

Proceedings of  
3<sup>rd</sup> National Conference on  
Current & Emerging Process Technologies  
25<sup>th</sup> January - 2020

# CONCEPT-2020



**Department of Chemical Engineering**  
in Association with  
**Indian Institute of Chemical Engineers**  
**K&C Student Chapter**

**Kongu Engineering College**  
**(Autonomous)**

Perundurai, Erode - 638 060. Tamilnadu.



Estd : 1984



Transform Yourself





# KONGU ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University – Chennai)  
PERUNDURAI, ERODE – 638 060 TAMILNADU

*Indian Institute of Chemical Engineers*  
*KEC Student Chapter*

&

**Department of Chemical Engineering**  
invite you for



## **CONCEPT-2020**

3<sup>rd</sup> National Conference on Current &  
Emerging Process Technologies

**January 25, 2020**





3<sup>rd</sup> National Conference on Current & Emerging Process Technologies

CONCEPT – 2020

INNOVATION FOR SUSTAINABLE DEVELOPMENT & ECONOMIC GROWTH

January 25, 2020



Estd : 1984

## KONGU ENGINEERING COLLEGE

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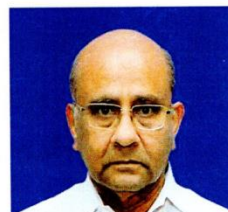
**P. SACHITHANANDAN**  
CORRESPONDENT



PERUNDURAI  
ERODE - 638 060  
TAMILNADU INDIA

### MESSAGE

I feel very glad to know that IChE- KEC Student Chapter and Department of Chemical Engineering, Kongu Engineering College are organizing the 3<sup>rd</sup> National Conference on Current & Emerging Process Technologies 'CONCEPT – 2020' on 25<sup>th</sup> January 2020.



The conference will be instrumental in promoting knowledge in the most recent advancements in current emerging process technologies and translating the knowledge to the specific engineering application.

I am confident that this technical conference will serve as an ideal platform for the students of Chemical Engineering and related disciplines to exchange their ideas and views.

I congratulate the faculty and the students of Chemical Engineering Department for conducting this conference for the consecutive third year.

I wish this event a grant success.

CORRESPONDENT

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3<sup>rd</sup> National Conference on Current & Emerging Process Technologies

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January 25, 2020



**KONGU ENGINEERING COLLEGE**

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Transform Yourself

**Dr. V. BALUSAMY**

B.E (Hons), M.Tech., PhD

PRINCIPAL

### MESSAGE

I am delighted to learn that IICHE – KEC Student Chapter and Department of Chemical Engineering, Kongu Engineering College are jointly organizing the 3<sup>rd</sup> National Conference on Current & Emerging Process Technologies 'CONCEPT-2020' on 25<sup>th</sup> January, 2020.



The field of Chemical Engineering and related disciplines have evolved to meet the challenges in the industry and society. It is important to expose the budding engineers to advance in this field. This conference provides a platform for academicians and students across the nation to interact with each other and to share their knowledge.

I congratulate the faculty and the students of Chemical Engineering Department for their hard work in organizing this event

I wish CONCEPT – 2020 a grand success.

PRINCIPAL

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### 3<sup>rd</sup> National Conference on Current & Emerging Process Technologies

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January 25, 2020



## KONGU ENGINEERING COLLEGE

(Affiliated to Anna University, Chennai)  
Perundurai, Erode - 638 052. Tamilnadu, INDIA.



**Dr. K. SARAVANAN**, M.Tech., Ph.D., (Tech)  
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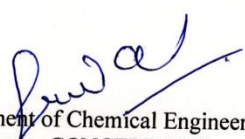


### MESSAGE



Innovations, inventions and subsequent developments in various fields of science and technology paved the way to the sophisticated life we live. However, each and every technology has its own inherent merits and demerits which need to be addressed at times. CONCEPT – 2020: National Conference on Current & Emerging Process Technologies is the third edition of the National Conference, organized by the Department of Chemical Engineering and IICHE – KEC Student Chapter, which provides a platform to exchange and update the significant developments taken place in the fields of modern science and technology and to discuss the issues and challenges thereof.

I am pleased to be a part of the conference CONCEPT – 2020. I am thankful to the faculty, staff and students who made this function a remarkable one.

  
Head – Department of Chemical Engineering &  
Chairman – CONCEPT 2020





## **ABOUT THE INSTITUTE**

Kongu Engineering College (KEC) was established in the year 1984. Approved by AICTE, New Delhi and affiliated to Anna University, Chennai. The Institution has completed 35 years of dedicated and excellent service in the field of technical education. The Institution offers 14 UG, 19 PG and 16 Research programmes in Engineering, Applied Sciences and Management branches. The Institution is one among the best self-financing engineering colleges imparting high quality technical education in Tamil Nadu and is rated 3rd among all self-financing colleges in India and 46th among all Engineering Colleges including IITs & NITs in India by MHRD & NIRF. The Institution has got NBA accreditation for all UG programme and is also ISO certified. It has also got the Best Engineering College award and the Best Principal Award. The Technology Business Incubator was established in the Institution with sponsorship from DST.

## **ABOUT THE DEPARTMENT**

The Department of Chemical Engineering was started in the academic year 1994 -1995 and offers B.Tech., and M.Tech., Degree programmes in Chemical Engineering. This department is one of the recognized research centers by the Anna University, Chennai. Well-equipped laboratories with advanced simulation software's like ASPEN, HYSYS, HTRI, gPROM and ProSIM's cater to the interests of aspiring students. The department focuses on imparting students with excellent technical knowledge to meet the needs of industries and research as well. The Indian Institute of Chemical Engineers Student Chapter, Kongu Engineering College started in the year 2001 aims to promote advancement of Chemical Engineering Science among the students and professionals.

## **ABOUT IIChE**

Indian Institute of Chemical Engineers was born just before the Indian Independence during the days fomenting with nationalistic inspirations. DrHiraLal Roy, the great visionary and pioneer of chemical engineering in India, along with few other stalwarts felt the need for such a forum within the country to rear the nascent initiatives for spread of chemical engineering education and foster the interest of the profession. A modest beginning was made on 18 May 1947 in a room of Jadavpur University, Kolkata, with 30 members, little fund and nominal infrastructure. Today, around 15,000 members are on its roll, the Institute has emerged as the apex professional body of chemical engineering professionals in India. The objectives of the Institute within their respective territorial limits, by organizing meetings, conferences and seminars; arranging workshops, refresher courses and counseling sessions; promoting research; guiding chemical engineering students in career planning; and initiating any other activities which are of social, technical and professional relevance to their members.



## ABOUT THE CONFERENCE

The continuous growth in population and the rapid industrialization lead to the degradation of the quality of the environment to a noticeable extent and the prominent change in The National Conference on Current & Emerging Process Technologies CONCEPT-2020 aims at bringing together the leading academic scientists, industrial persons, researchers and UG, PG students of AICTE approved Engineering colleges and UGC approved Arts & Science and pharmacy colleges to exchange and share their experiences and research outcomes in the aspects of emerging and advanced process technologies.

Our Major Domains are

1. Advanced Separation Technologies
2. Catalysis & Reaction Engineering
3. Biochemical Engineering
4. Chemical Process Technology & Safety
5. Renewable Energy
6. Green Chemistry
7. Nanotechnology
8. Food & Nutrition
9. Polymers & Composites
10. Petroleum Refining & Petrochemicals
11. Process Instrumentation, Control & Automation
12. Waste Water Treatment, Reuse & Recycle
13. Metallurgy & Material Technology
14. Process Modelling, Simulation & Optimization
15. Others - include advances in science , engineering and technology

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### 3<sup>rd</sup> National Conference on Current & Emerging Process Technologies

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January 25, 2020



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## AGENDA

**Venue :** Maharaja Auditorium

**Date :** 25/01/2020

08.45 am-09.30 am	<b>REGISTRATION</b>
09.30am-09.35am	<b>PRAYER SONG</b>
09.35am-09.40am	<b>LIGHTING THE KUTHUVILAKU</b>
09.40am-09.45am	<b>WELCOME ADDRESS</b> <b>Dr.K.Saravanan</b> M.Tech.,Ph.D.(Tech) Professor & HOD/Chemical
09.45am-09.50am	<b>PRINCIPAL ADDRESS</b> <b>Dr.V.Balusamy</b> B.E (Hons)., M.Tech., Ph.D., Principal, Kongu Engineering College
09.50am-09.55am	<b>PRESIDENTIAL ADDRESS</b> <b>Thiru.P.Sachithanandan</b> Correspondent, Kongu Engineering College
09.55am-10.05am	<b>INTRODUCTION OF CHIEF GUEST</b>
10.05am-10.15am	<b>INAGURAL ADDRESS</b> by <b>Dr. G. S. V. Ratnam</b> Honorary Treasurer, IChE Kolkata & Senior Principal Scientist, Central Leather Research Institute (CLRI)- Chennai
10.15am-10.20am	<b>RELEASE OF THE CONFERENCE PROCEEDINGS</b> <b>Dr.T.Kannadasan</b> Chairman, IChE Coimbatore Regional Center & Principal, Hindustan College of Engineering & Technology – Coimbatore
10.20 am-10.25 am	<b>HONOURING THE CHIEF GUESTS</b>
10.25 am-10.45am	<b>BREAK</b>
10.45am-01.00pm	<b>TECHNICAL SESSIONS</b>
01:00pm-01:45pm	<b>LUNCH</b>
01:45pm-04:00pm	<b>TECHNICAL SESSIONS</b>
04:00pm-04:30pm	<b>VALEDICTORY</b>



## INVITED SPEAKERS



**Dr. G. S. V. RATNAM** M.Tech., Ph.D.  
IChE Hony. Treasurer, Kolkata  
Senior Principal Scientist,  
Central Leather Research Institute (CLRI) - Chennai.

Dr. G. S. Venkata Ratnam is currently the Scientist In-charge, Chemical Engineering Pilot Plant Cell for Industrial Safety and Risk Analysis Chemical Engineering Division, Central Leather Research Institute (CLRI), Adayar, Chennai. He obtained B.Tech Chemical Engineering in 1980 and consecutively M.Tech Chemical Plant Engineering in 1983 from National Institute of Technology, Warangal. He earned his doctoral research in Hydrodynamic studies in Concurrent Gas-Liquid Downflow through Packed Beds from IIT Madras and completed in 1991. He has a work experience of 28 years and worked in projects involving Hazop, Safety Audit, Consequence Analysis, Risk Estimation, Process Development and Upscaling. He acted as Team Leader and completed Hazop and Safety Audit studies for several industries such as GC 25 Flare System of KOC-Kuwait, Chennai Petroleum Corporation Limited, Kochin Refineries Limited, Hindustan Petroleum Corporation-Visakhapatnam, Offsite and utility facilities of SFCL FZE, Jebel Ali, Dubai, Liquid Hydrogen Plant and Main Engine Test Facilities of ISRO-Mahendragiri, Kuwait Petroleum Corporation and IOCL-Paradip etc. He has published over 38 articles in the peer-reviewed International journals and also holds a patent for “A Novel Process for the Preparation of Fatty Esters using Enzyme as Catalyst for the Manufacture of Natural and Synthetic Fat-liquors used in Leather Processing”. At CLRI, he has guided 4 Ph.D research scholars and 18 post graduate and graduate students. He is a Life Member in Indian Institute of Chemical Engineers, National Safety Council of India and Loss Prevention Association of India. He has served as President, Secretary and Treasurer of NITW, Chennai Chapter and Chairman-IChE-Chennai Regional Centre. He is an elected Council Member of IChE (2019 – 2021) and presently serving as Honorary Treasurer of IChE-Kolkata.





## **INVITED SPEAKERS**



**Dr. T. KANNADASAN M.Tech, Ph.D**  
IICChE Chairman - Coimbatore Regional Centre  
Principal - Hindusthan College of Engineering and Technology, Coimbatore

Dr. T. Kannadasan is Principal of Hindusthan College of Engineering & Technology, Coimbatore. He obtained B.E. Chemical Engineering from Annamalai University in 1978, M.Tech in Plant Design from Coimbatore Institute of Technology, University of Madras in 1980 and Ph.D. in 2003 from Annamalai University, Chidmbaram. He joined as Assistant Professor in Coimbatore Institute of Technology in 1982 and elevated to Professor in 2011. He has thirty eight years of teaching and research experiences in addition to two years of industrial experience. During his academic carrier he was assigned with the duties like Director (Academic Courses), Dean (Academics), Vice-Chancellor (Officiate), & Director, Anna University, Coimbatore. He has guided sixteen Ph.D and twenty five M.Tech students. To his credit he has more than 60 publications in International and National journals. He is the reviewer for the journals like “The Journal of Institution of Engineers (India), Journal of Environmental Science and Engineering, India, Journal of Chemical and Biochemical Engineering, Basic Research Journal of Engineering Innovation (BRJENG), Asia-Pacific Journal of Chemical Engineering, Curtin University of Technology, Australia and John Wiley & Sons, Ltd. He also received research grants from various agencies like AICTE, DIT, AR&DB New Delhi, GTRE, Bangalore. In which, “*Design Analysis and Development of Foldable using structure for MAVs*” awarded with the fund of Rs. 97 Lakhs by AR&DB New Delhi is one of his remarkable achievements. His research areas are in Heat exchanger, Fluidization and Alternate energy. He has served as a member in Board of Studies in various institutions. He is Life Member in IICChE and ISTE, fellow and senior member in IE(I) and APCBEES. He was Honorary Controller of Examination, IICChE in 2014 and elected as Council member of IICChE during 2007 to 2009 & 2012 to 2014 and presently serving as the Chairman IICChE Coimbatore Regional Center.



## Oral Presentations

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2.	AST087	Mugaishudeen G, Sivaram K, Yogeswaran D and Pahalavan G	Feasibility studies on the treatment and reusability of RO brine generated in textile effluent treatment plant	1
3.	BCE030	Solai Komalarani, J R Anupama and V Sivakumar	Extraction of phytochemicals from aerial parts of cassia auriculata	2
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5.	BCE034	Rajendran Jensi, Senrayan Jeeva and V Sivakumar	Alkaline Pretreatment of Rice Straw for Fermentable Sugar Production	3
6.	BCE080	Dhivakar Karthick M and Rampradheep G S	Crack Healing Mechanism and Element Reaction of Bacteria in Cement Composites	3
7.	BCE086	Jerlin Dino J S, Sandhiya T, Sineha L and Anbarasi K	Cotton silk oil – a potential source for bio surfactant production	4
8.	BCE092	Chitra Devi V, Mothil S, Sineha L, Rahul Rajan A T and Santhosh P	Extraction of Polyphenols From Cashew Nut ( <i>Anacardium occidentale</i> ) Shells Using Rotocel Extractor	4
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12.	BCE120	Sathish Raam R, Dr.Chitra Devi V, Mothil S, Kesav Prasath R.S, Aravindan L.C and Kirubakaran P	Production of value-added products from <i>Chlorella vulgaris</i> using hydrothermal liquefaction	7
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		Thamarai Selvan		
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## ORAL PRESENTATIONS

### 1. Advanced Separation Technologies

#### AST078

#### EXTRACTION OF POLYHYDROXY BUTYRATE FROM BACTERIA PRESENT IN AGRICULTURE SOIL

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#### Abstract

Plastic usage plays a major role in various applications. Synthetic plastics are produced from non-renewable resources like Petrochemicals and their intended use results in solid waste generation, global environmental pollution and deterioration of properties of substances stored in plastic containers. Therefore, there is a great need for replacement of conventional plastic. Biodegradable plastic is the promising solution which is free from above disadvantages. Numerous sources and ways are available to synthesis bio-degradable plastics. In the current work, Polyhydroxy butyrate (PHB), a type of bio-degradable plastic is produced. PHB has physical and chemical properties similar to that of conventional plastics. PHB is a carbon energy source which is stored in *Staphylococcus.sp* and *Bacillus.sp* bacterial walls under stressful growth conditions (low nutrient supply). This study focuses mainly to isolate this bacterium from rhizospheric soil and culture their growth to extract PHB from the bacteria. The work also involves the study of application of the produced biodegradable plastic in the medicinal field.

**Keywords:** *Biodegradable plastic, Polyhydroxy butyrate, Bacillus and staphylococcus bacteria, Rhizospheric soil, Medical field*

#### AST087

#### FEASIBILITY STUDIES ON THE TREATMENT AND REUSABILITY OF RO BRINE GENERATED IN TEXTILE EFFLUENT TREATMENT PLANT

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#### Abstract

Textile industries have become one of the most important sectors in the industrially developed world. Textile dyeing process consumes large amount of water for processing the raw materials along with different chemicals and fixing agents. The effluent coming out of dyeing unit contains huge amount of organic and inorganic pollutants found to be unfit for recycle purposes and cannot be directly drained into the environment. There are many treatment methods available for treating the effluent water coming out of Textile mills. One of the conventional methods now followed is zero liquid discharge (ZLD) by which more than 90% of water is treated and reused by the industry either for processing or converted into steam and about 10% was stored in the form of sludge which shows no sign for reusability.



Though the ZLD process looks attractive and efficient, it involves huge amount of capital and operating cost in the likes of evaporators, crystallizer and ATFD (dryer). It was also found that ZLD contributes significantly to carbon footprint which results in global warming. In order to find a feasible solution for the above mentioned problem we have formulated and experimented on a novel technique comprises of packed bed zeolite and Ozonisation process. We studied the characteristics such as pH, colour, TDS, TSS, Hardness, Turbidity of the treated water and compared it with the Dye bath feed water characteristics. We concluded our study by dyeing the fabric with treated RO brine by our novel technique. The results show that we can reuse the treated RO brine for dyeing process replacing the conventional ZLD process.

**Keywords:** Dye Wastewater, Zero Liquid Discharge, Zeolite, Ozonisation, Reverse Osmosis, Reject management

## 2. Biochemical Engineering

### BCE030

#### EXTRACTION OF PHYTOCHEMICALS FROM AERIAL PARTS OF *CASSIA AURICULATA*

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#### Abstract

Bioactive compounds are phytochemicals found in plants that are capable of modulating metabolic processes and resulting in the promotion of better health. Phytochemicals such as polyphenols and flavonoids are considered health promoting and disease preventing dietary supplements. The present work deals with the extraction of bioactive compounds from *Cassia auriculata*, and also identification of the phytochemicals present in the *Cassia auriculata* extracts obtained from conventional (soxhlet) extraction technique. The maximum yield of Total Phenolic Content (TPC) and Total Flavonoid Content (TFC) of the *Cassia auriculata* samples (leaves, flowers, seeds, pods and combination of seed and pod) were determined. Out of all the samples, leaf extract gives the maximum yield for TPC and TFC. The phytochemical analysis to identify the nature of the components present in the leaf extract was carried out using Gas Chromatography – Mass Spectroscopy (GC-MS). SEM analysis was carried out to study how the extraction mechanism influenced the surface of the sample.

**Keywords:** *Cassia auriculata*, polyphenols, flavonoids, soxhlet extraction, TPC, TFC

### BCE033

#### EXTRACTION AND IDENTIFICATION OF PHYTOCONSTITUENTS FROM JAMUN (*SYZYGIUM CUMINI*) SEED

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#### Abstract

Phytoconstituents are the secondary metabolites present in plants which are responsible for eliciting the pharmacological effects in human. Recent developments in research focuses on

the extraction, identification and quantification of these phytoconstituents as these contribute a plethora of dietary and health benefits. *Syzygium cumini* L. (family, Myrtaceae) seeds, commonly known as Jamun or Indian blackberry, is native to India possesses a wide range of secondary metabolites that exhibit nutritional and pharmacological properties. The total phenolic content (TPC) and total flavonoid content (TFC) of Jamun seed extract obtained using aqueous alcoholic solvent extraction was determined. The phytochemical composition of extract was accomplished by Gas Chromatography-Mass Spectroscopy.

**Keywords:** *Jamun seed, Extraction, Phytoconstituents, GC-MS, Phytochemical Analysis*

#### **BCE034**

### **ALKALINE PRETREATMENT OF RICE STRAW FOR FERMENTABLE SUGAR PRODUCTION**

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#### **Abstract**

Renewable lignocellulosic biomass is used to produce ethanol as an alternative energy source using an inexpensive feasible process. Lignocellulosic biomass usually contains hemicellulose and cellulose which could be converted to fermentable sugar like glucose. In this work, Renewable agricultural by-product rice straw was selected and its lignocellulosic composition was estimated. They were pre-treated with various alkalis at different operating condition to delignify the biomass. The effect of process variables was studied and optimized for the maximum holocellulose recovery and delignification using alkali pre-treatment of rice straw (RS). The pre-treated rice straw (RS) was subjected to dilute acid hydrolysis at optimized conditions and the reducing sugar yield was estimated using DNS method. Fourier Transform Infrared Spectroscopy (FT-IR) analysis was used to confirm the removal of lignin after alkali pre-treatment of rice straw.

**Keywords:** *Rice straw (RS), Biomass, Delignification, FT-IR*

#### **BCE080**

### **CRACK HEALING MECHANISM AND ELEMENT REACTION OF BACTERIA IN CEMENT COMPOSITES**

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#### **Abstract**

Concrete is usually liable to cracking because of drying and thermal contraction or could also be applied load. Once micro-cracks development influences the reinforcement, not solely the concrete itself could also be broken, however conjointly deterioration happens within the reinforcement because of contact to water and O<sub>2</sub>, and presumably CO<sub>2</sub> and chlorides too. Repairing concrete structures presently takes tons of time and cash, however conjointly incorporates a vital impact on the surroundings. Here biomimetic's shows a substantial role in contagious concrete. The microbes mixed into fresh concrete, it is hard to prove that they

dynamically donate to calcium carbonate precipitation and the effects on concrete strength are variable. *Sporosarcina pasteurii*, *Sporosarcina Subtilis* will provoke organic compounds that square measure secures together with the Ca supply to impress the new composed small cracks by CaCO<sub>3</sub> precipitation. Through this paper, the subsequent distinguished facts regarding classification of a bacterium, self-healing of cracks in concrete, chemical action for crack correction, element reaction of a bacterium are studied. The application of bacterium in the construction field and hitches of microorganism concrete with fair measure detected and acknowledged from the opposite exploration mechanism are concealed. Solidifying of concrete is done in some ways like an application of precise spar causative bacterium for concrete repair.

**Keywords:** *Auto-Revive, bio enzymes, cracks, precipitation, chemical action, bacterium*

### **BCE086**

#### **COTTON SILK OIL – A POTENTIAL SOURCE FOR BIO SURFACTANT PRODUCTION**

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#### **Abstract**

Surfactants are mostly made up of non- renewable sources. The majority of the currently used surfactants are petroleum-based and are produced by chemical means. These compounds are often toxic to the environment and may affect the ecological problems. The main purpose of this study is to synthesize bio-surfactants from cotton silk oil using alkaline base. This paper presents the bio-surfactant synthesis of cotton silk oil using sodium hydroxide to study the effect of parameters such as temperature and time of sodium hydroxide on the bio-surfactant yield were studied. Cotton silk oil is chosen as raw material in synthesizing bio-surfactant due to its fatty acid content. The resulting bio-surfactant was washed with concentrated sodium chloride, filtered, washed with distilled water twice and dried in the oven at 60 °C for 24 hours. Then, the characteristic of the bio-surfactant was analyzed and compared with the commercialized detergent. The pH, interaction with hard water, emulsification with oil and height of foam fulfilled the set criteria by ASTM D460.

**Keywords:** *Biosurfactants, cotton silk oil, sodium hydroxide*

### **BCE092**

#### **EXTRACTION OF POLYPHENOLS FROM CASHEW NUT (*ANACARDIUM OCCIDENTALE*) SHELLS USING ROTOCEL EXTRACTOR**

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#### **Abstract**

Cashew nut shell liquid which is rich in polyphenols like cardanol, anacardic acid, and cardol was extracted from dried and crushed cashew nut shells using a Rotocel extractor. The extractor was fabricated using mild steel and a copper coil was mounted inside. The heating

of the solvent was done by passing hot water into the copper coil to analyze the effect of temperature on the extraction process. The solvents used in the extraction process were n-hexane and methanol. The extract was collected and the presence of polyphenols in the extract was identified using a high-performance liquid chromatography (HPLC) test. The process parameters are identified to be solvent temperature, feed to solvent ratio and feed rate. And then further studies on the medicinal values of the polyphenols mainly anacardic acid and cardanol in the treatment of cancer and other pathophysiological disorders were carried out.

**Keywords:** *Cashew nut shell, polyphenols, extraction, n-hexane, methanol*

### **BCE098**

#### **COMBINED ACTION OF SOIL MICROBES AND COMPOST WITH BIO-CHAR TO IMPROVE SOIL FERTILITY AND PLANTS GROWTH**

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#### **Abstract**

The soil is mostly affected by the addition of chemical fertilizers. This article present about the effects of composting of biochar in soil and with the microbes. Bio-char which is a stable solid, more rich in carbon and which can increase soil fertility of acidic acids and change the physio-chemical properties. Bio-char is affected by their intrinsic temperature sensitivities by organic C fractions and soil microbes. The compost of biochar will increase the organic C and total N levels in soils. Soil microorganisms are used to decompose organic matter and the different types of microbes are helpful to different types of organic matter, between their covering just about everything. In this review paper, the combined process of biochar and compost shows good performance and a high agricultural value to soils, and the use of microbes is an additional profit to improve the fertility and health of the soil. The result from various articles showed that compost, biochar, and microbes in the soil increase the nitrogen effect, reduce compost time and reduce impacts on the environment.

**Keywords:** *biochar, composting, microbial activity, soil fertility, plants growth*

### **BCE106**

#### **CARBON FOOTPRINT OF FOOD WASTE BY LIFE CYCLE ASSESSMENT (LCA) FRAME WORK**

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#### **Abstract**

Food waste is a major alarming issue in India. According to the United Nation Development Programmed (UNDP) about 40% of food produced India is wasted. To reduce the food wastage, government of India initiated a new Campaign Called “THINK EAT SAVE”. It is an anti-food wastage and food loss campaign aimed at reducing the wastage footprint. The emission of greenhouse gases (GHG) and their impact on global warming have been researched broadly for several decades. Due to the recent development in the Life Cycle



Approach (LCA) many programs of International bodies, now-a day's use the concept of LCA to assess the effects of wasted food product. With this background it is proposed to carry out a comprehensive analysis on carbon foot print of wasted food waste. The LCA methodology has been used for estimating the greenhouse gas (GHG) emission from the food waste originating from two different hostels in an institutional area in terms of carbon footprint. Field level monitoring and measurements were made continuously for 15 days for the assessment of food waste from hostels and questionnaire survey has been carried out with all the stake holders to identify and to understand the existing status to purchase of material, transport, processing and its use. The data from the field level study and results of questionnaire survey were given as input to the Food carbon scope TM a software tool used for the assessment of carbon footprint emerging from food and beverage products. Overall, dairy products and rice consumption shows the higher contributors of greenhouse emission.

**Keywords:** *Food waste, Green House Gas, Global warming, Life Cycle Assessment, Carbon footprint Climate change.*

### **BCE116**

#### **EFFECTIVE EXTRACTION OF RESVERATROL THROUGH HYDROTROPY**

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#### **Abstract**

Resveratrol, extracted from plants has both anti-bacterial and anti-fungal activity. A hydrotrope is a compound that solubilizes hydrophobic compounds in aqueous solutions by means other than micellar solubilization. Hydrotropes are compounds that improve the solubility of surfactants in water, particularly those structured to contain high levels of builders or alkalinity. Sodium xylene sulphonate, Toluene sulfonic acid, Na salt and sodium cumene sulphonate are used as hydrotrope since it has the ability to solubilize resveratrol in water. An efficient ultrasound-assisted extraction is used to process for resveratrol along with hydrotrope of known concentration. Since the resveratrol is highly sensitive to light the research is done in a dark environment. To find the solubility of the resveratrol in the solution, determined by the UV-visible spectrometer. The study was made with various concentration of resveratrol in defined (50 ml) of a hydrotrope. The analysis was done by varying concentration and temperature of the water bath. The sample is projected to HPLC to infer the purity or the concentration of the resveratrol in the solution. From the results, it is clear that the solubility increases with increase in the temperature. Particularly, sodium xylene sulphonate and sodium cumene sulphonate are identified as best hydrotropes for the extraction of resveratrol.

**Keywords:** *resveratrol, HPLC, sodium xylene sulphonate, sodium cumene sulphonate*

**BCE120**

**PRODUCTION OF VALUE-ADDED PRODUCTS FROM CHLORELLA  
VULGARIS USING HYDROTHERMAL LIQUIFACTION**

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**Abstract**

Using biomass as a feedstock for energy generation has emerged as an area of interest. This study focusses on the sustainable production of a bio-crude from the micro algal species *Chlorella vulgaris*. The derived crude oil is further upgraded by industrial process to serve as a feedstock for various uses. The constituents of this algae derived oil must be similar in structure and low in impurities, especially nitrogen and sulfur content, to allow for the economical upgrade of this oil to renewable diesel. Liquefaction were used to pre-treat algae and generate a biocrude primarily characterized by free fatty acids and unsaturated hydrocarbons. The reaction was carried out at a temperature and pressure of up to 250°C and 35 Pa respectively. The loading for the reaction was 20% W/W in water. The dry biomass of *Chlorella* algae (60 g) was converted under HTL conditions at a reaction time of 30 min. Here the extracted biomass was liquefied to bio-crude at 250°C. The bio-crude extracted is separated into oil, aqueous solution and bio-crude using DCM. The products obtained are further undergone elemental analysis testing (CHNSO) along with Gas chromatography and Mass spectroscopy (GC-MS). To make algal bio-crude economically viable, extraction of value-added co-products along with oil, appears absolutely necessary like Lutein,  $\beta$ -carotene,  $\alpha$ -tocopherol,  $\alpha$ -carotene.

**Keywords:** *chlorella vulgaris*, HTL, Bio Crude

**3. Catalysis & Reaction Engineering**

**CRE019**

**KINETIC STUDIES ON THE BIODEGRADATION OF ATRAZINE USING MIXED  
MICROORGANISMS IN BATCH REACTOR**

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**Abstract**

Atrazine degradation was carried out in batch reactors using the mixed microorganisms obtained from cow dung. Response surface methodology (RSM) was applied to optimize the process variables like pH, temperature, inoculum concentration and agitation speed. The linear and interactive effects of these process variables on atrazine degradation were studied. From the results, the optimum value of process variables for the maximum degradation of atrazine was: pH - 6.2, temperature – 28.2°C, inoculum concentration - 5% and agitation speed - 140 rpm. At these conditions, effect of atrazine concentration on atrazine degradation was studied. A maximum atrazine degradation of 87.2% was achieved at an initial atrazine concentration of 2 mg/L. Different cell growth models and substrate inhibition models were

employed to study the kinetics of atrazine degradation. The results show that Haldane model fits the data well with  $R^2$  value of 0.9235.

**Keywords:** *RSM, Atrazine, Kinetic, Inhibition, Biodegradation*

### **CRE077**

#### **EXPERIMENTAL INVESTIGATION ON ROTATING PACKED BED REACTOR**

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#### **Abstract**

Packed bed reactor which is commonly used for absorption process has disadvantages of less efficiency in Mass transfer and Heat transfer rates. To overcome this advantage, Rotating Packed Bed Reactor is introduced. RPB is reactor which replaces Gravitational force with Centrifugal force for more contact between two phases which increases mass transfer and heat transfer rates. In the proposed work, Air and water are the two different substances used for the study of mass transfer characteristics. Initially the work involves the investigation of Pressure drop. From the experiments carried out to determine pressure drop, it was observed that the gas flow rate is more important factor than the liquid flow rate because of less liquid hold up under centrifugal force and Mass transfer rate was enhanced under centrifugal force

**Keywords:** *Rotating packed bed reactor, Centrifugal force, mass transfer coefficient, Pressure drop*

### **3. Chemical Process Technology & Safety**

#### **CPTS014**

#### **STUDIES ON EFFECT OF DRYING CHARACTERISTICS ON PALMYRA SPROUT**

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#### **Abstract**

The drying kinetics was studied to determine the best drying method of palmyra sprout. Two drying methods include tray drying and microwave assisted hot-air drying were employed. Three different temperature (50°C, 60°C, 70°C) and power level (0.2kW, 0.4kW, 0.6 kW) selected and dried in both cooked and uncooked condition. According to the results, drying had a falling rate over time. Drying kinetics of sample was explained and compared using five mathematical models. To determine co-efficient of these models, non-linear regression analysis was used. The models were evaluated in terms of reduced chi-square ( $\chi^2$ ), Root mean square error (RMSE) and higher  $R^2$  values of experimental and predicted moisture ratios. Statistical analyses indicated that the model with the best fitness in explaining the drying behaviour of sample was logarithmic model for tray drying and Midilli model for microwave assisted hot-air drying. Moisture transfer in sample was also described using Fick's diffusion model. The highest effective moisture diffusivity  $8.017 \times 10^{-9} \text{ m}^2/\text{s}$  belong to tray dryer at 70°C,  $8.212 \times 10^{-9} \text{ m}^2/\text{s}$  at 0.6 kW for microwave assisted hot air dryer. The activation energy for both drying methods was ranged from 41.88 - 46.28 kJ/mol and 101.7 -

109.2 W/g, respectively.

**Keywords:** *Palmyra sprout, Tray drying, Microwave drying, drying kinetics*

### **CPTS022**

#### **STUDY ON BARRIERS IN THE IMPLEMENTATION OF SAFETY MANAGEMENT SYSTEM IN CONSTRUCTION PROJECTS**

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#### **Abstract**

The Indian society and economy have suffered human and Financial losses as a result of poor safety record in the Construction industry which is far from achieving a Zero-injury goal. Thus, effective safety management systems are critical ongoing efforts to improve safety. The safety management system (SMS) was introduced in the year 1980s to reduce the risk of fatalities, injuries and reduce material waste in the Construction industry. This study has taken the step in identifying the barriers and strategies to improve the implementation of Safety Management System at construction sites. In this study, current industry practices were reviewed to identify the benefits and obstacles of implementing SMS. This study was carried out by conducting questionnaire survey among various Construction related workers such as project manager, Safety Manager and so on to identify barriers in the implementation of Safety management system in their Construction firms. The responses were collected and analysed using SPSS Software. Results show that the top obstacles were putting safety as a lower priority due to cultural differences in organizations, Subcontractors face lack of bargaining power over main contractors, tight project deadlines, Improper conduction of Drug testing, obstruction by subcontractors and inactive participation for the SMS implementation by the project members. The findings from this study are beneficial to the industry as well, because they can intensify the industry practitioners understanding on SMS and help them to elevate the implementation of SMS in their workplaces. From the findings of survey, suitable suggestions and recommendations are given to overcome those obstacles in implementing Safety management system.

**Keywords:** *Safety Management System, Construction project, Benefits, Obstacles*

### **CPTS042**

#### **ASSESSMENT OF CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT IN INDIA**

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#### **Abstract**

The construction and demolition waste are one of the main components of total waste generated in India. It has a higher environmental impact, such as air, water, and soil pollution. It also causes fire by evaporation of hazardous solvent materials. There are various techniques available for waste disposal. However, the most commonly used techniques are



landfill and fly-tipping. The main reasons for not adopting sustainable methods are higher recycling cum transportation cost, a minimum number of recycling stations, unaware of waste disposal methods, unavailable of the market for recycles, and reusing waste. These issues can be overcome by improving the market for recycled materials, increasing the number of wastes recycling stations, providing incentives, imposing a heavy penalty for those who don't follow the law, and creating awareness among the company and public. In this paper, the construction and demolition waste disposal techniques are studied. The questionnaire survey is conducted to get the details of waste management in various companies. With that data, suggestions are given to remove barriers in waste management.

**Keywords:** *Construction and demolition waste, Generation, Fly-tipping, Waste management*

### **CPTS043**

#### **STUDY ON FALL ACCIDENTS AND ITS PREVENTION: AN APPROACH THROUGH QUESTIONNAIRE SURVEY**

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#### **Abstract**

Workers working in the high-rise building suffer from work-related injuries and fatalities by falling from heights. Identifying the factors causing fall accidents and identifying the available fall protection systems in the construction sites. Most of the workers not wearing the fall harness belt mainly due to lack of awareness and due to the discomfort of the strap. The article shows fall frequency and factors causing the fall accidents and the existing fall protection methods in the construction sites. By increasing the safety in the construction can improve productivity and reduce the cost spent on compensation and fee spent on health.

**Keywords:** *Construction Falls, Personnel Protective Equipment, Safety, Risk Management*

### **CPTS046**

#### **RISK SAFETY MANAGEMENT IN CONSTRUCTION OF METRO RAIL PROJECTS**

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#### **Abstract**

Metro projects are extremely-uncertain for the reason that of the natural uncertainties in-ground and groundwater conditions, multiple construction methods and tools. A lot of attempts made to execute risk safety management systems into urban metro rail construction projects. The aim is to construct a new type of model for risk safety management in metro rail projects, to study the existing risk safety management system and to identify the risks that occur during construction and to create, implement, and determine the efficiency of the model for safety in the construction of metro rail projects. The factors were identified from the literature study. The questionnaire survey has been framed with the nine risk factors and conducted among the employees working in metro tunnel construction projects, and analysis has been carried out through SPSS software.

**Keywords:** *Construction risk, Metro Projects, Safety management*

### **CPTS055**

#### **PREDICTION OF URBAN SPRAWL USING GEOSPATIAL TECHNIQUE - A CASE STUDY OF ERODE URBAN AREA FOR SMART CITY DEVELOPMENT**

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#### **Abstract**

In the Smart City Development Mission under the Government of India and Ministry of Urban Development, Erode is one of the nine shortlisted cities under Stage V challenge. According to Census 2011, Tamil Nadu held the lion's share among the urbanized states in India, with an urban growth rate of 48.5%. Moreover, the Erode city coverage area of 8.35 sq.km was expanded to 109.52 sq.km, which indicates the urban expansion of Erode city, hitherto. This dynamic expansion of the Erode urban area took place due to its potential in textile and industrial activities. This study aims to create the map of urban sprawl of Erode City for varying time. It predicts the future expansion of the built-up area to address the mission of Smart City development activities. With the help of Geographical Information Systems, the delineation of the build-up areas for three years with the time interval of 5 years is done from high-resolution spatial datasets, and the result is compared with the population growth rate. The built-up area was found to be 19.86 Sq.km, 23.05 Sq.km, and 27.75 Sq.km for the years 2008, 2013, and 2018, respectively. The study revealed that 3.72 % of the built-up area had been increased from the year 2008 to 2013 and a increase of 5.48% in the built-up area from the year 2013 to 2018. About 23.17 %, 26.89 %, and 32.37 % was urbanized in the years 2008, 2013, and 2018, respectively. It is supported by the finding that, the urban area expansion is correlated with the demographic profile of the study area which resulted in a positive correlation. The future expansion is predicted to be 39.61 % for the next five years, which shows the potentiality of urban growth with proper planning to achieve the Smart City Mission.

**Keywords:** *Geographical Information Systems, Prediction, Smart cities, Spatial representation, Urban sprawl*

### **CPTS099**

#### **STUDY ON FLUID FLOW OVER CORRUGATED OPEN CHANNELS**

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#### **Abstract**

Open Channel Flow is the fluid flow with a free surface open to the atmosphere as in natural water streams such as streams, rivers, and culverts, etc. This flow behavior of open channel flow is governed by the effects of viscosity and gravity relative to the inertial forces of the flow. In this study, the flow across the corrugated rectangular plate at different

parameters such as fluid flow rate, viscosity, and the inclination angle is studied. Particles of different density like fine sand, calcium carbonate, and activated carbon were mixed to enhance eddy flow in the channel, thereby increasing the turbulence, retention time. The fluid was then collected using a V- notch at the end of the open channel and recycled back into the system. The result of flow behavior obtained practically is compared by simulating the flow behavior in computational software.

**Keywords:** *open channel, rectangular corrugated plate, eddy flow, turbulence, flow behavior*

#### **CPTS104**

### **CARBON FOOTPRINT ASSESSMENT OF GREENHOUSE GAS INVENTORIES IN ERODE REGION- TAMIL NADU, INDIA**

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#### **Abstract**

The concentration of greenhouse gases rises up due to human activities, which in turn raises the atmosphere and results in global warming. In this year's index, India stands 12th position in the greenhouse emission. According to CCPI reports of 2019 states the India ranks 11th by improving its performance in the renewable energy sector joining in the group of medium performers. However, challenging in the year of 2030 India has an overall high rating in the emission category. These consequences can be identified by using an indicator such as GWP(Global warming potential) can be calculated mathematically and its expressed in terms of carbon dioxide(CO<sub>2</sub>).These consideration have provided remarkable fame to quantification of the contribution of various activities to global warming normally given as the term carbon footprint. Assessing a carbon footprint is a valuable step towards making measurable emissions reductions. The amount of GHGs (Greenhouse gases) emitted can be measured by Life Cycle analysis. The objective of the study is to examine the GHGs inventories in various regions and explores with bond of population and gross domestic product (GDP).The emission inventories include electricity, livestock, diesel generator, waste sector and LPG have been taken. The emission factors from the Intergovernmental Panel on Climate Change guidelines are used. Emissions of each GHG's are evaluated by multiplying the consumption of source by the corresponding emission factor. The total CO<sub>2</sub> emissions for Erode Taluk are estimated and suitable mitigation measures are suggested.

**Keywords:** *Global potential, Temperature, CO<sub>2</sub> emission, Life Cycle Assessment, GDP, Emission inventory*

#### **CPTS113**

### **STUDIES ON SOME AMINE COMPOUNDS AS CORROSION INHIBITOR FOR MILS STEEL IN HYDROCHLORIC ACID**

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#### **Abstract**

Corrosion of oil and gas well equipment during Acidizing process causes a severe problem in

industries, this problem can be prevented to a maximum extent by the application of corrosion inhibitors, Present work involves the study of some amine compounds such as Cyclohexylamine and n-octylamine as corrosion inhibitors for mild steel in 15% HCl at room temperature. The inhibitive action of the two inhibitors has been studied using the weight-loss method and potentiodynamic polarization method. Cyclohexylamine and n-octylamine yield inhibition efficiencies of 60% and 99.5% at 250 ppm concentration respectively. Surface coverage data were calculated. The adsorption of all these inhibitors on the metal surface in 15% HCl is bound to obey Temkin's adsorption isotherm. The surface morphology of mild steel with all these inhibitors is characterized by scanning electron microscopic studies, Reflectance studies were carried out using UV-visible spectrophotometer. Potentiodynamic polarization studies agree well with the results obtained by weight loss studies. All the above techniques reveal that Cyclohexylamine and n-octylamine act as very good inhibitors for mild steel corrosion in 15% HCl at room temperature.

**Keywords:** *Acidizing process, Corrosion inhibitors, HCl, Cyclohexylamine, n-octylamin*

### **CPTS117**

#### **HEAT TRANSFER ENHANCEMENT USING AN INTEGRATED HEAT EXCHANGER**

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#### **Abstract**

Heat exchangers are considered to be one of the most important equipment for thermal management in the process industries dealing with high energy devices accompanied. In the present scenario, many studies are carried out to enhance the rate of heat transfer by effectively utilizing maximum amount of energy possible. The objective of this study is also to increase the heat transfer rate using a hybrid heat exchanger. The hybrid heat exchanger is a combination of shell and tube exchanger and double pipe heat exchanger. It consists of double shell (i.e. an extra outer shell over a shell and tube heat exchanger). The enhancement in heat transfer rate is evident from the increment of heat transfer co-efficient (i.e. to increase the amount of heat transferred between the fluids) and develop product handling capacity. It is possible by annular region between the two shell that acts as the source of heat transfer medium for heating fluid. The presence of an extra shell over the shell and tube heat exchanger, is used to transfer the excess heat evolved from the inner shell. This excess heat is transferred to either third fluid where the annulus acts as preheater or by pivoting the outlet cold fluid to the annular region there by increasing the heat transfer coefficient.

**Keywords:** *Heat exchanger, Double pipe, Shell and tube, Annulus, Heat transfer coefficient*

### **CPTS121**

#### **DESIGN AND ANALYSIS OF COWDUNG SPREADER PROCESS**

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#### **Abstract**

India's main source of income is from agriculture, this sector contributes more than 50% of GDP. So, we have started a research to help the farmers. We found that before ploughing in



agriculture, the land farmers manually spread cow dung in the field. Then they plough the land. In order to complete this process, requirement of human and time are very more. To overcome this problem, we carried out the research to combine the process of ploughing and spreading cow dung into a single process with the help of rotovator. In this work, rotovator is attached to the storage tank in which the cow dung and fertilizer are mixed and spreaded in land. In between the rotovator and storage tank a grinder is fixed to grind the large particles of cow dung. and It is driven by a chain drive. Power of rotovator is given with the help of tractor by means of PTO (power take off) shaft.

**Keywords:** *Process technology, agriculture, separator*

## **4. Renewable Energy**

### **RE081**

#### **PRODUCTION OF BIODIESEL FROM WASTE COOKING OIL UNDER VARYING PARAMETRIC CONDITIONS USING HYDRODYNAMIC CAVITATION WITH A SINGLE HOLED ORIFICE**

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#### **Abstract**

Biodiesel can be obtained by the trans-esterification of oils and alcohols in the presence of catalysts such as NaOH, KOH, etc. The triglycerides present in oil gets converted into fatty acid methyl ester (FAME) and glycerol. In this study, waste cooking oil and methanol are treated in a hydrodynamic cavitation reactor in the presence of NaOH for trans-esterification reaction to take place. The two layers obtained namely, Fatty Acid Methyl Ester layer and glycerol layer is separated using a separating funnel and the excess solvent (methanol) in the methyl ester layer is removed by evaporation. The usage of waste cooking oil can be considered most economical in contrast with fresh refined oils and hydrodynamic cavitation is also more efficient in comparison with the conventional methods. The process was carried under varying parameters such as methanol to oil ratio (4:1, 6:1, 8:1), catalyst loading (0.55%, 0.75%, 1%) and reaction temperature (40°C, 60°C, 80°C). The biodiesel content present in the samples was analysed using a High-performance Liquid Chromatography (HPLC) analyser. From the results obtained, the optimum condition for high biodiesel content was found to be at a molar ratio of 6:1, with a catalyst loading of 1%, at a reaction temperature of 60°C using Design-Expert software.

**Keywords:** *hydrodynamic cavitation, trans-esterification, waste cooking oil, Design-Expert*

### **RE085**

#### **AN ALTERNATIVE SOURCE OF ELECTRICITY USING MICROBES**

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#### **Abstract**

Microbial fuel cells (MFC) represent a very promising technology for generating

electrical energy from organic and inorganic matter in wastewater using microorganisms as biocatalysts. MFCs provide a suitable, eco-friendly alternative to produce energy and to treat wastewater simultaneously. Various types of wastewater can be used as feedstock for the microbial fuel cells in which the exoelectrogenic bacteria produce electrons under anaerobic conditions. Compared with conventional aeration technologies for wastewater treatment, MFCs produce less sludge with net energy production. Nowadays electricity plays a major role in daily life. It is one of the methods of electricity production.

**Keywords:** *Alternative, Electricity, Energy, Microbial fuel cell*

## **RE100**

### **EFFECT OF TEMPERATURE ON HYDROTHERMAL CARBONIZATION OF WOODY LIGNOCELLULOSIC FEEDSTOCK**

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#### **Abstract**

Hydrothermal Carbonization (HTC) is a wet biomass conversion technology. It mimics the natural process of coal formation in the lab in just a few hours. HTC was conducted on three woody feedstock *Casuarina equisetifolia* L., *Wrightia tinctoria*, and *Neolamarika cadamba* in a 50 mL stainless steel closed autoclave reactor and heated at higher temperatures (180-250°C) under self-generated pressure keeping water to biomass ratio (6:1 v/w%), and reaction time (1.5 h) constant. The resulting lignite-like solid products called biochar with a little amount of liquid product having a high degree of aromatization and oxygen-containing groups. The mass yield and energy yield on biochar obtained during this process were calculated and the effect of temperature on HTC was studied. The biochar obtained at different temperatures was characterized using SEM analysis to study surface modification during the thermal conversion process.

**Keywords:** *hydrothermal carbonization, woody feedstock, temperature, mass yield, energy yield, SEM analysis.*

## **5. Green Chemistry**

### **GC044**

#### **STUDIES ON INFLUENCE OF PLASTICIZER ON THE PROPERTIES OF PLA BASED PACKAGING FILM**

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#### **Abstract**

The world requires appropriate packaging across anything that it carries. The use of plastic materials has been proven hazardous to mankind. Several alternatives are being searched upon for packaging. One such utility is the use of Poly Lactic Acid (PLA). PLA is one of the most promising polymers, because it is thermoplastic, biodegradable, and

biocompatible and has high strength, high modulus, and good process ability. In this present study PLA based biodegradable films were developed from the blends of plasticizer, surfactant (Tween80) and investigated the effect of plasticizer on Mechanical, Barrier, Optical and Degradation properties of biodegradable PLA films. The results of the present study clearly demonstrated that, PLA based films are biodegradable and good candidates to replace non- biodegradable synthetic plastic system in the consideration of food packaging systems.

**Keywords:** *Polylactic acid (PLA), Surfactant, Plasticizer*

### **GC051**

#### **GO GREEN BY “CEMENT LESS TECHNOLOGY IN CONSTRUCTION INDUSTRY”: A REVIEW**

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#### **Abstract**

This review paper deals with, Limestone Calcined Clay Cement (LC3) which contains as tiny as half clinker by utilizing calcined clay and limestone. The generation of clinkers is the fundamental cause of CO<sub>2</sub> emission, LC3 is the new technology used to reduce the clinker factor by replacing it up to 50%. The usage of supplementary materials will be greater advantage to reduce CO<sub>2</sub> emission, therefore the major part of utilizing limestone and calcined clay because it is abundantly available and economically viable. LC3 can be substituted for clinker which has similar mechanical properties and will increase durability, therefore the use of limestone and calcined clay with these will blends and control both the cost and environmental impacts. The refinement limit will reach faster with higher calcined content, slowly the formation of carbo-aluminate hydrates will get limited after it reaches its refinement limit. Here, the use of LC3 as supplementary material, gives equal strength which is similar to Ordinary Portland Cement (OPC), therefore to attain the greater strength the use of high range of clay isn't necessary, here the initial setting time of LC3 get delays when compared to OPC. Generally, the use of limestone above 15% is entirely limited in the development field but in different nations, it can be permitted up to 35% according to the temperature condition of the field. In this context, the goal is to study about why LC3, the use of LC3 as supplementary and described about the properties of limestone and calcined clay.

**Keywords:** *emission, Durability, Limestone, Cement*

### **GC073**

#### **EXPERIMENTAL STUDY ON POLYMER BASED SELF CURING CONCRETE**

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#### **Abstract**

Curing of concrete helps in controlling the dampness content during the early stage most

importantly for the first 28 days to achieve the desired qualities without any difficulty. It also helps in increasing the durability aspect of concrete by improving the microstructure of concrete. But proper curing is not done in all situations. The composition of concrete with less ratio of water to cement should be done with proper curing. Insufficient curing will significantly reduce the concrete strength in a significant manner. Self-curing is the process to control evaporation of water from concrete thereby maintaining the moisture control in normal for better curing. Curing is very important for the chemical reaction of cement which will directly influence the strength of concrete at an early age. The proper curing condition involves keeping the concrete in moist condition until the chemical reaction of cement complete to achieve its desired properties. The curing should not be delayed at any cost after the casting of the concrete and must continue for a specified time. It also helps in preventing shrinkage cracks. The focus of this project is related to rigid pavements since the surface to volume ratio of the pavements is large and hence it will be difficult to achieve complete curing. So internal curing helps in reducing the premature cracks there by improving the strength and durability of the concrete. The study aims to process proper curing of concrete and to learn the properties of fresh and hardened concrete. This paper signifies the properties of self-curing concrete which increases when polymer is added compared to the normal concrete.

**Keywords:** *Super Absorbent Polymer, Steel Slag, Self-Curing Concrete, Mechanical Properties, Rigid Pavement*

## **GC112**

### **GREEN SYNTHESIS OF Ag-DOPED TiO<sub>2</sub> NANOPARTICLE USING PLECTRANTHUS AMBOINICUS LEAF EXTRACT AND ITS APPLICATION IN PHOTOCATALYTIC DYE DEGRADATION**

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#### **Abstract**

The green Ag-doped TiO<sub>2</sub> nanoparticles were synthesized (TiO<sub>2</sub> NPs) using aqueous *Plectranthus amboinicus* green leaf extract. TiO<sub>2</sub> NPs have been characterized by X-ray diffraction (XRD), Ultra Violet–Visible (UV–Vis) studies, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) and Fourier Transform–Infra-Red (FT–IR) analysis. XRD pattern analysis confirms the presence of pure anatase crystalline structure of TiO<sub>2</sub>. The photocatalytic activity of the green Ag-doped TiO<sub>2</sub> NPs was ascertained by the photo-oxidation of methyl orange in aqueous solution illuminated with a low-pressure mercury lamp (approx. 254 nm). Almost complete degradation of dye occurred in 120 min. The results show that TiO<sub>2</sub> nanoparticles have suitable photocatalytic activity for the degradation of Methyl orange.

**Keywords:** *Green nanoparticles, Photocatalysis, Photo-oxidation, Methyl orange*



## 6. Nanotechnology

### NT032

#### **EVALUATION OF PROPERTIES OF POLYSACCHARIDE FILM INCORPORATED WITH CELLULOSE NANO PARTICLES**

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#### **Abstract**

The increasing restrictions on the production and usage of plastics in the past decade due to environmental pollution and climate change have increased the research and development in the field of biodegradable plastic alternatives. India as a nation houses a wide range of plants with high polysaccharide content. We have chosen Guar gum, a polysaccharide derived from the plant *Cyamopsis tetragonoloba*. This polysaccharide produces stable high viscous solutions and has the ability to form uniform films. However, the films do not meet the needs and standards of the market due to their inferior mechanical and barrier properties. Thus, to improve the properties of the films, cellulose Nanoparticles can be incorporated. In this research work, guar gum-based films were prepared with cellulose Nanoparticles as reinforcement and their properties were evaluated.

**Keywords:** *Polysaccharide films, Cellulose, Mechanical properties*

### NT035

#### **PREPARATION OF NANOPARTICLES FROM AGRICULTURAL WASTE RESIDUE**

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#### **Abstract**

Nanofillers play a critical role in polymeric blends. They are found to improve the mechanical, barrier and thermal properties of polymer blends due to its nano-scaled property and finds application in microelectronics, biosensors and coatings. Some of the currently used nanofillers include silica, alumina, magnesium hydroxide, calcium carbonate, titanium dioxide, silicon carbide which are inorganic in nature. The preparation techniques of these inorganic nanofillers are expensive and they do not degrade easily and so remains as contaminant in the environment affecting aquatic organisms. To overcome this major drawback, preparation of organic fillers is much sought after and therefore nanofillers from agricultural residues are prepared and incorporated in polymer materials. This study focuses on preparing lignocellulose particles as fillers. Direct Acid Hydrolysis was carried out to produce lignocellulose nanoparticles. The obtained lignocellulose particles are characterized using particle size distribution analysis, Fourier Transform Infrared (FT-IR) spectra analysis and TGA analysis.

**Keywords:** *Nanofillers, Lignocellulose, FT-IR, TGA*

**NT060**

**SYNTHESIS AND CHARACTERIZATION OF Ch-PEG-Ag NANOPARTICLES USING *FICUS CARICA* FOR THE APPLICATION OF MEDICAL TEXTILES**

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**Abstract**

Nanotechnology plays a major role in the field of medicine nowadays due its multifunctional properties. Medical textiles are one of the most expanding sectors in the technical textile market. Nanoparticles make a huge impact on healthcare sector and increasingly used in wound dressings and house hold products due to their antimicrobial activity. In this study, silver nanoparticles (Ag nps) were synthesized by using *Ficus carica* fruit extract as reducing agent and it was conjugated with chitosan nanoparticles stabilized with PEG molecules. The conjugated Ch – PEG – Ag nanoparticles were characterized by UV – Vis, FTIR, DLS - Particle Size & Zeta Potential to understand their physicochemical properties. Then conjugated Ch – PEG – Ag nanoparticles were test for antimicrobial activity. Further, the conjugated nanoparticles will be incorporated into medical textile due to their excellent properties.

**Keywords:** *Ficus carica*, Silver nanoparticles, Chitosan nanoparticles, Ch-PEG-Ag nanoparticles, Medical Textiles, PEG

**NT062**

**COMPARATIVE STUDIES OF HYDROXYAPATITE (HAp) NANOPARTICLES SYNTHESIZED BY USING DIFFERENT GREEN TEMPLATES**

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**Abstract**

Hydroxyapatite (HAp) nanoparticles have been widely used as a biocompatible ceramic in many areas of medicine, mainly for orthopedic and dentistry applications due to its resemblance to mineral bone and enamel. In this study, HAp nanoparticles were synthesized using tartaric acid rich different green templates such as banana peel, tamarind leaves, prickly pear fruits and grapes. The synthesized HAp nanoparticles from different green templates were characterized with FTIR, DLS, XRD, SEM analysis and their results were compared. FTIR spectrum with sharp peaks confirmed the presence of functional groups such as OH and PO<sub>4</sub><sup>3-</sup> groups in the synthesized HAp nanoparticles. Particle size analysis showed the acceptable size range and average particle size for all the synthesized HAp samples. Zeta potential confirmed that the synthesized HAp nanoparticles had negative charges on its surface and the higher stability was showed for HAp nanoparticles from grapes. XRD spectrum confirmed that the synthesized HAp nanoparticles matched with the standard HAp peaks and it was found that the crystallite size was low for HAp nanoparticles from grapes. SEM images showed the morphological characteristics of synthesized HAp nanoparticles and the uniform distribution of HAp nanoparticles with spherical flower like structure was

observed in grapes template. Therefore, HAp nanoparticles synthesized using grapes extract showed better results when compared with other green templates.

**Keywords:** *banana, grapes, green templates, hydroxyapatite, nanoparticles, tamarind, prickly pear*

#### **NT067**

### **ROLE OF NANOTECHNOLOGY IN HUMAN HEALTH CARE & BIOMEDICAL SCIENCE**

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#### **Abstract**

Nanotechnology plays a major role in the technical world at present in all aspects. Nanotechnology has a large impact in human healthcare and biomedical area. It will make a huge impact in the next decade. Using nanotechnology, the scientists provide a large solution in many humans. The major role of nanotechnology in human health care are Disease Diagnosis, Drug Delivery, Cancer Treatment, Fitness Monitoring, Antibacterial Treatments, Wound Treatment, Human Cell Repair, Tumor treatment, Diagnosis of Genetic Diseases, Kidney Disease, Heart Disease and more. Using deep analysis of bio particles, the Disease are Diagnosis and further treatment will be continued for better requirement. In this paper we summarized about how nanotechnology play a major role in health care & biomedical science

**Keywords:** *nanotechnology, Biomedical, Diagnosis*

#### **NT114**

### **EFFECT OF NANOPARTICLES ON PERFORMANCE OF VAPOUR COMPRESSION REFRIGERATION SYSTEMS**

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#### **Abstract**

Nanotechnology is an emerging technology which finds its application in many fields. Development of Nano refrigerants provides a new research frontier improvement in the performance of Vapour Compression Refrigeration system. The studies on Nano refrigerants are still in its budding stage. The intention of present work is to provide a comprehensive analysis by experimentally investigating coefficient of performance and performance parameters of a VCR system using Titanium dioxide nanoparticles along with Polyester oil-RL68H in different proportions. Various outlooks of future scope associated with the studies of Nano refrigerants have also been analysed. It has been seen that the vapour compression refrigeration system with titanium oxide nano particles exhibited enhanced COP. It has been found that inclusion of nanoparticles in vapour compression refrigeration contributes

noteworthy augment in the performance of refrigeration system.

**Keywords:** Nanotechnology, Titanium dioxide, Polyester oil, COP

## 7. Food & Nutrition

### **FN07**

#### **PLANT BASED COMPOSITE MILK AS SUBSTRATE FOR YOGHURT PRODUCTION**

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#### **Abstract**

Milk is a nutrient-rich, white liquid food produced by the mammary glands of mammals. Early –lactation milk contains colostrum, which carries the mother’s antibodies to its young and can reduce the risk of many disease. Composite milk is a blend of milks from both animal and plant origin. In this study the milk sources used for the production of composite yogurt are cow milk, coconut milk and cottonseed milk. The aim of the present study was to optimize the yoghurt process for composite milk yoghurt using response surface modelling approach. The application of RSM to design optimization is aimed at reducing the cost of expensive analysis methods. RSM obtained 30 trials based on responses such as acidity, pH, and moisture content. From the result of response surface methodology, the composition of milk samples for composite milk yogurt production were obtained. The microbial content of composite milk yogurt is found to be  $1.78 \times 10^4$  CFU/g. The parameters analyzed were energy (71.3 kcal), total ash (0.63%), moisture content (88%), pH (4.98), and titrable acidity (0.67%). The shelf life of the composite milk yogurt at ambient condition and for refrigerated condition was studied. It was observed that incorporation of coconut milk and cottonseed milk with cow milk in the production of yogurt is been nutritionally and organoleptically superior in most quality attributes.

**Keywords:** yoghurt, composite milk, microbial content, response surface methodology (RSM), colony forming unit (CFU).

### **FN09**

#### **OPTIMIZATION OF COMPOSITION FOR PREPARATION OF EDIBLE CUTLERY USING RESPONSE SURFACE METHODOLOGY (RSM)**

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#### **Abstract**

The objective of the study was to prepare nutritious edible cutlery using the composite flour such as wheat flour, pearl millet and barnyard millet and optimize the composition based on water absorption characteristics at various temperatures like room temperature (29°C), cold temperature (10°C) and hot temperature (50°C) using Box Behnken design under Response Surface Methodology (RSM). Levels of independent variable such as wheat flour, pearl millet and barnyard millet flour have been varied from 0-40 %, 0-50 % and 0-50%



respectively. Data obtained from the experimental analysis was analyzed using pareto analysis of variance and it was fitted with second order polynomial equation. Composition was optimized using Derringer's desired function methodology based on both individual and combination of all responses, optimum composition was found to be at 50.12 % wheat flour , 26.18 % barnyard and 0% of pearl millet flour under this composition water absorption was 49.76 % , 35.93 % and 41.09 % for 10°C, 29°C, 50°C respectively. The optimized sample had the nutritional value of 83.68 g/100g of carbohydrate, 2.36 g/100g of total fat and 5.67 g/100 g of protein. It was biodegraded within 5 days and this kind of product was replaces plastic cutlery.

**Keywords:** *composite flour, edible cutlery, nutritional value, RSM, water absorption*

## **FN029**

### **DEVELOPMENT OF STARCH BASED PACKAGING FILM**

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#### **Abstract**

Research and development in natural polymeric materials with new formulation strategies to develop composites have potential applications in food packaging. Advancement in food packaging materials is expected to grow with the advent of cheap, renewable and sustainable materials with enhanced barrier and mechanical properties. In recent years starch and natural fibres application as bio-filler/reinforcement materials in composites increased due to its availability as renewable materials and ecological concern. Observing the tremendous advantages and opportunities associated with natural fibres and starch, there is a need to develop natural fiber reinforced starch-based biodegradable packaging material. Hence, the objective of the research is to develop and characterize fibre reinforced starch based biodegradable films for food packaging applications. Agricultural waste residue rich in cellulose is utilized to extract fibres by pre-treatment. The properties of fibre reinforced films are analyzed and studied.

**Keywords:** *Food Packaging Films, Biodegradable, Starch, Filler*

## **FN096**

### **STUDIES ON PHYSIOCHEMICAL AND SENSORIAL PROPERTIES OF BISCUITS USING COMPOSITE PROTEIN RICH FLOURS**

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#### **Abstract**

Now-a-days people tend to consume baked products that contribute to high carbohydrate levels which leads to ill health effects. Among the bakery products biscuits are the most preferred product due to their longer shelf life and distinct palatability. The key ingredients like refined wheat flour and sugar contribute to increased carbohydrate level and may lead to diseases like obesity. Our objective is to enhance the protein and fibre content by complete

replacement of the refined wheat flour with composite protein rich flours and reduce the carbohydrate content by replacing sugar with a mixture of fructo-oligo-saccharide and maltitol. Almond, Coconut and Flaxseed flours have been taken in the ratios (2:2:1, 2:1.5:1.5, 2:1:2) and maltitol fructo-oligo-saccharide mixture have been taken in the ratio of (70:30) for biscuit preparation. The protein and fibre values obtained for the three ratios of flours taken are 10.64g, 5.80g, 2.66g and 38.46g, 7.69g, 16.67g respectively. The biscuit made from the ratio 2:2:1 was found to have higher protein and fibre values and had good sensorial properties. Textural properties like hardness, cohesiveness, chewiness was good compared to the control sample. The protein and fibre content of the first formulation (2:2:1) made were higher compared to other formulations.

**Keywords:** *Coconut flour, Almond flour, Flaxseed flour, Maltitol, Fructo-oligo-saccharide*

## **8. Polymers & Composites**

### **PC013**

#### **FLEXURAL STRENGTH STUDIES ON CONCRETE USING SYNTHETIC POLYMER AS SHEAR REINFORCEMENT**

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#### **Abstract**

Steel Plays major role in the field of construction industry. Due to Rapid industrialization and urbanization has increased to twofold the demand and usage of materials. Increasing demand creates depletion of material. Excessive waste plastic creates Environmental pollution, in order to reduce the waste, it can be converted into polymers and can be used in the field of construction industry. Waste material can be used to replace the steel material in concrete as an alternative source. Usage of synthetic material increases day by day due to its advantages. A study was carried out to understand the behavior of synthetic polymers to be used in different fields. The research work is carried out for different polymers. It is found from the results that Strength of synthetic polymers is more when compared with other polymers and can be used as reinforcement in concrete there by reducing the weight of concrete member. The application of using synthetic polymer in concrete is not only limited to the weight reduction but also it reduces the cost of construction. Cost of construction can be reduced in the following ways, first it does not need skilled labours, second reduces the corrosion risks. Synthetic polymer has higher tensile strength compared to conventional steel polymer, hence more investigation to be carried out to expose the potentiality of the material.

**Keywords:** *Steel, Waste plastic, Synthetic polymers, Strength*

**PC020**

**STRENGTHENING OF STRUCTURAL ELEMENTS USING POLY VINYL ALCOHOL AND GLASS FIBER COMPOSITES**

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**Abstract**

Engineered Cementitious Concrete (ECC), widely known to be Bendable Concrete. The advantage of ECC is that it can be molded easily in the required form and it is utterly reinforced with short random fibers, both polymer, and non-polymer fibers. It is known for its good compressive, tensile and flexural behavior. To overcome the absence of strain hardening property in conventional concrete, ECC was instituted. In the sulfate chloride environment, the ECC material remains durable when compared to normal concrete. As per referred works of literature the fibers usage should not exceed 2%. In this study, four mixes were made. There were two mixes with mono fibered reinforcement and two mixes with hybrid fibered reinforcement. Here the PVA and Glass fibers are hybridized to reach the mechanical performance of the ECC mixes. Superplasticizer used here in this study, improves the workability and minimize the shrinkage cracks. As far as mechanical performance is concerned, hybrid fiber reinforcement of PVA and glass is shown to be high in compression, mono fiber reinforcement with glass is shown to be high in both tensile and flexure.

**Keywords:** *Bendable Concrete, strain hardening, PVA fibers, glass fibers, compressive, tensile, flexure*

**PC021**

**EFFECT OF EXPANSIVE AGENT AND SHRINKAGE REDUCING ADMIXTURE ON ECC WITH POLYVINYL ALCOHOL AND POLYPROPYLENE**

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**Abstract**

This research aims to determine the strength of engineered cementitious composites. The strength tests like compressive strength, flexural strength, and direct tensile strength were determined. Expansive agent and shrinkage reducing admixture were used. These admixtures used to enhance the strength and reducing the water content in the mix. The expansive agent also increases the compressive strength, but it does not give any changes in direct tensile and flexure properties. Polyvinyl alcohol and polypropylene fibres have excellent structural properties that are ideal for Engineered Cementitious Composites. Superplasticizer increases the workability of the fresh concrete and also it reduces shrinkage. Glass fibre is also used because of its high tensile property. The hybridization with low and high modulus fibres are engaged to increase the strength of Engineered Cementitious Composites.

**Keywords:** *Compressive strength, direct tensile strength, engineered cementitious, composite, expansive agent, flexural strength, shrinkage reducing admixture, polymeric fibres*

**PC052**

**EFFECTS OF MINERAL ADMIXTURES IN MECHANICAL PROPERTIES OF HIGH-PERFORMANCE CONCRETE**

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**Abstract**

Mineral admixtures are widely used as cement replacement materials in high-performance concrete (HPC). While the effect of mineral admixtures on rheological properties of the mechanical behavior of HPC has been investigated by many researchers, further research is needed to optimize the effective dosage of these admixtures in high-performance concrete (HPC). This paper discusses the effect of Silica fume, Quartz powder and Alccofine on the properties of fresh and hardened concrete. The aim of this silica fume and alccofine powder is used as a cement replacement. The replacement of alccofine varies from 5% to 15%. Parameters such as compressive strength, split tensile strength and flexural strength were studied. The result of the experimental study indicates that the addition of silica fume and alccofine improves the mechanical properties of plain concrete.

**Keywords:** *Silica fume, Quartz powder, Alccofine, High Performance Concrete*

**PC053**

**ASSESSMENT ON FRESH PROPERTIES AND HARDENED PROPERTIES OF SELF COMPACTING CONCRETE**

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**Abstract**

Self-compacting concrete is type of self-flowable compacting concrete. It compacts with its property. It is an innovative type concrete it does not requires additional vibration for compaction. It is useful for concreting in deep and narrow columns and a very congested area. It also used in high rebar structures, in bridges and deep earthwork areas. One of the limitations of SCC is high Portland cement is used for the preparation of mixtures, it increases the cost of construction. In this type of concrete chemical admixtures used for attaining designed strength and it also increases the cost. For this purpose, mineral admixtures are introduced to reduce cost and also increases the fresh concrete properties, mechanical properties, durability, and other purposes. Because mineral admixtures are mostly waste materials or industrial by-products, if it used as a proper replacement material for Portland cement, it reduces the cost and also the hydration process. Fly ash, Ash of Rice husk, Silica fume, Metakaolin, Granulated blast slag are some of the mineral admixtures frequently used partially replacement on Portland cement. Chemical admixtures such as polycarboxylate based superplasticizer are mostly used in all the test mixtures. It acts as a water reducer in concrete. It also increases the workability. Mineral admixtures also increased the strength, control segregation, and bleeding and increased the concrete properties. A review on SCC with various admixtures in both chemical and minerals, its effects on concrete



with different mix proportions fresh concrete property and hardened concrete properties were discussed briefly in this paper

**Keywords:** *Admixtures, Fresh Properties, Hardened Properties, Self-Compacting Concrete*

### **PC071**

#### **EXPERIMENTAL STUDY ON MECHANICAL AND DURABILITY PROPERTIES OF POLYESTER FIBER CONCRETE**

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#### **Abstract**

Worldwide, a deep research is currently being conducted concerning the use of fiber plastic wraps, laminates and sheets in the area of repair and strengthening of reinforced concrete members. Research advances has been made in the development of fiber reinforced concrete to control cracks, crack propagation in plain concrete, and also to increase the overall ductility of the material. However, there are many types of fibers with different material and geometric properties, the exact fracture behavior of fiber reinforced concrete materials which is not clearly understood still. Synthetic fibers do plays a dominant role for a long time in a variety of applications for their high specific strength and Young's modulus. The aim of this project is to evaluate the performance of polyester fibers in concrete and make the concrete cracks free. The optimum percentage of polyester fiber in concrete was found with respect to cube compressive strength at the age of 28 days and the durability properties were also tested for cube at the age of 90 days. The cube specimen was cast at different percentage such as 0.10%,0.20%, 0.30%, 0.40%, and 0.50% by total mass of concrete. The optimum level of polyester fiber was found. From this study, the polyester fibers are suggested to be effectively used for control cracking, increasing the overall property like compressive, flexural, tensile strength and overall quality of concrete. Hence, Polyester Fiber Reinforced Concrete (PFRC) has the potential for large scale use in concrete construction.

**Keywords:** *Polyester fiber, Durability, Fiber Reinforcement Concrete, Cracking, Mechanical properties*

### **PC075**

#### **EXPERIMENTAL STUDY ON MECHANICAL BEHAVIOUR OF SELF-COMPACTING CONCRETE WITH HYBRID FIBRE REINFORCED CONCRETE**

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#### **Abstract**

In this paper, fiber-reinforced self-compacting concretes were developed for precast building components, incorporating polymeric synthetic slipping fibers and to achieve the mechanical behavior of self-compacting fiber, polypropylene and steel fiber. To attain the workability, compressive and splitting tensile strengths, compositions were determined by

preliminary tests on self-compacting materials with various proportions of polypropylene and steel fibres. The tests confirmed the positive contribution of fibers in the mechanical behavior of self-compacting concrete. The comparison between self-compacting concrete and self-compacting polypropylene and steel fiber of similar mechanical characteristics indicated a possible better mix bond in the case of self-compacting types. The results also showed that the mechanical behavior of the self-compacting concrete, polypropylene and steel fiber.

**Keywords:** *Mechanical properties, SCC, Polypropylene fibre, Steel fibre*

## **PC089**

### **SYNTHESIS OF BIO-POLYMERS FROM PROSOPIS JULIFLORA**

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#### **Abstract**

The adverse environmental degradation created by various plastics produced from petroleum products is a major concern for the world nations. The developed and developing nations have adopted various strategies on the production and usage of highly hazardous conventional plastics. Various research works have been undertaken to formulate a sustainable alternative for conventional plastics. In this regard, an effort was made to synthesis a biodegradable polymer for large scale commercial usage in packaging applications. Biodegradable polymers can be produced from various resources. The study involves the production of bio-plastic from Banana peel and Prosopis juliflora. Cellulose, a major component required for biopolymer synthesis was extracted from Prosopis juliflora which then combined and processed with a dried banana peel. Additives and preservatives that contribute to the polymer characteristics were added in suitable proportions and processed under defined conditions. The mixture was then dried at a temperature of 130 °C to yield the final product. The biopolymers thus produced were tested for its water absorption capacity, thermal resistance, tensile strength, biodegradability and microbial attacks. It was observed that the water absorption capacity of the biopolymer was lower for lesser starch and higher cellulose concentrations. The tensile strength was found to be 1.67 N/mm<sup>2</sup> which was due to the addition of zinc oxide. No microbial attack was observed during storage and it was also found that the biopolymer was able to withstand high temperature up to 130 °C during its usage.

**Keywords:** *biopolymer, banana peel, cellulose, plasticizer, preservative*

## **PC102**

### **EXPERIMENTAL STUDY OF LOAD SETTLEMENT BEHAVIOUR OF CIRCULAR FOOTING RESTED OVER M-SAND**

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#### **Abstract**

M-sand finds widespread applications in construction sector in the past few years.

This study analyses load carrying capacity of circular footing rested on M-sand bed. M-sand is prepared with four relative densities, 25%, 50%, 75% and 90% and 27.9°, 33°, 36.9° and 39.4° are the friction angles obtained from box shear test. Load tests are performed on a model footing in a custom made tank. Higher bearing capacity and lower settlements are found when relative density is 90%. The results are examined with Terzaghi's analysis and good similarity was found.

**Keywords:** *fine-grained soil, polypropylene fiber, nano-silica, white cement, Expansive soil, UCS*

## **PC110**

### **FABRICATION AND PROPERTIES TESTING OF SISAL FIBER REINFORCED EPOXY COMPOSITES WITH RANDOM ORIENTATION**

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#### **Abstract**

Due to environment and sustainability issues, this century has witnessed global attention in green technology in the field of materials science through the development of composites. So Natural fiber-reinforced composites have become an important field of the green composite. The main objective of this paper is to investigate the effect of sisal fiber reinforced epoxy composites in random orientation. Sisal fiber is abundant, low cost, degradable and good strength. Sisal fiber is separated from sisal leaf using suitable techniques and those fibers surface are modified by chemical pre-treatment method (alkali treatment 5% NaOH solution). Pre-treated fiber with constant length and volume of fiber is reinforced in the matrix. Pure epoxy and sisal fiber reinforced epoxy composites are prepared by hand lay-up method. Thus the prepared composites are tested as per ASTM standard. Fourier-transform infrared spectroscopy, SEM analysis, water absorption, tensile strength, flexural strength, and % elongation are examined for the composite. The properties of the prepared composites are compared with pure epoxy. Experimental results show that the fiber-reinforced composites showed enhanced mechanical properties compared with plain epoxy composites.

**Keywords:** *sisal, epoxy, hand lay-up, reinforcement*

## **9. Petroleum Refining & Petrochemicals**

### **PRP108**

#### **STUDY OF ALKALINE HYDROLYSIS OF POST CONSUMED PET WASTES FOR RECYCLING**

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#### **Abstract**

Among various recycling methods for PET, chemical recycling is the most established and convenient strategy as per the principles of sustainable development. In hydrolysis process, the depolymerisation of PET yields Terephthalic acid (TPA) and ethylene glycol

(EG). This process leads to the complete depolymerisation of PET to its monomers, carried out by the chemical recycling of PET waste in the reactor and 92% conversion of PET will be obtained at 90 degree Celsius. The operational parameters such as time, temperature and amounts of ethylene glycol and catalysts are varied to achieve greater efficiency of the reaction. Chemical recycling of post consumed waste PET bottles via alkaline hydrolysis. At the complete conversion of the PET wastes, terephthalic acid is obtained which is examined by the FTIR Spectrometry and XRD analysis. The viscous nature of the product is examined by using Rheometric analysis. It is usually carried out in the aqueous alkaline solutions of sodium hydroxide. This method is also relatively facile and cost effective. The important objective of this paper is to eliminate or reduce PET plastic wastes and convert completely into value added products for additives.

**Keywords:** *Polyethylene terephthalate (PET), Alkaline Hydrolysis, waste management, Recycling and Reuse.*

### **PRP115**

#### **IMPACT OF ALCOHOL ON PERFORMANCE CHARACTERISTICS OF A CI ENGINE**

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#### **Abstract**

The use of alcohols in CI engines is an alternative way of minimizing dependence on diesel fuel. Specifically, higher alcohols such as n-propanol, n-butanol (nB) which consists of high carbons and can be produced from mainly non-edible sources. They can directly be mixed with diesel fuel which in return could result in significant improvement in performance. For this reason, the examination of the use of such high carbon alcohols in diesel engines has become significantly important in recent years. In this work, 2 different binary (D-nB) fuel mixtures were obtained by mixing the diesel fuel with n-butanol. In this work, butanol is blended with diesel in varying proportions and its experimentally tested in diesel engine. Experimental results were compared with that of diesel which indicates significant improvement in performance.

**Keywords:** *Alcohols, n-propanol, n-butanol.*

## **10. Process Instrumentation, Control & Automation**

### **PICA008**

#### **SIMULATION OF VARIOUS PI CONTROLLERS BASED ON COMPUTATIONAL ALGORITHMS FOR AN NON- INTERACTING SYSTEM**

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#### **Abstract**

In this research work, various conventional and computational algorithms for designing a



PI controller is studied. The lab scale non interacting liquid tank system is considered for this study and simulation purposes. The mathematical model of system is identified and various conventional methods for design a PI controller is implemented. The simulation results of the conventional algorithms are compared with various computational algorithms and the effectiveness is demonstrated both in simulation and real time environment using Simulink software. Also, the closed loop performance indices are tabulated and compared.

**Keywords:** *Non-Interacting system, SISO Process, PI Controller, Fuzzy Controller, Genetic Algorithm, Ant Colony Optimization.*

### **PICA023**

#### **THE CONTROL ACTIONS NEEDED IN A RECIRCULATING AQUAPONICS SYSTEM**

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#### **Abstract**

Aquaponics, as a vertical farming technique, has undergone various developments to make it an efficient replacement for conventional farming methods. Hydroponics, a soil-less farming method has been combined with Aquaculture (fish-farming) to obtain a system with its own ecological balance. The disadvantages of these systems are overcome by the symbiotic relationship between them. As a result, Aquaponics has a better production and growth rate than other farming methods. The various elements that are to be considered during the design of an Aquaponics system have been discussed in this paper.

**Keywords:** *Aquaponics Systems, Symbiosis, Microflora, Dissolved Oxygen*

## **11. Waste Water Treatment, Reuse & Recycle**

### **WWT015**

#### **REMOVAL OF ACID BLUE 9 FROM AQUEOUS SOLUTION USING GROUNDNUT SHELL AS AN ADSORBENT**

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#### **Abstract**

In this study, groundnut shell powder has been successfully used as an adsorbent for the removal of Acid blue 9 (AB9) dye from aqueous solution. The effect of various parameters such as temperature, adsorbent dose, contact time, adsorbent size and agitation speed were investigated. The optimum conditions obtained from response surface methodology are: temperature-36.2°C, adsorbent dose (3.5 g/L), contact time (204 min), adsorbent size (150 mesh), and agitation speed (235 rpm). At the optimum condition, experiments were performed at various pH and initial dye concentration. Based on these results, kinetics and equilibrium studies were carried out by pseudo-first order, pseudo-second order model and Langmuir and

Freundlich equations.

**Keywords:** Adsorption, Dye, Acid blue 9, Ground nut shell, Kinetics

### **WWT017**

## **BIODEGRADATION OF TANNERY WASTEWATER IN A FLUIDIZED BED BIOREACTOR WITH LOW DENSITY BIOMASS SUPPORT**

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### **Abstract**

A multiphase, fluidized bed bioreactor with low density particles was used in this study to treat the highly complex tannery industry wastewater. The characteristics of tannery wastewater were studied. It shows high organic content and dark in colour. The performance of a three phase fluidized bed bioreactor with low density biomass support was studied under various average initial substrate concentrations, by varying COD values (1560, 3220, 4680 and 6240 mg/L) and for various hydraulic retention times (40, 32, 24 and 16 h) based on COD removal efficiency. The optimum bed height for the maximum COD reduction was found to be 80 cm. Experiments were carried out in the bioreactor at an optimized bed height, after the formation of biofilm on the surface of low-density particles (Density = 870 kg/m<sup>3</sup>). Mixed culture obtained from the sludge, taken from tannery industry effluent treatment plant, was used as the source for microorganisms. From the results it was observed that increase in initial substrate concentration leads to decrease in COD reduction and COD reduction increases with increase in hydraulic retention time. The optimum COD removal of 89.5% occurs at an initial substrate concentration of 1560 mg/L and for the hydraulic retention time of 24 h.

**Keywords:** Tannery, Fluidization, COD, Wastewater, Low density

### **WWT018**

## **ADSORPTION OF NICKEL FROM AQUEOUS SOLUTION USING SAW DUST AS SORBENT**

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### **Abstract**

Sorption of nickel from aqueous solution was carried out using saw dust, obtained from plywood was investigated. Batch experiments have been carried out to find the effect of various parameters such as pH, temperature, sorbent dosage, metal concentration and contact time on the sorption of nickel using sawdust powder. Response surface methodology (RSM) is employed to optimize the process parameters. Based on the central composite design, quadratic model was developed to correlate the process variables to the response. The most influential factor on each experimental design response was identified from the analysis of variance (ANOVA). The optimum conditions for the sorption of nickel were found to be: pH – 5.3, temperature – 35.7°C, sorbent dosage – 3.1 g/L, metal concentration – 100 mg/L and contact time – 27 min. At these optimized conditions the maximum removal of nickel was found to be

86.70%.

**Keywords:** *Nickel, Adsorption, Sawdust RSM, Metal removal*

### **WWT076**

#### **TREATMENT OF TEXTILE EFFLUENT USING SUB SURFACE FLOW CONSTRUCTED WETLANDS**

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#### **Abstract**

Vertical sub surface flow constructed wetland systems for waste water treatment have been proven to be effective, low cost and sustainable alternative for conventional waste water treatment technology. The removal of pollutants like BOD, COD and heavy metals like chromium in these systems depends on physical, chemical and biological processes that naturally occur in wetlands and are associated with vegetation, sediment and their microbial communities. In the current work it has been intended to treat textile effluents using sub surface flow constructed wetlands. The setup is constructed using acrylic tube. Adsorbents like eggshells, gravels, wood husk and activated charcoal were used for the adsorption of pollutants and were filled in the acrylic tube. Escherichia Coli is the microorganism used for the digestion of organic matters and the plant species – Cana Indica was grown on the surface of the constructed wetland. The BOD and COD removal efficiencies were greater than 40%.

**Keywords:** *Constructed Wetlands, Natural adsorbents, Vertical flow, textile effluent*

### **WWT091**

#### **ASSESSMENT OF GROUNDWATER POLLUTION IN NORTH ERODE CITY**

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#### **Abstract**

Water is the most essential element for life on Earth. Water has always been a life-sustaining drink to humans and is essential for the survival of all organisms. Our study area is on the North Erode City of Tamil Nadu. Erode north is surrounded by many dyeing industries, chemical industries & tanneries. These industries directly dump their effluents into the groundwater and get polluted. In our project, a systematic study has been carried out to assess the water contamination and the effect of effluents discharged by the industries. We have collected 20 groundwater samples in the erode region and the water quality is assessed using the quality parameters such as Temperature, pH, Electrical conductivity, Chlorides, Alkalinity, Total Hardness, Total Dissolved Solids, Total Solids, Suspended solids, Dissolved Oxygen, Chemical Oxidation Demand. The results obtained from few samples are found to be highly polluted due to the impact of dyeing industries, tanneries, and chemical industries. Therefore, it is highly important to take conservation of the groundwater quality in this region for future sustainability.

**Keywords:** *Contamination, Effluents, Pollution, Groundwater, Industries*

**WWT107**

**SYNTHESIS OF NANO-ADSORBENT AND IT'S APPLICATIONS IN INDUSTRIAL EFFLUENT TREATMENT**

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**Abstract**

Disposal of untreated waste in the environment leads to the creation of harmful disease, greenhouse gases and climate change. So the demand arises to eliminate or avoid these kinds of risks to the both society as well as environment. Because of this there are enormous solutions and ideas that are playing a crucial role in this risk avoiding activity. One of the ideas is to treat the waste or discharge what ever gets out from industries for disposal. In this study a novel carbon nano fibre adsorbent is synthesized by hydrothermally. Various experiments have been conducted to study the effect of this adsorbent on industrial effluent and obtained great results in the removal of toxic substances.

**Keywords:** Horse manure, Ethylene blue adsorption, Carbon nano fiber, novel adsorbent

**WWT111**

**ADSORPTIVE REMOVAL OF PB(II) FROM ELECTROPLATING WATER USING FRESHLY PREPARED COTTON SEED CAKE CARBON**

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**Abstract**

Activated carbon was prepared from cottonseed cake (CSCC) by chemical activation with sulphuric acid followed by bicarbonate addition, was applied for the adsorption of Pb(II) from aqueous solutions. Batch experiments were carried out to study the effect of various parameters such as contact time, pH and adsorbent dosage on Pb(II) along with, commercial activated carbon (CAC). Surface morphology and elemental analysis of CSCC and CAC before and after adsorption were characterized by SEM and EDX. Compared with CAC, the CSCC had a wider applicable range of pH from 4.0-8.0. Equilibrium data agreed well with Langmuir isotherm for CSCC and CAC respectively. Based on the Langmuir isotherm the adsorption capacity was found to be 53.48 mg g<sup>-1</sup> for CSCC which was significantly 3.3 times greater than that of CAC (13.45 mg g<sup>-1</sup>). The kinetic data followed the pseudo-second-order model and thermodynamic parameter shows that the process is spontaneous in nature.

**Keywords:** Adsorption, Cottonseed cake carbon, Kinetics, Langmuir, Freundlich Isotherm

## 12. Metallurgy & Material Technology

### MMT047

#### **A STUDY ON LOW COST AND ENERGY EFFICIENT MATERIALS FOR SUSTAINABLE HOUSING**

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#### **Abstract**

One of the necessities of human beings is suitable housing. At current, there are millions of people without an appropriate roof over their heads. The world requires environmentally friendly, sustainable housing of low cost to afford to house for the millions of impoverished peoples. Housing construction should tame the existing method of conventional construction, which is affluent and has meager thermal performance and ignores the substantial environmental impact of high embodied energy of the building process. Consequently, there is a requirement for developing better low-cost sustainable building techniques. In this paper, an eco-friendly residential building and low-cost building are identified, and the materials used in those buildings are identified. The cost of each material is collected, and it helps to know the low cost and energy-efficient materials for construction. Few green building materials are also identified, which can be used for sustainable housing.

*Keywords: Eco-friendly material, Energy-efficient material, Low cost, Sustainable housing*

### MMT050

#### **STUDY ON FLEXURAL STRENGTH OF CONCRETE WITH PARTIAL REPLACEMENT OF CEMENT WITH HYPOSLUDGE AND CRIMPED STEEL FIBRES**

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#### **Abstract**

The use of waste materials as replacement of natural resources is one of the best approaches to improve sustainability. Paper mill sludge (Hypo sludge) is a major economic and environmental problem for the paper and board industry. Most of the wastes sent to dumping sites and landfills. These waste materials could be incorporated in concrete manufacturing as a replacement for cement due to its similar pozzolanic property. From the literature studied it was clear that use of hypo sludge in concrete increases compressive strength but on the other hand decreases flexural strength. In order to overcome the decreased flexural strength, fibres could be used. This project involves partial replacement of cement with Hypo sludge and also adding steel fibres to improve the flexural strength in M25 grade of concrete mix. The hypo sludge replacement percentage was chosen to be 10% and the fibres were added on two different percentages i.e., 0.5% and 1%. The prisms were made and tested for flexural strength. The test showed that 0.5% usage of steel fibres given 7.4% improved flexural strength compared to conventional concrete mix and the 1% fibre proportion showed greater flexural strength of 18.4% higher strength compared to the



conventional concrete mix.

**Keywords:** *Cement Replacement, Flexural Strength, Hypo Sludge, Pozzolanic Material,, Sustainability, Steel Fiber, Waste Management.*

### **MMT058**

#### **LABORATORY STRENGTH BEHAVIOUR STUDY OF COHESIVE CLAY SOIL STABILIZED WITH LIME**

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#### **Abstract**

Geotechnical Engineers are in search of new sustainable material, which can be suitable and effectively used to improve the engineering properties of clay soil. In this research lime is used as stabilizing material in the varying percentage of 1%, 3%, 5%, 7%, 9%, 10%, 12% and 15%. Lime is used as an admixture to stabilize the soil. The swelling pressure of the soil mixed with various proportions of lime such as 1, 7, 12 and 15%. Unconfined compression test. Liquid limit, Plastic limit, standard compaction proctor test, free swell index test and one dimensional consolidation test are conducted to evaluate the strength of the clay soil in the laboratory. The experimental results showed that the maximum strength improvement was achieved in the 12% lime mixed with clay soil and the strength improvement in the range of 300kPa. The swelling test results showed that the addition of lime to the soil decrease the swelling nature of clay soil.

**Keywords:** *Clay soil, Lime, Unconfined compression test, Free swell index test*

### **MMT061**

#### **PERFORMANCE OF LIGHT WEIGHT CEMENTITIOUS COMPOSITES USING GIB**

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#### **Abstract**

This research paper aims to develop a light weight cementitious composites using light weight fine aggregates. GIB is used to replace the fine aggregate by 100%, 80%, 60%, 40%, 20%, 0%. Poly Vinyl Alcohol (PVA) fibres were added in the mix to improve the tensile and flexural strength. Compressive strength, split tensile strength, flexural strength was tested in the specimen after a curing period of 28 days. From the result, it was observed that the presence of GIB in the light weight cementitious composite reduce the self-weight of the component. Hence increase in GIB enhances the strength of the cementitious composites.

**Keywords:** *LWE, CCPV, AGIB, Mechanical properties*

**MMT063**

**MECHANICAL BEHAVIOR OF ENGINEERING CEMENTITIOUS COMPOSITE  
WITH DOLOMITE**

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**Abstract**

This paper discusses about the experimental work on the Engineering Cementitious Composites (ECC) with Dolomite. ECC is well-known for its strain hardening capacity and ductility in nature. Polymer fibre namely Polyvinyl Alcohol fibre is used instead of steel reinforcement bars. Large quantity of cement is used in ECC when compared with the conventional concrete. The steel slag causes the great threat to the environment in terms of quantity and disposal. In this project the steel slag is used instead of fine aggregate to develop green components. The experimental studies were done in compression, impact, tension and creep has been tested and summarized in this studies. The physical and mechanical performance of material has been tested after 28 days of curing at normal temperature conditions. The ECC showed about it is better than the conventional in compression strength, tensile strength and flexural strength is discussed and presented.

*Keywords: ECC, Dolomite, Ductile, Steel Slag, Tensile, Compression, Creep strength*

**MMT066**

**MECHANICAL PROPERTIES OF HYDROXYAPATITE PREPARED BY  
MECHANO CHEMICAL METHOD USING DOLOMITE**

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**Abstract**

Hydroxyapatite (HAp) was synthesized using the dolomite as the calcium precursor by the mechano chemical method. The structural, morphological and mechanical properties was characterized by the X-ray diffraction (XRD), Scanning electron microscopy (SEM) and Energy Dispersive X-ray spectroscopy (EDX) analysis. Linear shrinkage, Hardness by Nano indentation and wear studies (Pin on disc) were done for the prepared HAp. The XRD analysis confirmed the formation of hydroxyapatite at a temperature of 1050°C and SEM-EDX image confirmed Ca/P ratio of HAp as 1.6678.

*Keywords: Bioceramics, Hydroxyapatite, Mechano chemical synthesis*

**MMT070**

**PERFORMANCE STUDY ON WASTE ADMIXED CLAY SOIL  
UNDER STATIC AND REPEATED LOAD**

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**Abstract**

In order to improve the poor soil / problematic soil is used as sub grade soil on one side and effectively utilize the wastes on the other side, an integrated approach has been carried out in this investigation to study the effect of ash on soil. The present study focus on the stabilization of soil using fly ash and rice husk ash individually. Soil sample (LL=73%,CH group) was collected from Chemmenchery area, Chennai. The testing program was conducted on the clayey samples mixed with different percentages (0,4,8,12,16,20,24,28,32,36,40) of fly ash and rice husk ash, included Atterberg limits, Free swell index, compaction, unconfined compression test, tensile strength test, consolidation, direct shear test and repeated load test. It is found that liquid limit and plasticity index decreased with the fly ash and rice husk ash contents. The FSI value also got decreased with fly ash and rice husk ash content. Treatment of soil with fly ash and rice husk ash showed a general reduction in maximum dry unit weight with increase in the ash content. The optimum moisture content increased with increase in fly ash and rice husk ash content. There is an increased trend in the unconfined compressive strength with fly ash and rice husk ash content upto optimum percentage. Tensile strength of soil increased with % fly ash and rice husk ash content up to the optimum content. Furthermore, the strength increased 2 to 3 times with the curing period compared to uncured sample. From the direct shear test it was observed that undrained cohesion value decreased and angle of internal friction value increased with percentage of fly ash and rice husk ash. In repeated load test, the elastic deformation increased and plastic deformation decreased with percentage of fly ash and rice husk ash.

**Keywords:** Fly ash, Rice husk ash, Poor soil, Liquid limit

**MMT101**

**IMPROVISATION OF SCALE-FREE REHEATING IN STEEL BILLETS**

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**Abstract**

In hot strip mills, in the steel industry, reheat furnaces are utilized to reheat slabs, billets, blooms, etc., to uniform Rolling temperatures prior to hot working. During this reheating operation, hot steel surfaces react with the in-furnace oxidizing atmosphere resulting in the formation of an iron oxides layer (scale). The yield loss due to this phenomenon depends on furnace operating conditions, i.e. steel temperature, excess combustion air, steel residence time in the furnace, etc., and ranges between 1.5 to 3% of

reheated steel. In this project, the oxidation of mild steel during reheating cycles as a function of the furnace atmosphere, the steel residence time in the furnace and steel temperature was investigated. The primary objective of this project is to develop and test a scale-free heating system that reduces scale formation in the steel reheating process, resulting in a substantial reduction in energy use, improvement in steel quality, and significant cost advantages for the Indian steel industry.

**Keywords:** *reheated steel, yield loss, oxidation, reheating cycles, scale-free*

### **13. Process Modelling, Simulation & Optimization**

#### **PMS090**

##### **PROCESS MODELING WITH TOLERANCE DESIGN**

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##### **Abstract**

Process modelling with Tolerance design introduces a framework for including different uncertainties at the chemical plant design stage. Through an integrated robust optimization approach and problem formulation, equipment, operating, control and quality costs are simultaneously taken into account, leading to system, parameter, and tolerance design. Rather than using single pointwise solutions in the decision space, operating windows leading to overall best performance are identified and defined. Such windows and their width allow us to point out control needs and goals at a very early stage of plant design. Two small-scale case studies (for a CSTR and a batch distillation column) provide enough evidence to support the practicality of the optimization framework - the robust solutions found are different and much better than the corresponding solutions obtained with the fully deterministic optimization paradigms. Process control, parameter, and tolerance design issues are not explicitly taken into account at the design stage for most chemical plants.

**Keywords:** *Integrated Robust Optimization, Problem Formulation, Equipment, Operating, Control System, Tolerance Design*

### **14. Other Advances in Science, Engineering and Technology**

#### **OAS002**

##### **ANALYSIS AND PREDICTION OF SMART DATA USING MACHINE LEARNING**

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##### **Abstract**

In the field of agriculture, Machine Learning had been one of the most important technologies. The need aroused as the sensor technologies were proved to be advantageous in agricultural industry. Various sectors like food safety and breeding had its contribution, because agriculture got improvised by that. The data on agriculture were taken from Tamil

Nadu data set. A comparison of consecutive years (2009-2013) was made in the production of crops among different seasons like Rabi, Kharif. The data available helped in the prediction of crop yield. Thereby, its analysis allowed farmers as well as companies for retrieving the value from certain data and also improved productivity. The Indian economy basically relied on the agricultural sector. Agriculture products needed a variety of protection like protection from insects, protection against rodents and many such undesired attacks in the field of agriculture. Growing status of crops was tracked by segregating, recognizing and measuring areas of different crops in Tamil Nadu and also estimated production early in the year. One of the biggest problems to be tackled is agricultural planning. According to study, crop yield rate, soil classification, weather prediction could be done using Machine Learning techniques. Crop selection was a major issue where cropping using available resources was a major concern.

**Keywords:** *Agriculture, big data, IoT, Machine Learning*

## **OAS024**

### **BIONIC CONTACT LENS**

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#### **Abstract**

Can you imagine that we could see the world around in front of our eyes as in science fiction movie like Terminator? Yes, it is possible using Bionic Contact Lens. Looking through the Bionic Contact Lens, we could see the display super imposed on the real world. Bionic lens is a Polymer based lens with similar shape and characteristics of everyday contact lens. The contact lens is embedded with LED, electronic control circuits, Micro batteries and Miniature antennas. In future, internet will be on our contact lens, we would simply, 'BLINK' and we will be online. Think about the contact lens that can link to our cell phone and show everything that could be on the internet through a display simply in our eyes. Imagine being able to see translation of a language as someone speaks a different language to you. These are all possible by using the bionic contact lens. Hence the bionic contact lens is used as computer human interface. These are developed to provide a virtual display that could have a variety of uses from assisting the visually impaired to video game industry. This lens could someday be connected to our brain through nerve impulses and a computer chip implanted into our eyes. So when we think of something we want to search, the bionic contact lens will automatically display it.

**Keywords:** *Contact Lens, LED, Virtual Display, Micro Fabrication technique, Miniature camera.*



**OAS025**

**INGESTIBLE SENSOR**

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**Abstract**

Ingestible sensing capsules are fast emerging as a critical technology that has the ability to greatly impact health, nutrition, and clinical areas. These ingestible devices are noninvasive and hence are very attractive for customers. With widespread access to smart phones connected to the Internet, the data produced by this technology can be readily seen and reviewed online, and accessed by both users and physicians. The outputs provide invaluable information to reveal the state of gut health and disorders as well as the impact of food, medical supplements, and environmental changes on the gastrointestinal tract. One unique feature of such ingestible sensors is that their passage through the gut lumen gives them access to each individual organ of the gastrointestinal tract. Therefore, ingestible sensors offer the ability to gather images and monitor luminal fluid and the contents of each gut segment including electrolytes, enzymes, metabolites, hormones, and the microbial communities. As such, an incredible wealth of knowledge regarding the functionality and state of health of individuals through key gut biomarkers can be obtained.

**Keywords:** *Wireless capsules, Smart pills, Telemetry, Small intestine, Swallowable, Biomarker*

**OAS026**

**STUDY ON IDENTIFICATION AND EFFECTIVE UTILISATION  
OF BUFFERS IN INVENTORY MANAGEMENT**

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**Abstract**

Inventory management involves storage, identification, procurement, and transportation. It is indelibly linked to safety, productivity and schedule performance. The main objective of the study is to effectively utilize the buffers for the constant supply of materials in the construction site. Buffer inventory also called buffer stock is a cushion of supply over forecast demand. Based on the theoretical framework regarding the inventory management system and its benefits, an empirical study has been conducted. The researcher administered a questionnaire method to collect data. The target population of the present study is restricted only to the project managers, quality managers to the various construction related works. The collected data were analyzed by using SPSS 16. Results show that the top obstacles were a note of buffer in an organization, variation of cost are considered, the requirement of additional equipment for buffers, Involvement of transportation management for the responsibility logistician, loss of quality concerning time. Thus reliability test has been conducted and Cronbach's Alpha value is 0.69 and found that data has to be reliable.

**Keywords:** *Inventory management, buffer inventory, safety stock, supply and demand*

**OAS027**

**IDENTIFICATION OF CAUSES OF CONFLICTS AND DISPUTES IN  
CONSTRUCTION INDUSTRY**

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**Abstract**

In the construction industry number of participants from various professions having different levels of knowledge and talents were involved and the conflicts were unavoidable. Conflicts and disputes were the major factors that would lead the projects to be unsuccessful. Thus it was necessary to identify the causes of conflicts and disputes to complete the project on the estimated time, budget and quality. The main aim of the project was to identify and analyze the main causes of conflicts and disputes in construction projects. To attain the aim, a literature review was conducted to identify the factors causing conflicts and disputes. The factors identified were categorized into eight and the main causes of conflicts and disputes were determined. Finally, the analysis was conducted to rank the major factors causing conflicts and disputes in the construction industry.

**Keywords:** *Conflicts, Disputes, Unavoidable, Construction Industry*

**OAS028**

**EFFECTIVE SELECTION OF RESOURCES FOR CONSTRUCTION USING  
PROGRAM TOOL**

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**Abstract**

In the Indian scenario construction industry facing a major problem in cost and time overrun. Effective time performance and cost performance are very important to execute the project in a successful manner by keeping them within the prescribed schedule and cost. Overall cost and duration of construction projects affected by the effective resource selection factor. This paper's objective is to rectify the improper selection of resources by a programming tool. Field survey and codebook study did collect the needed data to feed in the programming tool. Prepared tool gets distributed and making to access by every stakeholder of construction projects. This may result in the selection of construction resources as effectively. The term cost overrun in the resource part will be reduced.

**Keywords:** *Cost overrun, Construction Industry, Program tool, Android Mobile Application*

**OAS037**

**A STUDY ON FACTORS INFLUENCING RESOURCE LEVELLING AND SMOOTHING ON TIME COST TRADE-OFF**

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**Abstract**

Construction enterprise has been described as the entire industry related to the utilization of human, natural, and financial resources in the conception, design, and production, protection, and demolition of constructing and civil engineering works. Construction projects are precise in nature, having their personal difficulties, uncertainties, and dangers, posing never-ending questions concerning the resources and fees. The achievement of a mission relies upon the performance with which the assignment management receives the paintings done through using the deliberate resources of guys, substances, equipment, time, and money. It is also necessary to smooth the resources when you have to optimize the resources, and you cannot extend the schedule. Twenty-two questionnaires are distributed to various engineers through Google forms. Finally, we concluded that there are many factors which affect the resource levelling and smoothing to some extent. Some of those factors are Lack of awareness, thinking resource levelling as an unnecessary process, Over allocation of resources, Prohibited work breaks lead to stress, Budget Overrun and unnecessary labour charges, Problems while handling multiple projects mostly affect the Resource levelling and smoothing process.

**Keywords:** *Resource leveling, Resource Smoothing, Resource Scheduling, Construction planning, Resource constraints, Task dependencies, Parallel tasking.*

**OAS041**

**ASSESSING THE INFLUENCE OF TEAMWORK IN CONSTRUCTION FOR LARGE SCALE PROJECTS**

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**Abstract**

Teamwork is much theoretically established within the construction management literature at the strategic level, i.e. how project owners, consultants, contractors and the following supply chain works as a 'team' to achieve the project objectives, the relative paucity of attention given to this aspect in the context of onsite construction activities is an evident gap in knowledge. A survey instrument is adopted from the mainstream organizational and management literature which aims to capture the perceptions of onsite construction works. The factors identified from the supporting literature has high influence on onsite teamwork. Semi-structured interviews with the concerned member can helps to teamwork practice. The teamwork practices will enable the organizational authorities to systematically develop high-performing crews.

**Keywords:** *Teamwork, Communication, Enthusiastic, competency, Performance*

**OAS064**

**QUALITATIVE ASSESSMENT OF STAGNATED SURFACE WATER  
USING GEO INFORMATICS**

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**Abstract**

Irrespective of the sources, the water used for drinking and irrigation contains dissolved salts, suspended solids and other foreign matters. The quantity and quality of these materials influenced by natural and anthropogenic activities determines its usability for the human beings and plants. Such a kind of stagnated water body with the geographical extent of 11°16'54.36"N 77°36'38.23"E - 11°16'38.79"N 77°36'27.00"E in the Perundurai region is analysed for its suitability for drinking and irrigation usage in this project. Initially, reliability of its water availability and storage is assured by the shoreline change study. The aerial extents of that water body were mapped and analysed from 2007 to 2018 for every year interval using high resolution Remote sensing imageries. The area of water spread has increased about 35.79% between the years and it assure the quantitative potentiality of the water body. For assessing the quality of water, ex-situ analyses on TSS, BOD, DO, Cl, So<sub>4</sub>, pH, Turbidity, Hardness, Alkanity and Acidity were carried out in 16 sampling locations in the water body and their spatial variations were mapped. Based on the results, the spatial variation maps for each parameter are generated and inferred as concentration of all the parameters are high in the downstream of the channel. Then, the weighted overlay method is applied to integrate the influence of all parameters in determining the quality of water and resulted as 40% of the water body is highly contaminated which is undesirable for usage and 60% (upstream side) of the water is under moderate vulnerability that can be used for irrigation purposes. Water Quality Index (WQI) is created by assigning higher weightage to pH, TDS, DO and lower weightage to turbidity. As per the IS10500 for drinking water standards, the calculated WQI which is equals to 35 deduce that the water is unfit for irrigation and can be used for irrigation for specific tolerance crops. All together, the study concludes that the water from the water body can be used for irrigation than merely let it as a runoff and the treatment of it can be used for the secondary usage for cleaning and flushing purposes.

**Keywords:** *Qualitative assessment, Spatial distribution, Suitability analysis, Geo informatics, water Quality Index, Weighted Overlay*

**OAS097**

**A STUDY ON STABILIZATION OF SOIL USING GGBS AND LIME**

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**Abstract**

Due to increasing rate of population, urbanization and industrialization in India, the demand for land is becoming increasingly more at alarming rates; this necessitates the use of unsuitable land for soils for various civil engineering applications. Structures, will include

lightly located buildings, pavements underground pipe lines constructed on expansive soils to serve distress is caused by shrinkage/swelling nature of such clays during summer and winter seasons due to fluctuations in water table. There are many methods for improvement of ground. Some of them are compaction grouting, vibro system, jet grouting, wet soil mixing, dry soil mixing, stabilization using admixtures like lime, quarry, dust, sugarcane ash, baggase ash, copper slag etc., column methods, thermal methods, pre compression. Clay soil is highly expansive soil and therefore proper stabilization methods are needed to be followed for its effective usage. GGBS is a waste material which can be used to stabilize this type of soils. In this project study of performance of GGBS and lime when stabilized with clay soil is studied. Various tests are performed to know the effect of above admixtures

**Keywords:** *Expansive soil, Stabilization, Pavements, Ground improvement, Grouting*

### **OAS103**

#### **DESIGN AND FABRICATION OF SEMI- AUTOMATIC RAPID WALL MAKING MACHINE**

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#### **Abstract**

Construction based production industries started to produce rapid wall for building. Example: GFRG (Glass Fiber Reinforced Gypsum), GFRC (Glass Fiber Reinforced Concrete) etc. These panels are majorly used in countries like Australia, China, India etc. and it can resist of earthquake. It has more advantages than brick constructed buildings like waterproof and thermal stability. This kind of panels are made using semi-automated machines with a set of process in two separate stages .There is no machine for producing Glass Fiber Reinforced Fly-ash mixture based panels. By using semi-automated machines, it can produce this panels with high surface finish, high strength, high thermal stability and water resistance etc. In this project uses fly-ash, sodium silicate, sodium hydroxide, and water as major raw materials for producing panels. Here first process is mixing the raw materials in definite proportion using gate valves and mixture motors. These mixed flyash solution is poured into mould tray (movable table) and then fibers are sprinkled over layer of solution. And again, process is repeated once if, it gets done, mould tray moves to heating chambers where it is heated using space heaters. So, the entire process is controlled using Arduino software for controlling the entire process. Fabrication setup produces rapid wall panels with less time and low cost of production.

**Keywords:** *automation, low cost, reduce manpower*

### **OAS105**

#### **SMART RAIN SAUCER**

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#### **Abstract**

Rainwater harvesting is the most effective method of water conservation. The rainwater in this process is collected at the surface before it is lost as surface run off. The ground water is then recharged artificially through the process. Many parts of the country are undergoing water scarcity. In order to overcome the water scarcity, it is necessary to harvest the



rainwater. Since the existing methodology to harvest the rainwater increases the ground water level. It cannot reuse the rainwater instantly. But in current scenario we are in need to reuse the rainwater instantly. An automated rain saucer, which is in the form of inverted conical shaped (saucer) structure is used to collect the rain water which is falling over the tank. Whenever the rainfall is sensed, the saucer opens and collect the rain water directly to tank. After the tank is filled or rain is stopped the saucer get closed automatically. It is a solution which can be easily implemented in every house and the rain water can be instantly reused.

**Keywords:** *Wastewater management, Rain harvesting techniques, management techniques*

### **OAS109**

#### **AN EFFICIENT ANDROID APP MONITORING FOR CAB BOOKING AND SERVICING**

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#### **Abstract**

Application-based cab booking deals with an online application system designed for booking cabs as per the requirements of the customers at their convenience. The traveller this is highly important and in today's internet age people should be able to book taxi online without having to pick up the phone and the taxi company as all their bookings are now managed via cab booking application. The cab booking service provided to customers has to log in to the app with individual login id/phone number and password. It brings together the cab operators/admin and the customers. For the application we will store some model names, their registration no, available cabs, rent rate on the basis of per day, each cab driver profiles for security purpose and the amount to be deposited accordingly. Finally, the process of cab booking can monitor day to day by the administrator. Admin has a full of authority to monitor the driver and customer. It can get a report of a summary regarding cab booking, online payment, customer feedback, etc. Using our team can take a further decision for other development. From the system car Rental Company can manage all car bookings and customer information. Users can book cars and admin can confirm the booking and cancel the booking on the basis of availability of the cars and drivers. Mostly peoples use cab service for their daily transportations need. A car booking agency can also check which car is free for booking and which cars are on booking at the present time. The objective and scope of my project Online Cab or car booking System is to record the details of various activities of the user. It will simplify the task and reduce the paperwork. Using this car booking management system car owner can also become a partner of car booking agencies by giving their car for booking. Online Car rental management system is a web-based application that allows users to book a car online.

**Keywords:** *android app, cab booking, online payment, customer feedback, rental management system*

**OAS118**

**ROUTE OPTIMIZATION OF SOLID WASTE COLLECTION VEHICLE IN  
EXISTING TEMPORARY STORAGE**

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**Abstract**

Over the past few decades increasing human population. associated phenomenon of a urbanization and economic development has resulted in the generation of huge quantities of municipal solid waste (MS W). Management of huge dumps of MSW without proper route has become a challenge in most cities in India. It involves several activities, which can be categorized into: collection, transportation and disposal of waste. This evolution had been driven by significant advances in computer technology, availability and quantity of data. As the complexity of the management increases there is requirement of computerized software to do the analysis. Municipal Solid Waste Collection/Dump Sites (MSWCS) is essential for municipal Solid Waste Management (MSWM) decision-making, collection route planning and dumps clean up. Geographic Information Systems (GIS) presents a platform to capture map, and analyse spatial MSWM issues. It further helps in identifying optimistic route for solid waste collection in the study area. From the analysis effective solid waste collection strategies for Erode Municipal Corporation is identified based on waste generation rate, Population and the preliminary data collected from the municipal office. Using ArcGIS network analyst, the project aims to Protect the waste bins from unsanitary condition and to make the solid waste disposal in economical manner by route optimization of solid waste collecting vehicle.

**Keywords:** *Collection, Transportation, Route optimization, ArcGis software*

**OAS122**

**PROCESS AND ANALYSIS WITH DEMOGRAPHIC METHODOLOGICAL  
REFINEMENT OF KARUR BUS BODY INDUSTRY**

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**Abstract**

The automobile industry plays a vital role in the Indian Economy because of huge investment, Employment opportunity, People & Government interest in sophisticated and environment free travel of people. Next to vehicle performance, Aesthetic aspect and Ergonomic design playing a vital role in vehicle manufacturing. The vehicle bodybuilding sector can satisfy those needs in the automobile industry. The study is done on the Karur bus body building industry. Karur is one of South India's largest bus body building hubs, providing a strong client base in the southern coast region. The Bus body building industry has been an icon of karur district, which has worked to grant survival support to the people and played a significant role in their financial sustain. The bus body manufacturing industry in the Karur city has taken a stand to changing demographics since its rise in the 1980s, even though market growth of fully-built buses (FBB) fabricated by Original Equipment Manufacturers (OEMs) has created a cautious circumstance among the coach builders. The buses built by OEM are the significant threat to the stability of Bus body coach builders. The intention of this paper is to evaluate the Karur bus body building industry and to create

research evidence in the parameters of Infrastructure facility, Productivity & Quality practice, Quality certification & implementation

**Keywords:** *Bus body building, Infrastructure facility, Productivity & Quality practice, Quality certification & implementation*

### **OAS123**

#### **PERFORMANCE ANALYSIS OF MACHINE LEARNING TECHNIQUES FOR THE PREDICTION OF BREAST CANCER IN BIG DATA ENVIRONMENT**

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#### **Abstract**

Every year more than a million women are diagnosed with breast cancer that results in the death of more than half of them, due to the delay in diagnosis of the disease. Machine Learning (ML) offers a better approach for the prediction of breast cancer. A feature selection technique, INTERACT is applied to select relevant features for breast cancer diagnosis. The tool used in this project is WEKA 2.3. The classification algorithms, namely Decision tree, Random forest and Support Vector Machine (SVM) are incorporated along with INTERACT technique. The relevant and important features for breast cancer diagnosis are chosen. The dataset used in this project is Wisconsin Diagnostic Breast Cancer (WDBC) subdirectory. The experimental result shows that the SVM outperforms the other classifiers. It improved accuracy of the diagnostic model by using feature selection method.

**Keywords:** *Breast cancer, INTERACT technique, Classification, Random forest, Decision tree, Support Vector Machine(SVM), Feature selection technique*

## POSTER PRESENTATIONS

### CPTS072

#### EFFECTS OF COMPOSITE NANOFUIDS IN DOUBLE PIPE HEAT EXCHANGER

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#### **Abstract**

Double Pipe Heat Exchangers transfer heat between two flows through a conductive barrier without physically mixing them. In order to improve the performance of double pipe heat exchangers, composite nanofluid has been used and comparative study has been made with water – water system. In this research, an attempt has been made to optimize the performance by varying the cold fluid with composite Nanofluid (TiO<sub>2</sub>, CaO, and MgO) along the water as hot fluid. The experiment was conducted by varying the concentration and flow rate of the heat exchanger. A comparison between parallel and counter flow heat exchanger was made. The result shows that usage of Nanofluid in cold water side with counter flow proved to be more effective than parallel flow double pipe heat exchanger.

**Keywords:** *Composite Nanofluid, Double Pipe Heat Exchangers, counter flow*

### GC045

#### STUDY ON FLY ASH AND GGBS BASED OVEN CURED GEOPOLYMER CONCRETE

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#### **Abstract**

In recent years, the cement production has been growing very rapidly. It is the third-largest source of emissions of carbon dioxide after fossil fuels and land-use change. In this study, the cement is replaced by Fly Ash and Ground Granulated Blast Furnace Slag (GGBS) which has almost the same particle size as cement. In the construction industry, the utility of Fly Ash and GGBS has emerged in recent years in the form of Geo-Polymer concretes. In this experiment, the sodium hydroxide (NaOH) is used as an alkaline activator of concentration 12M and the ratio between fly ash and alkaline is taken as 0.40 respectively. The Geo-Polymer concrete is prepared with Fly ash and GGBS is mixed in various proportions and then the specimens are heat cured at oven. The specimens were oven cured at 800C for 24 hrs. The compression test was carried out for various proportions of Fly Ash and GGBS and it is found that the mix proportion of Fly Ash 20% + GGBS 80% showed better results than other mix proportions.

**Keywords:** *Fly ash, Ground Granulated Blast Furnace Slag (GGBS) Geopolymer, Sodium hydroxide, Sodium silicate, Oven Curing*

**GC048**

**STUDY ON BEHAVIOUR OF GGBS AS PARTIAL REPLACEMENT OF CEMENT  
IN CONCRETE WITH ADDITION OF POLYCARBOXYLATE ETHER**

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**Abstract**

The experimental study is based on the replacement of cement by Ground Granulated Blast-Furnace slag (GGBS) is investigated by compressive strength, flexural strength and Split Tensile strength to increase the strength parameter based on durability test. In order to increase the workability, the Polycarboxylate Ether is added. High-strength concrete tends to be economical, although its initial cost is higher than that of high-strength concrete in building, increasing the structure's service life and less damage to the structure that would reduce overall costs. The grade of concrete will be 60 N/mm<sup>2</sup>. Polycarboxylate Ether was also incorporated along with the GGBS to further enhance the mechanical properties. Here we have replaced cement (OPC 53 grade) with GGBS like 10%, 20%, 30%, 40%, 50% and 60%. The w/c ratio is 0.4. We have used Polycarboxylate Ether as a chemical admixture. Through SEM analysis the chemical bonding between the cement particles and the chemical position is revealed. The strength is increased more effectively by adding 40% of GGBS instead of cement and the addition of polycarboxylate gives the good workability to the concrete to increase the strength, therefore the GGBS and polycarboxylate plays better role in this studied.

**Keywords:** *Compressive Strength, flexural strength, split strength, Polycarboxylate Ether*

**GC084**

**MULTIPURPOSE CLEANING SOLVENT**

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**Abstract**

A solvent is a chemical compound that can be used to dissolve, soften, melt or extract another compound. In daily life, we use different types of cleaning solvents for different purposes. Our project is a multipurpose cleaning solvent. This cleaning solvent is used for all purposes. It can be used for domestic purposes and industrial washing purposes like dishwashing, cloth washing, washing vehicles, house cleaning, and toilet cleaning, etc. It cannot affect human beings. And it is low in cost. The production is easy. The cleaning solvent only contains safe chemicals. The chemicals are not dangerous. This is all in one product.

**Keywords:** *cleaning, product, solvent*



**MMT040**

**EXPERIMENTAL INVESTIGATION ON MECHANICAL PROPERTIES OF HIGH-PERFORMANCE CONCRETE**

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**Abstract**

This paper presents the art of knowledge of High strength concrete which is very beneficial for the construction industry. This project gives information about the aims at increasing the strength of concrete used in the present day by introducing various pozzolanic materials such as silica fume, quartz powder and chemical admixture (Master Glenium Sky 8233). Silica fume has been used as a replacement (10% replacement) material for cement and quartz powder is used as an additive (5% additive) material. The chemical admixture was used for the reduction of water content and to increase the setting time of concrete which in turn improves the strength in concrete due to the addition of pozzolanic materials. In this study, prepared concrete subjected to compressive strength test, split tensile strength test, flexural strength test was conducted by using cubes, cylinder, and prisms for curing period of 7 days 14 days and 28 days. The cement concrete was prepared with a mix design of M60.

**Keywords:** *High Strength, Master Glenium, Pozzolanic material, Silica fume, Quartz Powder, Mechanical Strength*

**MMT049**

**EFFECT OF MINERAL ADMIXTURES ON THE EARLY AGE STRENGTH OF FLY ASH BASED FRESH CONCRETE**

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**Abstract**

The growth of the construction industry, demanding cement production day by day. On account of the production of cement, the emission of greenhouse gases in the environment increases tremendously. Alternatively, Replacement of cement with fly ash reduced the compressive strength at an early age of concrete due to the lack of lime content in the concrete mix and also delay the rate of the hydration process. This paper investigates the effect due to the incorporation of Ground Granulated Blast Furnace Slag (GGBFS) and Metakaolin on the early age strength of fresh concrete containing fly ash as Supplementary Cementitious Material (SCM). Concrete samples with the incorporation of various percentages of GGBFS and Metakaolin (0%, 25%, 50%, 75%, 100%) have been cast and tests have been conducted at the 7 days of concrete samples. Results have been compared with conventional fly ash-based concrete. Incorporation of GGBFS and Metakaolin with a control mix enhanced the 7 days compressive strength up to 30% compared to the conventional concrete. The present study proposes a promising method for enhancing the early age of the fly ash-based concrete.

**Keywords:** *Concrete, Mechanical strength, Fly ash, Mineral admixture, Early age strength, Metakaolin, Slag.*

**MMT059**

**STUDIES ON MECHANICAL PROPERTIES OF FIBRE REINFORCED  
CONCRETE INCORPORATING PLASTIC WASTE AS FINE AGGREGATE**

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**Abstract**

Plastic waste is an emerging issue posing serious pollution problems to the human and the environment. New effective waste management options need to be considered especially on recycling concepts. This study investigates the performance of concrete prepared with Plastic waste as part of a fine aggregate. A detailed effort has been made for the systematic study of strength and durability of Plastic waste concrete with and without the addition of steel fiber to the concrete. The M30 mix design was adopted. The steel fiber was added at 1 % to the volume fraction of the concrete. Plastic waste was added at 5%, 10%, 15% & 20% of the fine aggregate. The test results showed that a significant improvement in compressive strength was achieved in the Plastic concrete compared to conventional concrete. The experimental program consists of compressive strength and flexure strength at 14 days and 28 days the age of curing, the cylinder compression test at 28 days the age of curing and elastic modulus was calculated. The test results of the experimental investigation showed that the addition of Plastic waste at 5% without steel fiber achieved the optimum results and the addition of plastic waste at 5% and 10% with steel fiber achieved the optimum results. The strength property declines for other proportions of Plastic waste. The results indicated that the Plastic waste up to 10% of the weight of the fine aggregate with the addition of steel fibre can be used effectively in concrete and thus results in waste reduction and resources conservation.

**Keywords:** Cement, Hooked End Fiber, Plastic Waste, Aggregate, Flyash

**NT031**

**EFFECT OF NANOPARTICLE INCORPORATION ON THE  
PROPERTIES OF STARCH BASED FOOD PACKAGING FILMS**

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**Abstract**

Development of environmentally friendly packaging films is a substantial step in the field of packaging. In recent years, biodegradable packaging materials have abundantly attracted the attention of researchers for commercial applications in the food packaging industry. Generally, incorporation of nanoparticles into bio-based films upgrades the film properties as they act as reinforcements in thermoplastic matrices and stimulates surface interactions within the compound matrix. Among the natural polymers, starch is widely regarded as an alternative to plastics derived from petroleum derivatives in the production of packaging films. This present study deals with the preparation of starch based biodegradable films with incorporation of both organic and inorganic nanoparticles as fillers. The enhanced

properties due to the addition of nanoparticles are studied and compared. Scanning Electron Microscopy Analysis was carried out to evaluate the dispersion of nanoparticles in the films and the biodegradability tests were also performed for the produced films.

**Keywords:** *Starch, Nanoparticles, SEM, Biodegradability*

#### **NT074**

##### **NANOTECHNOLOGY: RECENT UPDATES OF PAPER SENSORS**

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##### **Abstract**

Pesticides are chemical substances which are used for crop improvement and they leave behind toxic substances when degraded. These residues are detected by biosensors. The role of pesticides in health is known, it is important to detect them in our environment and in our foods. Usually the biosensors which are used to detect pesticides are large and expensive. Smaller detectors called “PAPER SENSORS” have been made to overcome this problem. Paper Sensors are cheap and can be used in locations where resources are limited. Paper Sensors can be done with the help of an Android program on a smartphone-an almost pocket-sized device that could detect pesticides quickly and at low cost. It detects low concentrations of pesticide. This type of sensor can be reusable and it is cost efficient. This poster reviews the recent development in the making of the Paper Sensors.

**Keywords:** *Sensors, paper, paper sensor, nano sensors*

#### **PC038**

##### **DEVELOPMENT OF LIGHT WEIGHT ENGINEERED CEMENTITIOUS COMPOSITES**

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##### **Abstract**

Light weight concrete with densities between 900 and 1600 kg/m<sup>3</sup> has been used in various structural and non-structural applications, offering considerable weight saving. In this project, Light Weight Engineered Cementitious Composites (LWECC) was developed by vermiculite as replacement of fine aggregate. By adding ductility, LWECC can further broaden the applicability. This project was carried out on mortar cubes, dog bone and prism by fully replacing the fine aggregate by vermiculite with constant 2% volume fraction of Poly Vinyl Alcohol (PVA) and polypropylene (PP) fiber. Specimens were casted according to ASTM standards, whereas 75mmx75mmx75mm cubes were casted for checking its durability property. Curing process were carried out after casting of the specimen for about 28 days. A large body of experimental results was obtained by testing these specimens in Universal Testing Machine (UTM) in material testing laboratory. This project compares the densities and the mechanical properties of the casted light weight engineered cementitious composites. The effect of gradation of vermiculite on compressive strength as well as durability was

experimentally investigated. The results showed that the LWECC with a density between 1400 to 1500 kg/m<sup>3</sup> was achieved by reducing the self-weight and water absorption capacity of about 5 to 6 %. The grading size of the vermiculite greatly influenced the mechanical strength of LWECC.

**Keywords:** *Light Weight Engineered Cementitious Composites vermiculite, PVA fibre, PP fibre, mechanical properties*

### **PC039**

#### **SHEAR BEHAVIOR OF CONCRETE BEAM REINFORCED WITH CARBON COATED STEEL FIBER - AN OVERVIEW STUDY**

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#### **Abstract**

The project deals with the study of shear behaviour of concrete with varying percentage of steel fibre. The fibres of hooked end steel fibre, which are used at varying percentages namely 1%, 1.5% and 2%. The strength tests show that addition of fibre used better result when compared with conventional concrete. Various test such as compressive strength, split tensile strength and flexural strength were carried out. Result of the experimental study indicates that addition of carbon coating steel fiber improves the properties of plain concrete.

**Keywords:** *Steel Fiber, Concrete, Reinforced, Shear, Carbon Steel Fiber*

### **PC054**

#### **A REVIEW ON RECENT DEVELOPMENT IN GEOPOLYMER COMPOSITES**

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#### **Abstract**

The prime concern in limiting the consumption of Ordinary Portland Cement, in the construction industry, by replacing with industrial by-products is seriously undertaken by the researchers. Geopolymer is considered as a replacing material to cement when composed by the base materials containing aluminum and silicon and activated by an alkaline solution to perform as a binder. Geopolymer binder's preference is made because of the less carbon content and incredibly lesser greenhouse emission than ordinary Portland cement. This paper evaluates the feasibility of geopolymer mortar, its workability and mix proportions with different binder materials, mechanical performance (compressive and tensile strength) and durable properties (acid attack, high temperature resistance, shrinkage resistance). The current study outcome shows that geopolymer adoption is done as an environment friendly and feasible material, which may be a suitable renewal to the conventional cement in the future.

**Keywords:** *Geopolymer, Feasibility, Workability, Mix proportions, Durability*







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