiesel yield. The results of this paper show that compared to other catalysts in the trials, the low-weight catalyst produced higher biodiesel (59% of yield). Previous tests demonstrated a biodiesel yield of 49.48% using the same CaO catalyst with a 1 wt.% catalyst.Results showed that waste eggshells might be used as a powerful catalyst to turn spent cooking oil into biodiesel. This would greatly reduce the cost of biodiesel and improve product output and fuel characteristics.

Key Words: Catalyst, Egg-shell, Transesterification, Biodiesel.

7. HYDRODYNAMIC CAVITATION: A NEW TECHNIQUE FOR MILK PRESERVATION

Chavhan Prasad R[1*]., Waje ShubhamV., Kadvekar Saurabh S., Ayare Sudesh D.

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ABSTRACT

A variety of bacteria can flourish well in raw milk as a culture media. As a result, within two to four hours of milking, many microorganisms thrive there and cause spoiling in raw milk. This makes it unfit for eating, as do the extended travel hours. Moreover, the existing preservation technique is both expensive and harmful. Also, the current procedure uses a lot of energy and is therefore not environmentally friendly. Technology for pasteurization, packaging, pasteurization, and storage is currently available. The cost of this procedure is high. Nutritional loss occurs as a result of pasteurization. This present work incorporates the use of cavitation technology rather than pasteurization, for food which is a revolutionary method.The microbial degradation of raw milk can be stopped by disinfection or a decrease in CFU count using cavitation as an application. Since it uses less energy and power and prevents nutrient loss, hydrodynamic cavitation is extremely economical in terms of commercialization. The process of vaporization, bubble production, and bubble implosion known as hydrodynamic cavitation occurs in a flowing liquid as a result of a fall and subsequent increase in local pressure.The bacteria are killed when shock waves from the intense pressure hit its nucleus. This event is what caused the CFU count to drop from 5.6 ×106 to 6.1×102. This tactic is distinctive because it has never been shown before.

Keywords: Cavitation, Food Preservatives, Milk Preservation, Pasteurization.

8. MAKING BIO-SANITARY PADS OUT OF COW DUNG.

Prasad Chavhan [1*], Yashodhan Mane, Abhishekh Kardile.

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ABSTRACT

Due to societal, cultural, and religious limitations as well as a lack of information, menstrual hygiene is not properly practiced in rural India. Due to their ignorance about goods like tampons, menstrual cups, and sanitary napkins, women cannot adequately practice good menstrual hygiene during their periods. In India, sanitary napkins are a relatively accessible answer to this issue, but the price of these napkins is the largest obstacle to their use. Rural women often use dirty cloths, rags, and other items since sanitary napkins are so expensive. These items are extremely filthy and can spread serious diseases like cancer and vaginal infections. Ectopic pregnancy and infertility are caused by sanitary pads made of petroleum. The production of biodegradable sanitary napkins is the answer to this issue. Elderly women, as well as women in rural and tribal areas of several countries, utilize dried cow dung cakes for menstrual blood absorption, which is quite unhygienic. This gave us hope that cow dung can be effective at absorbing menstrual blood. Cow dung has substances that can absorb blood. When the cellulose from cow dung is removed, it is transformed into CMC (Carboxy Methyl Cellulose), which is mixed with Na Alginate (50%) to create drogels, a gel-like substance that serves as a superabsorbent component in sanitary napkins and is biodegradable. The sanitary pads were developed to be extremely absorbent by combining these two ingredients with extra absorbing agents. 34 ml of blood are absorbed. Cow dung manure is a reliable, easily accessible renewable resource that can be used to produce sanitary napkins that are cheap for women and, more importantly, disposable and biodegradable in comparison to other brands of pads.

Keywords: Women Hygiene, Biodegradable Hygienic sanitary Pads, Extraction of cellulose.

9. SUSTAINABLE BIO-DIESEL PRODUCTION USING WASTE AS FEEDSTOCK: A REVIEW

Chavhan Prasad R.,[1*]Koli Gaurav R., Jadhav Monika M.,Mapara Jayesh V.

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ABSTRACT

The need for alternative renewable energy has increased due to the rising level of global warming and the depletion of fossil fuels. With a same cetane number and oxygen stability as regular diesel, biodiesel becomes a promising replacement. The use of edible oil in the production of biodiesel raises the cost of production and has an impact on food security. To reduce processing costs and waste deterioration, researchers are currently using various waste oils as feedstock. The purpose of this study is to shows the possibility of used cooking oil as a feedstock for the transesterification process that produces biodiesel Waste cooking oil, cotton seed oil, chicken fat, watermelon waste oil, and other types of waste oils have all been employed as feedstock. Many chemical catalysts, both homogeneous and heterogeneous, as well as biocatalysts, have been used to speed up reactions.

Due to their affordability and environmental friendliness, bio-catalysts have gained major importance in recent years.

Key Words: Renewable energy, biodiesel, trans esterification, waste oils, used cooking oil, bio-catalysts, chemical catalysts, food security, cost reduction, sustainability.

10. PYROLYSIS OF TEXTILE WASTE UNDER ATMOSPHERIC CONDITIONS"

Kadam Prasad D 1 [1*], Dhukate Abhishek K., Gawas Rohit P., Tekade Syam P.

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ABSTRACT

Pyrolysis is the process to convert organic materials like plastics, biomass, textile waste through thermal degradation into the liquid product that can be further purified into oxygenated fuel additives, hydrocarbon biofuels, etc. This process is carried out in the absence of oxygen. Pyrolysis is very beneficial & important process in industry. This process helps to reduce solid waste pollution. Textile waste is one of the major solid wastes. Textile waste is a material which is unusable left after the finishing of any textile product. Every year worldwide 1.92 million tons of textile waste is produced in which 52.2% is polyester & 23.2% is cellulose. The experimental study on the pyrolysis of textile waste i.e., cellulose & polyester is discussed in current paper. To get the yield i.e. pyrolysis oil product, both textile materials (cellulose & polyester) requires the period of 2.5 hours and the temperature reached upto 160 °C for cellulose & 179 °C for polyester. By feeding 25 gm of each material at initial stage of the process, results in 26% & 4% liquid product (pyrolysis oil) and 28% & 26% solid product (bio-char) for cellulose & polyester respectively. Due to high amount of uncondensed gases i.e., 46% for cellulose & 70% for polyester, the quantity of product oil get affected. Cellulose found more superior than polyester in case of their liquid product purity just after the pyrolysis process.

Keywords: Pyrolysis, Textile Waste, Cellulose, Polyester, Pyrolysis oil, Bio-char, Uncondensed gases, Liquid product purity.

11. MICROENCAPSULATION OF LIMONENE BY USING POLYURETHANE MELAMINE FORMALDEHYDE.

Prasad Chavhan [1*], Mane Yashodhan, Rohit Nalwala.

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ABSTRACT

Melamine formaldehyde microcapsules containing fragrant oil are produced using a technique that is widely utilized. Utilizing this technique, fabrics' olfactory performance can be improved. It is extremely difficult to disseminate in low levels of formaldehyde, improve olfactory advantages, and carry the fragrance in the capsule during storage. A Melamine Formaldehyde microcapsule known as MechacapsTM was created by Givaudan. According to Sofia N. Rodrigues, using the interfacial polymerization approach, they were able to create polyurethane-urea microcapsules with a solid content of roughly 41% and a pH of 7.18 for the microcapsule solution after washing. After five dry cleaning cycles, up to 97% of the limonene is lost, ranging from 24% in the first cycle. We have developed many cores using substances like polyurethane at this time. In our research, we chose to combine polyurethane with melamine formaldehyde, adding a reaction scheme at various pH levels to extend the lifespan of the microencapsules and produce a solid free emulsion.

Keywords: Microencapsulation, Polyurethane, Perfume for cloths.

12. A REVIEW: RECYCLING OF RUBBER WASTE USING PYROLYSIS INTO CHAR, LIQUID & GASES.

Sudarshan Desai [1*], Vickrant Gharat 2, Subodh Thakur 3, Prasad Chavhan 4.

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ABSTRACT

Solid waste is now very crucial problem now a days in the world, Rubbersare made by chemically cross-linking polymer-filler components, so, recycling of rubber waste is difficult. Pyrolysis is regarded as a potential recycling technology among the several rubber waste disposal options. With the use of the pyrolysis process, hundreds of tons of used rubber waste could be converted into gaseous, liquid, and black carbon char. Pyrolysis is a method that involves melting used rubbers without oxygen. Pyrolysis is used to liquify the rubber and prevent combustion, used rubbers can be converted to char, gas, and oil.Using rubber waste and recycling techniques can help to lessen environmental impact. Recycling helps to lessen all of these threats by reducing solid waste and producing products from waste materials at a reasonable cost.Used rubber products can be recycled and turned into valuable products using a variety of physical and chemical processes that seek to recover materials, energy, or chemicals from them. In this present work we studied different methods of utilization of rubber solid waste and its useful products obtained from rubber waste by pyrolysis. As per the study present work suggest that any mechanical or chemical process can be used to recover the rubber recycling powder. The high-grade reclamations that were found can be used by the rubber industry. The resulting reclaims can replace 15 to 35 percent of the virgin rubber without changing the essential chemical, physical, or mechanical properties of the rubber vulcanizates. It's feasible to save money. Overall, pyrolysis is less harmful to the environment. However, pyrolysis process innovations and research must be undertaken in order to increase conversion, particularly with regard to the environmental factor.

Keywords: Rubber Waste, Pyrolysis, Recycling, Solid waste.

13. POTABLE WATER FILTER USING COCONUT DERIVED ACTIVATED CARBON CHAR.

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ABSTRACT

Due to contaminated ground water, there is a severe problem with the availability of potable water everywhere. Some of the main impurities of ground water are heavy metals like lead, chromium (Cr), and metalloids like arsenic (As), which are dangerous to human health. The goal of the current effort is to develop a multipurpose, two-compartment integrated water filtration system for use in communities and to validate it on a lab and pilot scale.The elimination of flocculating contaminants and enhancement of the taste and odour of drinking water are the major purposes of the top compartment. Sand layers that have been functionalized to remove metal and microbiological impurities make up the second compartment. In this work, we took char from coconut shells, activated it, and formed an activated carbon cake. To increase porosity, we used jambha stones that were between 5-8 mm in size.Before and after filtering, the developed integrated water was tested for COD (Chemical Oxygen Demand) and BOD (Biological Oxygen Demand). Before filtering, the water's COD result was 55 ppm, while the BOD result was 9 ppm. The water findings for COD and BOD after filtering are 20 PPM and 2 PPM respectively. According to the results, this procedure is practical and secure for drinking. This filtration's material is readily available, fungus-free, easily replaceable, dependable, and secure.

Keywords: Potable Water Filter, COD, BOD, Activated Carbon, Drinking water.

14. STUDIES IN HYDROGEN GENERATION IN ALUMINIUM-WATER REACTION

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ABSTRACT

Hydrogen is considered as a future fuel owing to its very high energy content (thrice of gasoline) and clean combustion products. Present study focuses on the in-situ/on-demand production of hydrogen gas using aluminum-water reaction in presence of sodium hydroxide. The waste aluminum obtained from food grade aluminum foil (10.5-micron thickness) was utilized as the source of aluminum. The aluminum activation has been attained by using a strong base sodium hydroxide (NaOH). Hydrogen generation in the aluminum-water reaction has been parametrically studied at concentration of 0.5N aqueous NaOH and at various temperatures of 30, 50, 70, and 90^{o}C. The near complete conversion of aluminum fed in the reaction was observed at all used temperatures in the reaction. The trends of rate of generation of hydrogen have been also presented and discussed in the present paper. The maximum rate of hydrogen generation was found to be **161.8 ml/min/0.1 g of Al** at **70^{o}C**. The obtained hydrogen generation data have been treated using Arrhenius equation for calculating activation energy of aluminium-water reaction which is found as **19.2 kJ/mol**. The data obtained in the present study will be useful in designing a commercial system of hydrogen generation.

Keywords: - aluminum-water reaction, aluminum foil, activator, rate of hydrogen generation, commercial accessibility.

15. INVESTIGATION ON FACTORS AFFECTING BATCH DRYING

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ABSTRACT

In industries including medicines, agriculture, food, fertilizers, and chemicals, drying is among the most crucial processes. The product should always be dried in a less amount of space and time. The drying process lightens the product and lowers the transportation expense [1]. The most important factors for a successful drying operation are time needed for drying, drying rate, fresh air humidity, air velocity, and material thickness [2,3]. In batch drying, pastes, lumpy solids, and other pasty materials that may be spread out on trays and dried by continually blowing hot air on their surfaces are commonly dried using tray dryers. As a result of hot air absorbing moisture from the solids, exhaust becomes humid. Depending on their function, efficiency, drying rate, and other factors, many types of batch dryer equipment are utilized in various sectors. The current investigations examine the impact of air velocity, cake thickness, and air temperature on the performance characteristics of the dryer. For various drying conditions, drying curves are plotted and explained. The amount of time needed for drying is theoretically determined and compared to actual time. Foods and vegetables that have been dried should be observed for changes in taste, colour, texture, and hardness in some cases [1,2]. It was observed that the drying rate increased with increase in temperature and air velocity but decreased with time [3].

Keywords: drying time, velocity, temperature, drying rate, moisture.

16. SYNTHESIS OF BIOETHANOL FROM SUGARCANE MOLASSES

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ABSTRACT

In recent years, the usage of biofuels as fossil fuel alternatives has increased. Even more interest has been focused in recent years to the process of turning biomass into ethanol fuel, which is considered to be the cleanest liquid fuel that can replace fossil fuels. As India is a well-known agricultural country so that it is the largest producer of sugarcane. Now a days India produces a maximum amount of sugar and Jaggery from sugarcane. But, due to the large amount of sugar produced from sugarcane the sugar factories purchase sugarcane at low cost from farmers. So that farmers are going in to loss. So solution on that Indian government start a new project based in directly bioethanol production from sugarcane. This projects increases the cost of sugarcane and indirectly sugarcane farmers can get a well price in future. By product from sugar industry is molasses, from that molasses bioethanol is produces. Sugarcane contains large amount of sucrose and convert it into a glucose or fructose by fermentation reaction and then into a bioethanol. Ethanol has a good liquid fuel properties therefore the fuel cost can be reduced if the bio-ethanol is mixed with petrol and diesel. Manufacturers of automobiles recommend and even advise using 10% ethanol-enhanced fuel in all of their vehicles.

E85—a combination of 85% ethanol and 15% petroleum the fuel type intended for flexible fuel cars. As ethanol biodegrades, it won't impact groundwater if there is a spill. A renewable fuel with a clean burn, ethanol. Fuel with 10% ethanol content can minimize carbon monoxide emissions by as much as 30% as opposed to pure gasoline. So, utilizing fuel supplemented with ethanol is good for the environment. Therefore Bio-ethanol production from sugarcane is an attractive feedstock. From GC analysis the purity of bioethanol is analyzed.

Keywords: sugarcane, Bio-ethanol, fermentation, yeast, molasses.

17. AMINO ACID EXTRACTION THROUGH HUMAN WASTE HAIR

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ABSTRACT

India produces a lot of human hair waste from its temples and saloons; in 2010, India alone exported almost 1 million kilograms of hair. Human hair waste is burned and degraded, raising environmental issues. Considering human hair is a material that is often seen as being useless, it has been found in basically every city and village in the world's municipal waste streams. Human hair is made up of a protein known as keratin which is made up of 18 different amino acids such as Alanine, Arginine, Aspartic acid, Cystine, Cysteic, Citrulline, Isoleucine, Glycine, Glutamic acid, Histidine, Leucine, Lysine, Methionine, Ornithine, Phenylalanine, Proline, Serine, Tyrosine, Threonine, Tryptophan, and Valine etc. These amino acids are extracted by hydrolysis process in presence of acidic catalyst. This combination of amino acids is used as a plant booster to promote plant growth, metabolism, protein synthesis, and insect protection. The most promising fertilizer sources among alternatives are amino acid-based bio fertilizers made from keratin waste since they are environmentally friendly and renewable. The protein that is present in the greatest amount in hair is alpha keratins, which is fibrous and contain low Sulphur. Human waste hair is one of the available raw materials, and because it is less expensive and simpler to gather than other keratin waste, it may be the best raw material for the manufacturing of amino acids because the cost of production will be lower.

Keywords: Amino Acids, Human Hair Waste, Keratin, Hydrolysis.

18. SYNTHESIS OF LITHIUM IRON PHOSPHATE BY USING HYDROTHERMAL AUTOCLAVE REACTOR

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ABSTRACT

$LiFePO_4$ is a potential candidate for the next generation of secondary lithium Batteries as it is capable of storing more energy in small size. In this paper the experimental work is done on synthesis of $LiFePO_4$, $LiFePO_4$ was synthesized by hydrothermal process by using four different types of capering agents.The compound has Olivin like structure. This structure is a useful contributor to the cathode of lithium rechargeable batteries. The reaction principles for synthesis of $LiFePO_4$ composite were analyzed, suggesting the most effective capering agent. The structural and compositional properties of $LiFePO_4$ were characterized by X-ray diffraction (XRD).The further research will be proceed on development of lithium Iron Phosphate Battery.

Keywords: Synthesis, Hydrothermal, $LiFePO_4$, XRD

19. EMERGING TECHNOLOGY: FOAMED POLYMER CONCRETE"

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ABSTRACT:

The concrete is an important part of construction industry. The field of concrete technology has under gone several changes in past few decades. One of them is addition of foaming agent in concrete. Foam concrete is a type of aerated concrete, having properties like light weight, fire and water resistant. The foamed concrete, which is a lightweight concrete having more strength-to-weight ratio with density varying from 300 to 1850 kg/m^3.This reduces the dead load on the structure, cost of production and labour cost involved during the construction and transportation. The structure becomes appropriate for all climatic conditionsdue to its pores nature which makes it thermal reducer and sound absorber.The paper reports a review of foamed concrete in terms of components, casting, mixing and proportion of ingredients. The foam concrete made using fly ash, Epoxy resin and Epoxy hardener, aluminum fine powder as foaming agent. Further, various mix proportion design discussed. The tests work performed for mechanical properties like compressive strength, density, impact sustaining nature and flexural strength.

Keywords: concrete, foaming agent, epoxy, strength

20. CONVERSION OF PET TO ALTERNATIVE FEED STOCKS

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ABSTRACT:

Polyethylene Terephthalate referred as PET Commonly used in Packaging Industries for Soft drink and water bottles. After usage these PET remain as it is in Environment as it do not decompose naturally which has caused for its huge accumulation on Earth Surface. These PET can be effectively converted into at feed stock for various materials,by simultaneous Glycolysis and Hydrolysis process. Consumed PET bottles are cleaned andgrinded then in Presence of constant volume of ethylene glycol and varying Water volumewith addition of zinc acetate, xylene and emulsifier reaction is carried out at 170-180°C for 3 hours in Stainless steel reactor resulting in esterification reaction. Product is filtered, distilled, dried and collected in Powder form obtained is oligomeric intermediates which is tested by conducting pyridine test. The product formed are being used in resin production for Paints, clothing, coatingindustry, etc.

Keywords: Alkyd resin, Polyethylene terephthalate, Glycolysis, Hydrolysis, Chemical recycling

21. REMOVAL OF CHROMIUM BY ADSORPTION WITH OPTIMIZATION OF AFFECTING PARAMETERS

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ABSTRACT

Waste water released from industrial activities is, loaded with toxic heavy metals like chromium, copper, lead, cadmium, nickel, zinc, arsenic, etc. which pose an increasing risk to not only human health but also the environment. These toxic metals can enter drinking supplies as the industrial waste water is introduced in the water streams, thus resulting in harm to aquatic and animal lives. These metals can get accumulated in the soil causing the agricultural damage. Therefore, it is essential to treat the waste water before releasing into waterways. In this current investigation, hexavalent chromium (Cr-VI) is removed using activated carbon derived from coconut shell by adsorption process. The experimental investigations have been carried out using activated carbon by varying the different parameters namely contact time for adsorption, pH of sample, initial chromium concentration in sample and adsorbent dosage. Batch experiments were carried out with the above parameters to determine the optimum conditions for removal of chromium. Increase in contact time of adsorption increases the removal to a certain time, beyond which it slows down and gradually it ceases. Similarly, increase in adsorbent dosage increases the adsorption until the adsorbent gets overcharged. The optimum pH for adsorption is in the acidic range as large number of OH^- ions can from metal precipitate. Increase in initial concentration of chromium favors the adsorption. Analysis for chromium removal after the adsorption was carried out by the UV spectrophotometer.

Keywords: Adsorption Activated Carbon, UV Spectrophotometer, Hexavalent Chromium, Optimization.

22. COMPARISON BETWEEN GEOSYNTHETIC CLAY LINER AND BENTONITE CLAY FOR WATER RETENTION IN LATERITE SOIL

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ABSTRACT :

In Konkan region, the high annual rainfall is around 3500 – 5000mm , but still most of the part of region faces scarcity of water during non-monsoon seasons as maximum part of Konkan belt have present of laterite soil.In this red coloured soil, due to the porosity and high sand content resulting high rate of percolation and infiltration of water. In-other hands we are using Bentonite clay and Geosynthetic clay linear to prevent the infiltration of water in soil. After absorbing water, the sodium Bentonite dry particles have a lamellar and compact structure, and the number and size of the pores gradually decrease to spread the water evenly.(ParabChandrashekhar - 2021).In current trends, bentonite clay and Geosynthetic Clay Liners (GCLs) are widely used in different kinds of anti-seepage projects. Hence in our research we are utilizing Bentonite clay as a admixture in Lateritic soil and application of Geosynthetic Clay Linear for the prevention of seepage loss. After Completion of experimental work around 30% to 40% of water retention is achieved.

Keywords: Geosynthetic Clay Linear, Bentonite Clay, Laterite Soil, Water Retention Capacity.

23. EXTRACTION OF CASHEWNUT SHELL LIQUID

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ABSTRACT

Cashew Nut Shell Liquid (CNSL) has many applications such as friction linings, paints, laminating resins, rubber compounding resins, cashew cements, polyurethane based polymers, surfactants, epoxy resins, foundry chemicals, and intermediates for chemical industry. Liquid from Cashew Nut shell is generally extracted by three methods viz. mechanical, roasting and solvent extraction which contains oil of about 20 to 25%. Solvent extraction (expeller) process of oil extraction is more feasible than other methods. The solvent ethanol was used as extracting agent in the present study. CNS to ethanol ratio of 1:3, 1:4 and 1:5 resulted in the yield of 29.34 %, 37.096 % and 40.92 % respectively. Ethanol can be easily separated from the CNSL and resulted into the high yield with low cost. The effect of particle size on the yield of extraction was also studied. The average recovery of CNSL at shell moisture content of 8-10% on wet basis was found to be 80 – 85 %. The ratio of feed to solvent also important factor for extraction process which affect the yield of CNSL. The optimum value for feed to solvent was observed as 1:4 on the basis of maximum yield of CNSL extraction.

Keywords: - Cashew Nut Shells Liquid (Oil), Solvent Extraction, Ethanol, Moisture content, Shell Size and solvent to feed.

24. STUDY OF CO-PYROLYSIS BEHAVIOROF GROUNDNUT SHELL ANDPOLYURETHANE USING TGA

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ABSTRACT

Biomass and organic industrial waste are being used as alternative energy sources due to the need for environmental protection and the depletion of fossil fuel reserves. The main composition of biomass consists of Cellulose or lignin and Polyurethane refers to a class os polymer composed of organic units joined by Carbamate (urethane).Biomass can be converted to a solid product called biochar, a condensable liquid called bio-oil, or a mixture of gaseous products that includes CO2, Co, H2, CH4, etc. Much work has been put into studying the conversion of biomass using pyrolysis in recent years. However, because polyurethane is a petrochemical-based polymer, it is important that we recycle them whenever possible to prevent precious raw materials from going to waste. One such issue is the deleterious properties of bio-oil, including the low heating value and the high instability at elevated temperatures. We studied TGA and experimentally performed pyrolysis and Co- pyrolysis of groundnut shell and polyurethane at atmospheric condition. We got the yield of oil that is 52%. wetry to increase the yield of oil.

Keywords: Pyrolysis, Co-Pyrolysis, Thermo gravimetric Analysis, Groundnut shell, Polyurethane, Pretreatment

25. FLOW OF GRANULAR MATERIAL THROUGH HOPPER

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ABSTRACT

In the field of mining, Pharma industry, mineral processing flow of granular material through hopper is crucial. In industries lots of problems happening related to the flow of granular material through hopper like rat-holing, arching, bridging, erratic flow, segregation etc.Granular material liberally exiting hoppers under gravity is one of the oldest and most studied problems in granular flow.

Particulate matter is made up of distinct solids or particles that move like liquids.. Material flow through the hopper is a matter of basic industrial unit operation and granular flow, the material flows under gravity and exits the storage bin through the bottom outlet of the bin. Such funnels are very useful in the food, biopharmaceutical, and agricultural industries. It is crucial to comprehend and model such granular fluxes in terms of the variables that have an impact on them, including grain size, solid percentage, wall roughness, particle-particle interactions, and others.

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Keywords: Granular material, Hopper, Rat-holing, Arching, Bridging, Erratic flow

26. EXPERIMENTATION ON COOLING TOWER TO STUDY FACTORS AFFECTING ON ITS PERFORMANCE.

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ABSTRACT

The cooling towers are broadly used for temperature control in various industries. as an experimental data obtained from actual laboratory scale induced draft cooling tower. In this experiment we are going to figure out which type of factors are experimentally on its performance. For

this experiment a lab scale cooling tower was used where experiments performed with different wet bulb temperature, water flow rate and air inlet flow rate after completing one trial 2 to 3 sets of reading were noted down . From these readings we observed changes in effectiveness. We maintained inlet water temperature at 45°c to 47 °c. After this process we got 60% to 80% of effectiveness.

After that we convert lab scale induced draft cooling tower into forced draft cooling tower. Then we operated it at different flow rates. After taking sets of readings. We compared calculations of these readings with the previous ones, then we conclude that when we operate forced draft cooling tower at high air flowrate it is slightly effective than the induced draft cooling tower.

Keywords: Cooling Tower, Factors affecting, Wet bulb temperature

27. DEGRADATION OF SUNSET YELLOW DYE USING HYDRODYNAMIC CAVITATION AND COMBINATION OF ADVANCED OXIDATION PROCESS

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The main source for water pollution is the industrial wastewater is contain more amount of organic compounds such as chlorinated hydrocarbons aromatic compound, textile dyes, and phenolic compounds. The conventional biological processes are not able to completely degrade these compounds there are new technologies is advanced oxidation processes Advanced oxidation processes are the technologies that generally use the hydroxyl radicals. .There are various degradation technique like cavitations (acoustic And hydrodynamic) photo catalytic oxidation. Among all AOP techniques, treatment of wastewater by cavitations is one of the finest alternative technique Degradation of sunset yellow dye is carried using one of the advanced oxidation processes is hydrodynamic cavitation. The effect of various operating parameters such as concentration of dye, pressure, pH of solution, Addition of H_2O_2 will be studied with the aim of maximum degradation. In industrial wastewaters such as dyes are not easy to conventional physical, biological and chemical purification process. Cavitation is the technique we study for treatment of wastewater by generating highly reactive free radicals.

Hydrodynamic cavitation is the capable to generating hydroxyl radicals.

Keywords: Hydrodynamic cavitation, Degradation, Dye, Advanced oxidation processes,

28. REMOVAL OF ORGANIC MATTER FROM WASTE WATER BY ADSORPTION

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ABSTRACT

Adsorption is an effective method for removing organic matter from wastewater using solid adsorbents. This study investigates the adsorption potential of activated carbon (CAC) and coconut coir (CC) by varying parameters such as adsorbent dosage, concentration, and pH. The adsorbents' high porosity enhances their adsorption capacity. Coconut shells were crushed, heated at 300°C for 45 minutes to improve porosity, and used to treat industrial effluent with an initial COD of 440 ppm and pH of 4.36. Batch adsorption studies showed that adsorption increased with higher adsorbent dosage. Optimal conditions were found at 4 g of CC and 5 g of CAC, achieving 89.09% and 90.90% COD removal, respectively, at pH 7. Freundlich isotherm provided a better fit than Langmuir isotherm. The study concludes that coconut coir is a promising low-cost alternative to commercial activated carbon for wastewater treatment.

Keywords:

Adsorption, wastewater treatment, coconut coir, activated carbon, COD removal, effluent treatment, adsorption isotherms, pH optimization, organic matter, pollutant removal.

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