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IEI EPITOME

A Century of Service to the Nation

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In this issue

Announcements

Members in the NEWS

Dr Marlene Kanga, FIE
Past President
World Federation of Engineering Organisations (WFEO)
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Dr Marlene Kanga announced as an **Officer of the Order of Australia**, a national honour, on Queen's Birthday, 13 June 2022.

Dr Marlene Kanga AO, an outstanding and transformative leader of engineering and technology organisations in Australia and internationally has been made an Officer of the Order of Australia, a national honor, "for distinguished service to engineering, particularly as a global leader and role model to women, to professional organisations and to business."

Dr Kanga studied Chemical Engineering at Indian Institute of Technology Bombay, is a Fellow of IEI and a recipient of the IEI Centenary Award in 2019.

Listed among Australia's top 10 women engineers, Dr Kanga is currently a non-executive Director of some of the largest organisations in Australia in utilities, transport and innovation.

Dr Kanga was President of the World Federation of Engineering Organisations (WFEO), 2017-2019, with 100+ national/continental members, representing 30+ million engineers. She was 2013 National President, Engineers Australia, with more than 100,000 members.

As WFEO President, Dr Kanga successfully led the proposal to declare 4th March World Engineering Day for Sustainable Development by UNESCO, the only international day for engineering.

She also led the review of the international engineering education benchmarks which underpin mutual recognition of engineering qualifications by the International Engineering Alliance, the most significant review since the Benchmarks were first established and now endorsed by WFEO and UNESCO.

"This is an extraordinary recognition of my leadership of some of the largest organisations involved in engineering and technology. This recognition is an opportunity to promote engineering as a rewarding and exciting career to young people, especially women and girls. My message is, "If you want to change the world, become an engineer," said Dr Kanga.

← *Insignia of the Office of the Order of Australia*

Mr Dullapalli Syam Kumar, FIE
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Roads & Buildings Department, Government of Telangana
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ICI (HDC) - UltraTech Award for Outstanding Concrete Structure Category-2021 awarded to **D Syam Kumar** for **Cable Stayed Bridge - Karimnagar** by **Indian Concrete Institute, Hyderabad Centre** during **Concrete Exçellence Awards** on 23 March 2022.

Members in the NEWS

Mr Samrat Banerjee, AMIE
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Mr Samrat Banerjee has been selected as an **International Judge** of **Quality Circle Forum of India** (QCFI) through a national level competition and participated in International Convention of Quality Circle Concepts ICQCC 2021 held in Hyderabad during 24-27 November 2021 and National Convention of **Quality Circle Concepts NCQCC 2021** held in Coimbatore during December 2021 as a **Honorable Judge** to evaluate live case studies of national and international level.

IEI AWARDS

CALL FOR PAPERS

The Steel Authority of India Ltd (SAIL) had instituted two Awards, namely, **SAIL AWARD** and **DR M VISVESVARAYA AWARD** to be given away every year during the Indian Engineering Congress to author/s of the articles adjudged best on selected topics. The prize-winning papers will be published in the Technical Volume of 37th Indian Engineering Congress.

The topics for the year 2022 are given hereunder.

SAIL AWARD

Countering Cyclic Downtrends in Steel Industry

DR M VISVESVARAYA AWARD

Contribution of Indian Steel Sector towards Net Zero Emission by 2070

Intending contributors are requested to send the soft copy of the paper by email to **award@ieindia.org** (with subject heading Paper for **SAIL/Dr M Visvesvaraya Award**) and submit four printed copies of their articles to :

Director (Technical)
The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020.

Last date of submission: October 15, 2022

For downloading the template of paper and declaration form, please visit the following link:

https://www.ieindia.org/webui/IEI-Activities.aspx#Call_Papers

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Book

Mr P A Prabhakaran, FIE
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Construction Management

Construction is one of the defining characteristics of humans. A building almost always serves a purpose that transcends its functional aspects. Despite construction being such an impactful activity we find our neighbourhoods littered with examples of poorly conceived or executed constructions. Failure to attend to details, lack of concern for our surroundings and eco-system lead to this situation. Besides causing perennial maintenance problems, the life span of such constructions get depleted over a period of time.

The author has been an active Civil Engineer for almost 60 years. He worked for MES. GREF and ISRO/DOS, and eventually retired as Chief Engineer, Civil Engineering Division, ISRO/DOS. In this book he discusses some of the key aspects in Construction Management. He has collated many of the practices and learnings from his vast and varied experience.

This book can benefit everyone involved in construction right from a first-time builder to a seasoned engineering professional.

ISBN: 9 3-9 36 57-5 3-4
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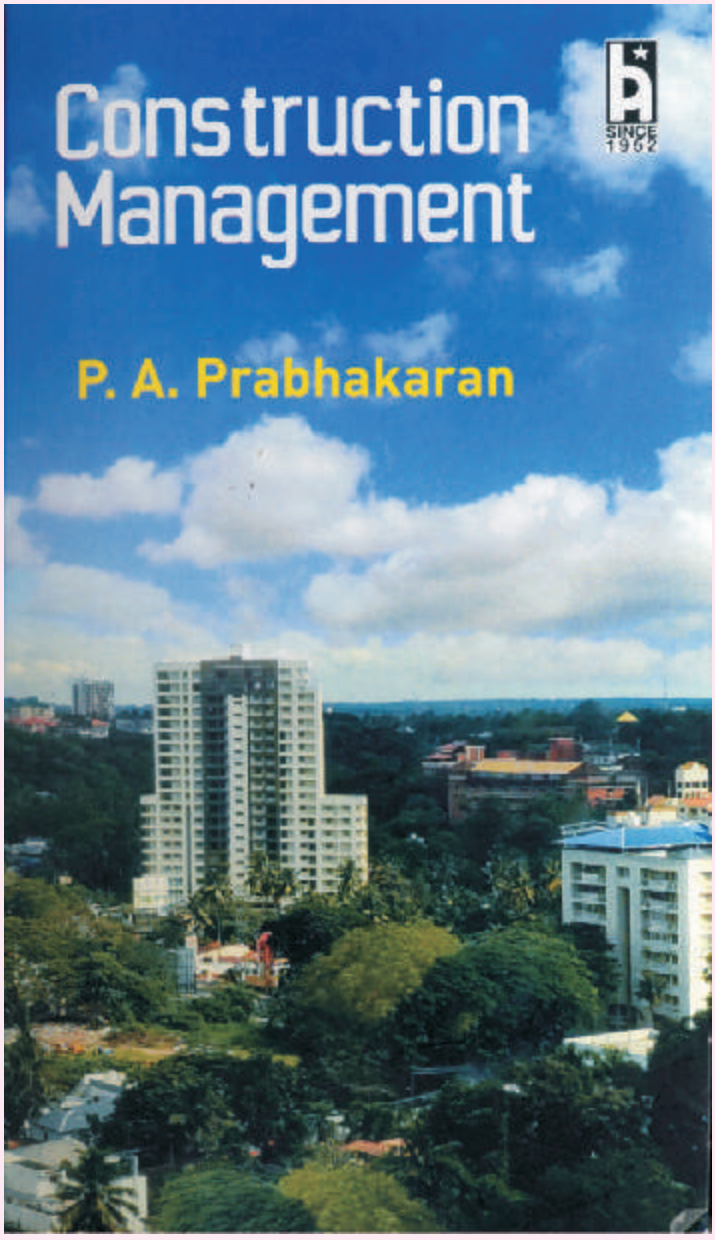
Price : Rs.200.00



PUBLICATION by Members

Book Chapters

Dr Karthikeyan S, FIE
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Title of Book Chapter: **Eye Controlled Wheel Chair System for Physically Challenged People**

Emergent Converging Technologies and Biomedical Systems, Lecture Notes in Electrical Engineering, 841, 2022, Springer, Singapore, pp 215–224, Print ISBN: 978-981-16-8773-0, Online ISBN: 978-981-16-8774-7

DOI: https://doi.org/10.1007/978-981-16-8774-7_18

Co-authors: M Dhariq Refai, R Narmadha & S Jayanthi

Abstract: As per another report mutually set up by the World Bank and the WHO, on the planet there are 15% handicapped are incapacitated. Utilizing an amazing wheelchair to drive paddling is one of the principal steps to coordinate individuals with extreme physical and scholarly inabilities into society. For seriously incapacitated individuals, driving a wheelchair is a troublesome assignment except if the tongue is utilized to control the toy stick. Simultaneously, the visually impaired and the handicapped deal with two issues, which establish an unforgiving climate for them, which imply haughtiness and limitation. Different projects have been intended to conquer the previously mentioned issues lastly permit clients to perform safe activities and perform significant day-by-day life undertakings. The mechanical wheelchair utilizes eye development and head development to control the wheelchair. Moreover, we can speak with room gear, for example, fans, by utilizing a similar head development to give more autonomy to the incapacitated. Use RF transmitter and collector to finish this correspondence. Utilizing this capacity, you can undoubtedly control different gadgets.

Keywords: Wheel Chair, RF Transmitter, Visually Impaired

Title of Book Chapter: **Manual and Automatic Control of Appliances Based on Integration of WSN and IOT Technology**

Emergent Converging Technologies and Biomedical Systems, Lecture Notes in Electrical Engineering, 841, 2022, Springer, Singapore, pp 197–214, Print ISBN: 978-981-16-8773-0, Online ISBN: 978-981-16-8774-7

DOI: https://doi.org/10.1007/978-981-16-8774-7_17

Co-authors: Adusumalli Nishanth, Annaa Praveen, Vijayabaskar & T Ravi

Abstract: As indicated by the Internet of Things, the future home the purported Smart Home, will be a consistent mix of actual savvy objects, interfacing, among them and with the general climate. Furthermore, since handsets are often used to manage certain aspects of people's lives, the capability to power and monitor Smart Households from they will become a requirement. The justification for the Home Automation System is to monitor the limits such as voltage, current and temperature using remote network architecture that operate on a screen. The main aim is to reduce a smart condo's excessive energy consumption. It aids with an improvement of controlling organisation introduction. The aim of its project is to design a well-thought-out intra smart home system that allows the consumer to monitor all of their electric and electronic devices from every other mobile. This project's use includes features such as screen surveillance, light and fan power, fire warning and greenhouse service. The detectors are linked to the Pic microcontroller, which sends the sensor' position to the email address. The Arduino is used to interfere with device and Wlan is also connected to the Arduino to have a Domain name from either an adapter. With the use of WSN, this research framework provides a solution for providing extremely accurate monitoring and scheduling position of current state of gear.

Keywords: Home Automation, Arduino, Bluetooth, WSN, Smartphone

PUBLICATION by Members

Papers published in the Journals / Proceedings

Dr Karthikeyan S, FIE
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Title of Paper: **A Novel Deep Learning-based Black Fungus Disease Identification using Modified Hybrid Learning Methodology**

Contrast Media & Molecular Imaging, 2022, Article ID 4352730, 11 pages

DOI: https://doi.org/10.1155/2022/4352730

Co-authors: G Ramkumar, S Aravindkumar, M Tamilselvi & S Ramesh

Abstract: Currently, countries across the world are suffering from a prominent viral infection called COVID-19. Most countries are still facing several issues due to this disease, which has resulted in several fatalities. The first COVID-19 wave caused devastation across the world owing to its virulence and led to a massive loss in human lives, impacting the country's economy drastically. A dangerous disease called mucormycosis was discovered worldwide during the second COVID-19 wave, in 2021, which lasted from April to July. The mucormycosis disease is commonly known as "black fungus," which belongs to the fungus family Mucorales. It is usually a rare disease, but the level of destruction caused by the disease is vast and unpredictable. This disease mainly targets people already suffering from other diseases and consuming heavy medication to counter the disease they are suffering from. This is because of the reduction in antibodies in the affected people. Therefore, the patient's body does not have the ability to act against fungus-oriented infections. This black fungus is more commonly identified in patients with coronavirus disease in certain country. The condition frequently manifests on skin, but it can also harm organs such as eyes and brain. This study intends to design a modified neural network logic for an artificial intelligence (AI) strategy with learning principles, called a hybrid learning-based neural network classifier (HLNNC). The proposed method is based on well-known techniques such as convolutional neural network (CNN) and support vector machine (SVM). This article discusses a dataset containing several eye photographs of patients with and without black fungus infection. These images were collected from the real-time records of people afflicted with COVID followed by the black fungus. This proposed HLNNC scheme identifies the black fungus disease based on the following image processing procedures: image acquisition, preprocessing, feature extraction, and classification; these procedures were performed considering the dataset training and testing principles with proper performance analysis. The results of the procedure are provided in a graphical format with the precise specification, and the efficacy of the proposed method is established.

Keywords: HLNNC, Mucormycosis, Pre-processing, Artificial Intelligence, SVM

Title of Paper: **An Ingenious Face Recognition System based on HRPSM_CNN under Unrestrained Environmental Condition**

Alexandria Engineering Journal, 61(6), 2022, pp 4307-4321

DOI: https://doi.org/10.1016/j.aej.2021.09.043

Co-author: M Tamilselvi

Abstract: Face recognition is an emerging technology that divulges various applications in diverse fields like medical image analysis, surveillance, personal identification, and security related cases. In order to effectively recognize the images from the known data sets, there are a number of face recognition algorithms which are in practice. However, a few problems are encountered in effective recognition with a satisfied parameter. Even though there are various algorithms like Local Binary pattern (LBP), Directional Binary Code (DBC), Multi Support Vector Machine (Multi- SVM), and Convolutional Neural Network (CNN) which are being used for face recognition, still the face recognition is not achieved satisfactorily especially for the large databases as the images are affected due to poor lighting and also owing to occlusion occurring in the stagnant pictures. Hence, a new approach called Hybrid Robust Point Set Matching Convolutional Neural Network (HRPSM_CNN) is proposed to effectively recognize the faces from the data sets over the unconstrained situations. This proposed method shows enhanced receiver operating characteristics when compared to the traditional algorithms. This HRPSM_CNN provides 97 % of accuracy rate for ORL and AR database and 96 % for LFW face database which are significantly higher than the existing traditional algorithms. The proposed algorithm is implemented in visually impaired assistive device and the results show better recognition under difficult situations like various lighting and weather conditions.

Keywords: Face Recognition, LBP, DBC, Multi- SVM, HRPSM_CNN

PUBLICATION by Members

Dr Elango Kannan, FIE
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Title of Paper: **Influences of Cryogenically Treated Work Material on Near-dry Wire-cut Electrical Discharge Machining Process**

Surface Topography: Metrology and Properties, 10(1), 2022, ISSN: 2051-672X
DOI: https://doi.org/10.1088/2051-672X/ac53e1

Co-authors: Youssef Trabelsi, Sampath Boopathi & Sivapragasam Alagesan

Abstract: In this research, influences of cryogenically treated Inconel 718 work material in near-dry wire-cut electrical discharge machining (WEDM) characteristics have been studied using argon-mist (mixing of pressurized argon gas and minimum amount of tap-water) and a reusable Molybdenum wire tool. The effect of cutting parameters (pulse width (PW), spark current (C), pulse interval (PI), and flow rate (F)) on surface roughness (SR) and cutting rate (CR) and using Box-Behnken response surface analysis. It was observed that CR and SR are increased by increasing PW, and C; conversely, reduced by increasing PI. The technique for order of preference by similarity to ideal solution (TOPSIS) method has been utilized to estimate the best parameters' settings for improving both machining characteristics. The optimum CR (9.81 mm^3 $min)^{-1}$ and SR (1.9 μm) have been obtained by optimum settings of 4 Ampere spark current, PW of 20 μs, PI of 72 μs, and 18 ml min^{-1} of the flow rate of mixing water using the TOPSIS method. The best settings of cutting parameters obtained from the TOPSIS method were considered to compare the near-dryWEDMperformance using cryogenically treated/untreated work materials. It was observed that CR and SR of the cryogenically treated work material are 9.17% increased and 21.58% reduced than the untreated work material due to an increase in electrical and thermal conductivities.

Keywords: Near-dry, WEDM, Argon-mist, Cutting rate, Surface roughness, Cryogenically treated work material, TOPSIS

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Title of Paper: **Recent Progresses in Super-hydrophobicity and Micro-texturing for Engineering Applications**

Surface Topography: Metrology and Properties, 9(4), 2022, Online ISSN: 2051-672X
DOI: https://doi.org/10.1088/2051-672X/ac4321

Co-authors: Vijay Kumar, Vishal Santosh Sharma & Varun Sharma

Abstract: Increasing interests have been prevalent lately among the research fraternity for the development of superhydrophobic surfaces (SHS) considering the favorable properties exuded by them. Recently, SHS have been employed effectively in diverse engineering applications like self-cleaning/anti-dust, anti-reflecting coatings, corrosion resistance, anti-biofouling, biomedical, oil-water separation, drag reduction, anti-icing, and cavitation erosion. Further, patterned topology by micro/nano surface texturing has been perceived lately as an engineering opportunity to enhance the surface performance and has opened various avenues for exploration. This work reports the recent research findings pertaining to the concept of superhydrophobicity and micro-texturing particularly in the context of their application for the impediment of the adversaries in metallic components. The comprehensive review on SHS and micro-texturing suggests that the integrated application of these surface modification techniques are proficient for mechanical interlocking of the deposited coatings.

Keywords: Corrosion, Micro/nano-texturing, Self-cleaning, Super-hydrophobicity, Cavitation Erosion

Title of Paper: **Effect of Reinforcements on the Sliding Wear Behavior of Self-Lubricating AZ91D-SiC-Gr Hybrid Composites**

International Journal of Surface Engineering and Interdisciplinary Materials Science, 10(1), 2022, pp 1-19, ISSN: 2166-7225
DOI: 10.4018/ijseims.2022010103
URL: https://www.igi-global.com/article/effect-of-reinforcements-on-the-sliding-wear-behavior-of-self-lubricating-az91d-sic-gr-hybrid-composites/282697

Co-authors: Sandeep Kumar Khatkar, Suman Kant & Narendra Mohan Suri

Abstract: This article statistically investigates the effect of various parameters such as material factors: silicon carbide (SiC) reinforcement, graphite (Gr) reinforcement and mechanical factors: normal load, sliding distance and speed on the sliding wear rate of vacuum stir cast self-lubricating AZ91D-SiC-Gr hybrid magnesium composites. The sliding wear tests have been performed on pin-on-disc tribometer at 10-50 N loads, 1-3 m/s sliding speed and 1000-2000 m sliding distance. It has been examined that hybrid composites yielded improved wear resistance with reinforcement of SiC and solid lubricant graphite. ANOVA and signal-to-noise ratio investigation indicated that applied load was the most critical factor influencing the wear rate, followed by sliding distance. Further, the AZ91D/5SiC/5Gr hybrid composite has exhibited the best

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wear properties. From the SEM and EDS analysis of worn surfaces, delamination was confirmed as the dominant wear mechanism for AZ91D-SiC-Gr hybrid composites.

Keywords: Wear Rate, Sliding Wear, Hybrid Composites, Wear Behavior, Signal To Noise Ratio, Normal Load, Critical Factor, Wear Properties, Pin On Disc, Sliding Distance

Title of Paper: **Influence of Laser Texturing Pre-treatment on HVOF-sprayed WC-10Co-4Cr+ GNP Coatings on AISI 304**

Surface Topography: Metrology and Properties, 10(1), 2022, Online ISSN: 2051-672X

DOI: https://doi.org/10.1088/2051-672X/ac5c68

Co-authors: Vijay Kumar, Kundan Chauhan & Rakesh Kumar

Abstract: High-Velocity Oxygen Fuel (HVOF) is one of the most important thermal spraying techniques for protective coating on pristine alloy surfaces by cermet feedstock powders. In the article, grit blasting before HVOF coating is replaced by laser texturing to create specific roughness and deterministic cavities pattern for better mechanical interlocking of deposited WC-10Co-4Cr + 3% Graphene Nanoplatelets (GNPs) on AISI 304 Steel Substrate. Two geometries; first one is Circular texturing (CT) of diameter (d) 100 µm and pitch (p) 120 µm, second is triangular texturing (TT) of side (s) 100 µm and side to side (ss) distance 120 µm have been used. Various testing measures; like surface roughness, XRD analysis, FESEM image analysis, EDS analysis, lattice strain and residual stress, scratch test, Vickers hardness test on coating and base substrate cross-section, and pin-on-disc test for sliding wear behaviour have been performed. After these coating characterizations, it was found that the lattice strain and residual stress decreases significantly, the micro-hardness of the cross-section improved, the adhesion strength of the coating was enhanced and a low sliding wear rate on the coated surface was observed. Uniform distribution of feedstock powder on the surface but higher porosity on the TT surface showed by FESEM image analysis and a large number of cracks observed during scratch tests at higher load.

Keywords: HVOF, Laser Surface Texturing, WC-10Co-4Cr+GNP, AISI 304, Circular and Triangular Texturing, FESEM Analysis

Title of Paper: **Fabrication of Superhydrophobic Surfaces by Laser Surface Texturing and Autoxidation**

Journal of Electrochemical Science and Engineering, 2022, Online ISSN 1847-9286

DOI: https://doi.org/10.5599/jese.1260

Co-authors: Vijay Kumar & Harish Bairwa

Abstract: The creation of superhydrophobic surfaces (SHS) has received exceptional thought from the entire research community due to its notable application in varied fields such as anti-icing, self-cleaning, drag reduction, anti-bacterial, and oil-water separation. The superhydrophobic (SH) conditions for a surface can be attained through the consolidation of a low surface energy surface with appropriate micro/nano-surface roughness through texturing. Motivated by the SH nature of lotus leaf and petal effect, microstructures have been prepared in this work on a metal surface by a fiber laser marking machine at 35 W. The textured surfaces with a different pitch to diameter (p/d) ratio (2.0-0.70) have been turned into hydrophobic and finally SH, after storing in an ambient environment for a few days due to oxide layer deposition on the textured surface. In this study, the maximum contact angle achieved by textured geometry after 30 days of auto-oxidation was 158.6 o. Further, test results showed that the fabricated surfaces have a high potential to maintain their SH nature even after the harsh condition of applications.

Keywords: Anti-bacterial, Oxide Layer Deposition, Texturing, Micro/nano-structure, Self-cleaning

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Title of Paper: **Evaluation of a Sulfidogenic System Fed with Microalgal Biomass of Chlorella Pyrenoidosa as an Electron Donor: Sulfate Reduction Kinetics**

International Journal of Hydrogen Energy, 47(42), 2022, pp 18566-18575, ISSN: 0360-3199

DOI: https://doi.org/10.1016/j.ijhydene.2022.04.028

Co-authors: V Sivasubramanian, M Velan & C Vigneshwaran

Abstract: In this study, a sulfidogenic reactor fed with microalgal biomass of Chlorella pyrenoidosa as an electron donor was operated in a continuous mode. This study evaluated the influence of various initial sulfate concentration from 1.0 to 2.5 g/L on anaerobic sulfate reduction kinetics by a sulfidogenic enrichment culture predominantly Desulfovibrio sp. VSV2. It was observed that volumetric sulfate reduction rate (VSRR) was consistently increasing with an increase in volumetric sulfate loading rate (VSLR) across the retention time of 7–10 days. For a retention time of 7 days, the maximum VSRR was noted as 0.0050 g/(L.h) with a corresponding VSLR of 0.0089 g/(L.h). When retention time was maintained for 10 days, a maximum sulfate reduction of 65% and a maximum bacterial concentration of 1.632 g/L were achieved for an initial sulfate concentration of 1.5 g/L. It was concluded that VSLR facilitated through both dilution rate and initial sulfate concentration had a significant influence over sulfate reduction kinetics. The results of the study suggested that the microalgal-fed sulfidogenic system could be effectively employed for reduction of sulfate from sulfate-rich wastewater.

Keywords: Chlorella Pyrenoidosa, Desulfovibrio, Microalgal Biomass, Volumetric Sulfate Loading Rate, Volumetric Sulfate Reduction Rate, Sulfate Reduction

PUBLICATION by Members

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Title of Paper: **The Improved Depression Recovery Motivation Recommendation System (I-DRMRS) in Online Social Networks**

SN Computer Science, 3(3), 2022, ISSN: 2661-8907

DOI: https://doi.org/10.1007/s42979-022-01047-7

Co-author: Poornima Nedunchezhian

Abstract: It is evident that the Online Social Network (OSN) has become a platform to express human emotions. The proposed Improved Depression Recovery Motivation Recommendation System (I-DRMRS) monitors people in depression through OSN posts and accelerates the life-saving process. The research objectives of the I-DRMRS are reducing the suicidal death rate, improving the prediction accuracy, reducing the False Positive (FP) rate and accelerating the process of identifying the suicidal (sybil) thought people. The I-DRMRS consists of three tasks. Task-1: clustering—location-based clustering and assigning the psychiatrists for every cluster, Task-2: classification—consists of both the rigorously trained TensorFlow (TF) image and the TensorFlow (TF) text classifier to detect suicidal thinking person's considering the images and texts they post in OSN on a daily basis as {suicidal—'s', non-suicidal—'ns'}. Task-3: motivator module (M-Module) and Alarm FOaF—the result of the classifier module is given as feedback to the psychiatrists assigned to each cluster. Psychiatrists motivate the suicidal thought person for a time period T, and monitor emotion shifts. The alarm is given to the suicidal thought person's Friend Of a Friend (FOaF) if no improvement is monitored by psychiatrists even after the M-Module has been implemented. The Facebook dataset extracted by the beautiful soup (Python) is used. The performance analysis shows 97% accuracy, 1% false positive (FP) rate, 0% false negative (FN) rate, 95% true positive (TP) rate and 98.7% true negative (TN) rate.

Keywords: Online Social Networks, Suicidal, Non-Suicidal, Machine Learning, Big Data, TF Classifier

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Title of Paper: **A Comprehensive Investigation of the Design of Solar-Powered Induction Motor-Driven Electric Vehicle (SIM-EV)**

Materials Today: Proceedings, 56(6), 2022, pp 3682-3686, ISSN: 2214-7853

DOI: https://doi.org/10.1016/j.matpr.2021.12.438

Co-author: Bhagwan Shree Ram

Abstract: Most of the working professionals used four-wheel vehicles and the IC engine-based vehicle generated more pollution and harmed the environment huge, Electric vehicles became a wide interest of the riders, and the result of it researchers attraction towards the efficient and economic electrified, pollution-free vehicle design and trying to remove the limitations. However, the charging stations required to charge the battery in-housed the vehicle to run the DC motor-based prime mover but the pieces of literature elaborated better performance in terms of cost and efficiency robustness as well as low maintenance Induction motor than DC motor as a prime mover. The photovoltaic-based charging can help to overcome the grid-connected charging station. This paper is a comprehensive investigation of the solar-powered induction motor-driven electric vehicle (SIM-EV). Where a photovoltaic rooftop is used to energize the storage battery and a 3Φ induction motor as a prime mover are incorporated to improve electric vehicle's overall performance. Case study of a mathematical model for 3Φ induction motor presented and discussion of the design of the charging device which includes converter as a major part of the electric vehicle, here converter designed and the observation of speed using MATLAB simulation result of induction motor. And the investigation-based study shall help to understand the opportunity standalone solar-powered induction motor-driven electric vehicle (SIM-EV) in the form of passenger cars and know the limitation..

Keywords: Induction Motor, Electric Vehicle, Solar Panel, Converter, Charging Station, Storage Battery, Solar Car

PUBLICATION by Members

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Title of Paper: **A Numerical Study on the through Thickness Shear Behavior of EPS Sandwich Panels**

Materials Today: Proceedings, 62(6), 2022, pp 4379-4385, ISSN: 2214-7853

DOI: https://doi.org/10.1016/j.matpr.2022.04.876

Co-authors: Dibya Jyoti Basu & Debasish Bandyopadhyay

Abstract: The expansion of industry has rapidly increased the need of energy; necessitating a greater usage of energy resources and posing substantial environmental dangers in the process. Thus, an energy-efficient modular building system appears to be a must-have choice for the India's required mass housing at affordable cost, while the environmental concerns are also looked into account. Insulating Construction Panels are one of the pre-casted building materials; comprising of a core panel of expanded polystyrene insulation encased in galvanized welded steel reinforcing mesh and shear connectors, which is then placed to the site with pressurized concrete skins on both the sides of the core. The structural integrity of these buildings, on the other hand, is heavily reliant on the functioning of these shear connectors and the degree of composite action (DCA). The present study aims to develop a full scale computational model of a single storey building made up of modular EPS panels, to study the effect of spacing and the consequences of different kinds of shear connector failures. Furthermore, the effect of door and window openings on the structural responses of the EPS panel building are discussed. The through thickness shear behavior of these materials are also investigated using multiple static and dynamic analyses steps. The mechanical behaviors of these panels are observed to be widely varying with the spacing, diameter, and adequacy of the shear connectors. The results infer that the present work seems to be necessary for the safety assurance of the insulated precast building panel structural systems, which has a lot of potential for practical usage and thus can help to accomplish the objectives of efficient and economical sustainable building systems in the upcoming years.

Keywords: EPS Sandwich Panels, Finite Element Analysis, Modular Construction, Shear Connectors, Sustainable Ecosystem

Published Articles in IEI Journals

Journal of The Institution of Engineers (India): Series B

Electrical, Electronics & Telecommunication and Computer Engineering
(Electronic ISSN: 2250-2114, Print ISSN: 2250-2106)
[SCOPUS Indexed & UGC-CARE (India) listed]
For download, Members may visit www.ieindia.org

Volume 103, Issue 3, June 2022

Paper Title: **A Graph Attribute Aggregation Method based on Feature Engineering**
Authors: **Hao Wang** & **Xin-Tao Ma**
College of Computer Science and Technology, Jilin University, Changchun, 130012, China
Li-Yan Dong & **Ming-Hui Sun**
Key Laboratory of Symbolic Computation and Knowledge Engineering of Ministry of Education, Jilin University, Changchun, 130012, China
DOI: https://doi.org/10.1007/s40031-021-00698-z
Publication Date: 04 January 2022
Pages: 711–719

Paper Title: **An Effect of Machine Learning Techniques in Electrical Load forecasting and Optimization of Renewable Energy Sources**
Authors: **Saroj Kumar Panda** & **Papia Ray**
Department of Electrical Engineering, Veer Surendra Sai University of Technology, Burla, India
DOI: https://doi.org/10.1007/s40031-021-00688-1
Publication Date: 04 January 2022
Pages: 721–736

Paper Title: **Applications of Adaptive Long Short-Term Memory to Active Filtering**
Author: **Alka Singh**
Department of Electrical Engineering, Delhi Technological University, New Delhi, India
DOI: https://doi.org/10.1007/s40031-021-00685-4
Publication Date: 21 October 2021
Pages: 737–746

Paper Title: **Application of SOS Algorithm for Solution of ORPD Problem**
Authors: **Dharmbir Prasad** & **Rudra Pratap Singh**
Department of Electrical Engineering, Asansol Engineering College, Asansol, West Bengal, India
V Mukherjee
Department of Electrical Engineering, Indian Institute of Technology (Indian School of Mines), Dhanbad, Jharkhand, India
DOI: https://doi.org/10.1007/s40031-021-00700-8
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Mechanical Engineering Department, National Institute of Technology, Patna, India
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DOI: https://doi.org/10.1007/s40033-021-00304-y
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Pages: 311–318

Paper Title: **Study of CCLW, Alumina and the Mixture of Alumina- and CCLW-Reinforced Aluminum-Based Composite Material with and without Mechanical Alloying**

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DOI: https://doi.org/10.1007/s40033-021-00312-y
Publication Date: 11 November 2021
Pages: 319–331

Paper Title: **Study the Effect of Introducing 6061 Al Alloy Chip on the Microstructure and Properties of the 6061 Wrought Al Alloy Prepared by Gravity Die-cast**

Authors: **Manish Dixit**
Department of Mechanical Engineering, BN College of Engineering and Technology, Lucknow, India
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DOI: https://doi.org/10.1007/s40033-022-00336-y
Publication Date: 15 March 2022
Pages: 333–340

Paper Title: **Study of Mechanical Properties of SiC and Gr Reinforced Al7075 Powder Metallurgy Composites and Analysis of Results using ANOVA**

Authors: **T S Manjunath**
R&D, Bosch India Limited, Technical Center India, Bangalore, Karnataka, India

Published Articles in IEI Journals

Department of Mechanical Engineering, Government Engineering College, Ramanagara, Karnataka, India
Seenappa & **M V Praveen Kumar**
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DOI: https://doi.org/10.1007/s40033-021-00319-5
Publication Date: 27 January 2022
Pages: 341–348

Paper Title: **The Practical Expression of Comprehensive Materials in the Process of Painting Art Creation**
Author: **Hongxian Geng**
Henan Mechanical and Electrical Vocational College, No. 1, Taishan Road, Longhu Town, Zhengzhou South University Town, Zhengzhou, 451191, Henan, China
DOI: https://doi.org/10.1007/s40033-022-00329-x
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Research Center (Physics), ATME College of Engineering, Myruru, Karnataka, India
DOI: https://doi.org/10.1007/s40033-022-00332-2
Publication Date: 16 February 2022
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National Institute of Technology, Rourkela, India
DOI: https://doi.org/10.1007/s40033-021-00307-9
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Authors: **Amit Golder** & **Indrajit Roy**
Department of Civil and Environmental Engineering, Birla Institute of Technology, Mesra, Ranchi, Jharkhand, India
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Pages: 375–381

Paper Title: **Wear Performance of UHMWPE and PCU Artificial Disc Materials**
Authors: **Daniel Glad Stephen J**, **Prakash M**, **Nirab Kumar Das** & **Shubham Shukla**
Department of Mechanical Engineering, SRM Institute of Science and Technology, Kattankulathur, Chennai, India
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Volume 103, Issue 1, June 2022

Paper Title: **Antibiofilm Activity of Biosurfactant Produced by Bacterial Strain Isolated from Petroleum-Contaminated Sites**
Author: **Anjali A Sharma**
Department of Microbiology, Shri. Shivaji Science College, Nagpur, Maharashtra, India
DOI: https://doi.org/10.1007/s40034-020-00175-0
Publication Date: 14 September 2020
Pages: 3–14

Paper Title: **Synthesis of Activated Carbon from Groundnut Shell Via Chemical Activation**
Authors: **Geeta Kumari**, **Bhavin Soni** & **Sanjib Kumar Karmee**
Thermo-Chemical Conversion Technology Division, Sardar Patel Renewable Energy Research Institute (SPRERI), Post Box No. 2, Near BVM Engineering College, Vallabh Vidyanagar, Anand, Gujarat, India
DOI: https://doi.org/10.1007/s40034-020-00176-z
Publication Date: 12 September 2020
Pages: 15–22

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Authors: **Thodupunoori Harshavardhan**, **Akshay Gaikwad** & **Paramita Haldar**
Department of Chemical Engineering, BITS Pilani, K. K. Birla Goa Campus, Zuarinagar, Sancole, Goa, India
DOI: https://doi.org/10.1007/s40034-020-00177-y
Publication Date: 16 September 2020
Pages: 23–29

Paper Title: **Kinetics of Gasification and Co-gasification of Petcoke and Coal**
Authors: **Komal Verma**, **Zavin R Gajera** & **Ashish N Sawarkar**
Department of Chemical Engineering, Motilal Nehru National Institute of Technology Allahabad, Prayagraj, Uttar Pradesh, India
DOI: https://doi.org/10.1007/s40034-020-00178-x
Publication Date: 18 September 2020
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Paper Title: **Effect in Growth of Corn Plant from Cellulose-Based Hydrogel Derived from Wheat Straw**
Authors: **Pradyumna Kumar Sasmal** & **Subhajit Patra**
Department of Chemical Engineering, Maulana Azad National Institute of Technology Bhopal, Bhopal, India
DOI: https://doi.org/10.1007/s40034-020-00180-3
Publication Date: 29 September 2020
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Authors: **Chinmayee Das**
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Department of Mechanical Engineering, VSSUT, Burla, Odisha, India
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Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, Madhya Pradesh, India
DOI: https://doi.org/10.1007/s40034-020-00183-0
Publication Date: 26 October 2020
Pages: 53–63

Paper Title: **Effect of Groundnut Shell Particulate Content on Physical and Mechanical Behavior of Jute–Epoxy Hybrid Composite**
Authors: **Prabina Kumar Patnaik**, **Srimant Kumar Mishra** & **Sameer**
Department of Mechanical Engineering, GIET University, Gunupur, Odisha, India
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Department of Chemical Engineering, NIT, Rourkela, Odisha, India
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Authors: **Anusha Jain**, **Sunder Lal Pal** & **Yash Jaiswal**
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Department of Chemical Engineering, Pravara Rural Engineering College, Loni, Ahmednagar, Maharashtra, India
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DOI: https://doi.org/10.1007/s40034-020-00190-1
Publication Date: 10 February 2021
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Department of Applied Chemistry, Laxminarayan Institute of Technology, Nagpur, India
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Publication Date: 22 November 2020
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Paper Title: **Lithium–Molybdenum–Borate Glasses Doped with Cu2+ ions as Solid Electrolytes**
Authors: **L Srinivasa Rao** & **C Thirmal**
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DOI: https://doi.org/10.1007/s40034-020-00193-y
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Department of Textile Engineering, Isfahan University of Technology, Isfahan, 84156-83111, Iran
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Department of Chemical Engineering, Assam Engineering College, Jalukbari, Guwahati, Assam, India
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Department of Chemical Engineering, National Institute of Technology Nagpur, India
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Department of Chemistry, National Institute of Technology Nagpur, India
DOI: https://doi.org/10.1007/s40034-020-00198-7
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Authors: **Battula Kumara Raja**, **Umang Goswami** & **Bharat Modhera**
Department of Chemical Engineering, Maulana Azad National Institute of Technology, Bhopal, Madhya Pradesh, 462003, India
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Department of Chemical Engineering, University of Petroleum and Energy Studies, Dehradun, Uttarakhand, 248001, India
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Anjali Oudhia
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Department of Applied Physics, FET-SSGI Shri Shankaracharya Technical Campus, Junwani, Bhilai, India
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Publication Date: 19 January 2021
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Authors: **Anjali Kumari Garg**, **Jaidev Kaushik**, **Deepika Saini**, **Ruchi Aggarwal** & **Sumit Kumar Sonkar**
Department of Chemistry, Malaviya National Institute of Technology Jaipur, Jaipur, India
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