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Chemosphere Volume 287, Part 3, January 2022, 132272



Development of mathematical model and experimental Validation for batch bio-drying of municipal solid waste: Mass balances

Ani Lawrance^a, Ajit Haridas^b, S. Savithri^c, A. Arunaqiri^a

- ^a Department of Chemical Engineering, National Institute of Technology, Tiruchirappalli, 620 015, Tamil Nadu, India
- ^b Environmental Technology Division, CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, 695 019, Kerala, India
- ^c Materials Science and Technology Division, CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, 695 019, Kerala, India

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Modelling and simulation of food waste bio-drying

Ani Lawrance ^a, Mani Veera Santhoshi Gollapalli ^a, S. Savithri ^c, Ajit Haridas ^b, A. Arunagiri ^a

- ^a Department of Chemical Engineering, National Institute of Technology, Tiruchirappalli, 620 015, Tamil Nadu, India
- ^b Environmental Technology Division, CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, 695 019, Kerala, India
- ^c Materials Science and Technology Division, CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, 695 019, Kerala, India

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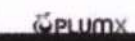
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Abstract

BACKGROUND

In the present investigation, rice husk modified by Cetyltrimethylammonium bromide (CTAB) was used for the adsorptive removal of perchlorate by fixed column experiments from aqueous solution. The performance of the cationic modified rice husk (MRH) was characterized by Fourier transform infrared analysis. Experiments were carried out in a properly designed test rig consisting of a fixed-bed column of the cationic MRH with provision for admitting variable flow rates of the adsorbate at specified concentrations. The experimental unit can vary the column heights of the adsorbent.

RESULTS

The influence of parameters such as inlet perchlorate feed concentration, flow rate of feed and height of bed used was analyzed based on the breakthrough curves and saturation time of the cationic modified adsorbent. The ranges of parameters were determined from parameter optimization studies using several sets of batch experiments.

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Background

Mangiferin is a C-glycoside xanthone molecule having a wide range of therapeutic properties. Hence, the present study aims to understand the efficacy of mangiferin against colorectal cancer (CRC) and to elucidate the mechanisms of action of mangiferin on colorectal cancer.

Method

The molecular mechanism of mangiferin against colorectal cancer was studied using Autodock Vina software. Pharmacophore analysis of mangiferin concerning five COX-2 inhibitor drugs was carried out using the PharmaGist server to analyze the possibility of using mangiferin as a COX-2 inhibitor. In vitro analysis of Mangiferin against various cancer cell lines was

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Comparative study of floating wetland and constructed wetland for Automobile wastewater treatment

Vishnu Sadanand^{1*}, Drishya S², Elna Cherian³, Veena V⁴, Dr. K B Radhakrishnan⁵, Anooj E S⁶,
^{1,2,3,4} UG Student, Department of Biotechnology and Biochemical Engineering, Sree Chitra Thirunal College of Engineering, Thiruvananthapuram.

⁵ Professor and Head of Department, Department of Biotechnology and Biochemical Engineering, Sree Chitra Thirunal College of Engineering, Pappanamcode, Thiruvananthapuram.

⁶ Xcellogen Biotech India Pvt Ltd, Thiruvananthapuram, 695024, Kerala, India
*Corresponding author e-mail: vishnu2000venus@gmail.com

Abstract

The wastewater from the automotive industries is one of the primary sources of oil and grease, heavy metals, cyanide, organic and inorganic pollutants that considerably adds to the pollution load of receiving water bodies and is vital for stream contamination. And also, nowadays automobile water treatment methods are highly energy demanding and expensive. In this study, the comparison of a floating and constructed wetland systems were carried out for finding, which is more effective in reducing the water quality parameters such as P^H, BOD, COD, TSS and TDS. The plant selected for the floating system and constructed wetland were *Eicchorniacrassipes* and *Eleusine indica* respectively. Analysis of the result indicates that the characterized constructed wetland is an effective secondary treatment method as compared to the floating wetland system, as latter resulted in increase of BOD & COD due to the desiccation of water hyacinth. During the implementation of a constructed wetland with a retention time of 15 days, it was shown to effectively maintain a neutral pH, reduce BOD by 87.17 %. COD by 88 %.

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Intrusion Detection System is a device or software in the field of cybersecurity that has become an essential tool in computer networks to provide a secured network environment. Machine Learning based IDS offers a self-learning solution and provides better performance when compared to traditional IDS. As the predictive performance of IDS is based on conflicting criteria, the underlying algorithms are becoming more complex and hence, less transparent. Explainable Artificial Intelligence is a set of frameworks that help to develop interpretable and inclusive machine learning models. In this paper, we use

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Electroencephalography (EEG) is a crucial non-invasive medical tool for diagnosing neurological disorder called encephalopathy. There is a requirement for powerful signal processing algorithms as EEG patterns in encephalopathies are not specific to a particular etiology. As visual examination and linear methods of EEG analysis are not sufficient to get the subtle information regarding various neuro pathologies, non-linear analysis methods can be employed for exploring the dynamic, complex and chaotic nature of EEG signals. This work aims identifying and differentiating the patterns specific to cerebral dysfunctions associated with Encephalopathy using Recurrence Quantification Analysis and Fractal Dimension algorithms. This study analysed six RQA features, namely, recurrence rate, determinism, laminarity, diagonal length, diagonal entropy and trapping

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This paper examines the Secrecy Outage Probability (SOP) and outage performance of an energy efficient Spatial Modulation (SM) in a bidirectional Decode and Forward (DF) Cooperative Cognitive Radio (CCR) system with the presence of an eavesdropper. In the proposed system, both primary and secondary users use SM technique to enhance the spectral efficiency and energy efficiency of the bidirectional system. The two primary users swap their information with the aid of a secondary user, which acts as a bidirectional DF relay node. Time Switching Relaying protocol-based energy harvester is employed in the secondary user to harvest the energy from both SM operated primary users. Secondary user information is embedded with jamming signal to confuse the eavesdropper. The SOP

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Analytical Investigation of Higher Education Quality Improvement by Using Six Sigma Approach

Ameen Abdulla M. S., Kavilal E. G.

Abstract

For over two decades in India, the technical industry's unique selling proposition (USP), with its wide infrastructure of technical institutes, has been capable of supplying best-in-class engineers. But recently, this claim does not hold water. According to the All India Council for Technical Education (AICTE), about 2.6 lakh mechanical engineers graduate every year in India. But the real count of industry ready mechanical engineers is approximately 7%. Hence, there is a need to assess the quality of engineering education in India to reduce the flaws in higher education. The purpose of the paper is to identify the various defects associated with technical education and eliminate those defects using various quality tools. This research is based on the six sigma technique, which is used to assess the quality criteria proposed by the National Board of Accreditation India (NBA). The proposed model is then applied to a typical tier II Indian engineering college located in south India. Six Sigma has two main methodologies: DMAIC and DFSS. The DMAIC (Define, Measure, Analyze, Improve, and Control) methodology is implemented for existing systems, whereas DFSS (Design for Six Sigma) is for assuring quality in new products. In this project, the conclusion is driven by the DMAIC methodology. Various statistical and non-statistical tools are employed in this research. The tools used are CTS-CTQ, SIPOC, Pareto chart, normal process capability analysis, one-way ANOVA, Ishikawa diagram, FMEA, RCBD, and SPC chart. All the statistical processes are done using Minitab analytical software. From the results, it is identified that the factors that have a risk priority number (RPN) greater than 300 need improvement, such as versatility in program curriculum, laboratories and workshops, and credibility among universities. Six Sigma can be achieved by developing proper strategies for mitigating these defects.

About The Authors

Ameen Abdulla M. S.
Department of Mechanical Engineering, Sree Chitra Thirunal College of Engineering APJ Abdul Kalam Technological University, Kerala, India

Kavilal E. G.
Department of Mechanical Engineering, Sree Chitra Thirunal College of Engineering APJ Abdul Kalam Technological University, Kerala, India

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ABSTRACT

Rotational molding is a powder processing technology widely used to manufacture hollow plastic products. It is a well-known process used for the manufacturing of large containers, water tanks, fuel tanks, refrigerated containers, etc. This study aimed at the incorporation of Tampico and Palmyra fibers as reinforcement in Linear Low-Density Polyethylene (LLDPE) tanks produced by the rotational molding process. The effect of fiber content on various properties like mechanical, morphological, and vibration damping characteristics of the composites were investigated. The fibers were initially treated with 5% NaOH solution for better reinforcing efficiency and to improve the degradation temperature. Thermo Gravimetry Analysis (TGA) reported that a sufficient increment in degradation temperature is achieved by NaOH treatment on fibers. The short fiber composites considered for the study have obtained better mechanical strength than long fiber reinforced LLDPE composites. The results proved that fiber length has

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The interplay of centrifugal and buoyancy driven convection in a vertical annulus formed by rotating adiabatic outer cylinder and stationary heated inner cylinder has been experimentally and numerically investigated. Experiments were performed for rotational speeds corresponding to the rotation parameter ζ in the range of $527 \leq \zeta \leq 2860$, maintaining the heat flux of the heated stationary inner cylinder as 80 W/m^2 , for radius ratio (η) and aspect ratio of the vertical annulus being 0.614 and 0.052, respectively. The problem was investigated numerically using the commercial computational fluid dynamics package, ANSYS CFX. The numerical methodology has been validated by comparing the numerically predicted average surface Nusselt number with experimentally obtained values. The comparison revealed an enhancement of the thermal performance of the heated stationary inner cylinder in the range $527 \leq \zeta \leq 1190$ due to the increase in turbulence intensity towards the heated inner cylinder. However, when the rotation parameter was increased further in the range $1190 \leq \zeta \leq 2860$, the thermal performance of the stationary heated inner cylinder showed only marginal improvement. The aforementioned thermal behavior of the inner heated stationary cylinder has been explored based on the flow statistics gathered from the numerical simulations.

V. K. Chithrakumar

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P.V. Jithu, G. Mohan  



Center for Computational Research in Clean Energy Technologies, Sree Chitra Thirunal College of Engineering, Thiruvananthapuram, Kerala, India


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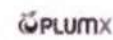
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Synthesis, solvatochromism and DFT study of pyridine substituted benzanthrone with ICT characteristics ☆

Anup Thomas ^a, Elena M. Kirilova ^b, B.V. Nagesh ^c, S.R. Manohara ^d, B. Siddlingeshwar ^e, Sergey V Belyakov ^e

- ^a Centre for Computational research in Clean Energy Technologies, Sree Chitra Thirunal College of Engineering, Trivandrum, India
- ^b Department of Chemistry, Daugavpils University, Vianibas 13, Daugavpils, Latvia
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- ^e Latvian Institute of Organic Synthesis, Aizkraukles Str. 21, Riga 1006, Latvia

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- ^a Centre for Computational Research in Clean Energy Technologies, Sree Chitra Thirunal College of Engineering, Trivandrum, India
- ^b Department of Physics, B.L.D.E. Association's S.B. Arts and K.C.P. Science College, Vijayapura 586103, India
- ^c Department of Physics, M.S. Ramaiah Institute of Technology, (Autonomous Institute affiliated to VTU), Bengaluru 560054, India
- ^d Nano-Composites and Materials Research Lab, Department of Physics, Siddaganga Institute of Technology, (Autonomous Institute affiliated to VTU), Tumakuru 572103, India
- ^e Department of Engineering Physics, K.L.E. Institute of Technology, Hubballi 580027, India
- ^f School of Chemical Sciences, SRTM University, Nanded 431 606, India
- ^g Department of Chemistry, Daugavpils University, Vienibas 13, Daugavpils, Latvia

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Evaluation of thermal and rheological characteristics of CNT-PAG nanolubricant for the development of energy efficient refrigeration systems

S.S. Sanukrishna^a, Vivek Mathew Jose^b

^a Department of Mechanical Engineering, Sree Chitra Thirunal College of Engineering, Thiruvananthapuram 695018, India
^b Department of Mechanical Engineering, National Institute of Technology, Kozhikode 673601, India

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S.S. Sanukrishna^a, M. Jose Prakash^b

^a Department of Mechanical Engineering, Sree Chitra Thirunal College of Engineering, Thiruvananthapuram 695018, India

^b Department of Mechanical Engineering, TKMIT, Kollam 691505, India

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The addition of nanoparticles is one of state of the art methods to enhance the thermophysical and heat transfer characteristics of cooling and lubricating fluids.



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Designing a novel small-scale parabolic trough solar thermal collector with secondary reflector for uniform heat flux distribution

S. Shajan^{a,b}, V. Baiju^a

- ^a Energy Research Lab, Department of Mechanical Engineering, TKM College of Engineering, Kollam, Kerala, India
- ^b APJ Abdul Kalam Technological University, Kerala, India

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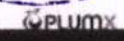
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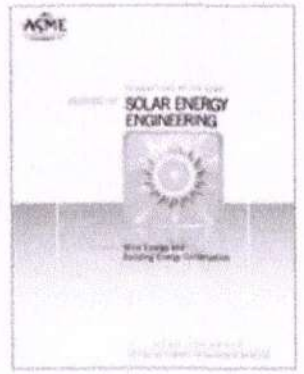


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Secondary Reflector and Receiver Positions for Uniform Heat Flux Distribution in Parabolic Trough Solar Thermal Collector

Baiju V. Shajan S.

Shajan S 1
Energy Research Lab, Department of Mechanical Engineering, TKM College of Engineering, Kollam, Kerala 691505, India; APJ Abdul Kalam Technological University, Kerala 695017, India

¹Corresponding author. Email: shajan@scetce.ac.in

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The distributions of heat flux over the circumference of the receiver tubes have an immense influence on the performance and reliability of the parabolic trough solar thermal collectors. The location of the receiver tube and the secondary reflector configuration may largely influence the performance of the system. Therefore, in this study, the effect of receiver tube position and parabolic secondary reflector configuration has been analyzed, and the non-uniformity of solar flux distribution,



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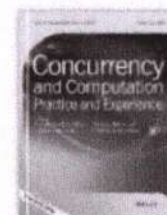
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The allocation of resources is a foremost demanding task in cloud computing. Scholars are yet finding it difficult to allocate appropriate resources to the set of user tasks. Our objective is to provide a platform that optimizes a dynamic resource allocation scheme. Multi-agent deep reinforcement learning-based greedy adaptive firefly algorithm (MAD-GAF) has been proposed herein includes both the resource management and allocation techniques. This chooses the best Quality of Service (QoS) measured host for a group of tasks efficiently and subsequently minimize the task execution time. The proposed cloud brokering architecture comprises a multi-agent system, the cloud provider and the user. Initially, deep reinforcement learning has been built to recreate the request of cloud customers by forecasting the value of unused resources. Then the recreated customer request is forwarded to the global broker agent, which maps the virtual machine (VM) to the most appropriate cluster of physical machine (PM). The virtual machine monitor (VMM) selects VMs by managing and accessing the physical resources. The global utility agent allocates VMs using the GAF optimization algorithm, which specifies the best QoS



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The introduction of jungle computing raises many issues regarding its feasibility because of the distributed heterogeneous highly dynamic resources. Difference in resource representation in different platform poses the first hurdle. Discovering and allocating appropriate resources in jungle without much delay is a challenging task. The paper proposes a three layer distributed architecture that handles jobs separately and in parallel. Dedicated hardware devices that are connected to each other handle resource discovery and allocation. A uniform resource description framework helps reducing the latency for



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- a Department of Electronics and Communication Engineering, SCT College of Engineering, Thiruvananthapuram, Kerala, India
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- c IAC Coordinator, APJ Abdul Kalam Technological University, Thiruvananthapuram, Kerala, India
- d Department of Neurology, SCTIMST, Thiruvananthapuram, Kerala, India
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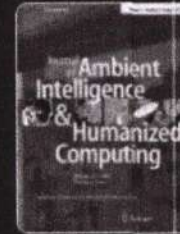
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Benjith Ravindran Unnithan Jataja, Vetrivel Chelian Thirumavalavan, +1 author S. Thirugengadam

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TLDR The concept of joint use of RIS and DF Relay is extended to the Index Modulation (IM) based wireless system and a Lambertian model of reflectance is employed in the analysis of the reflecting nature of RIS. Expand

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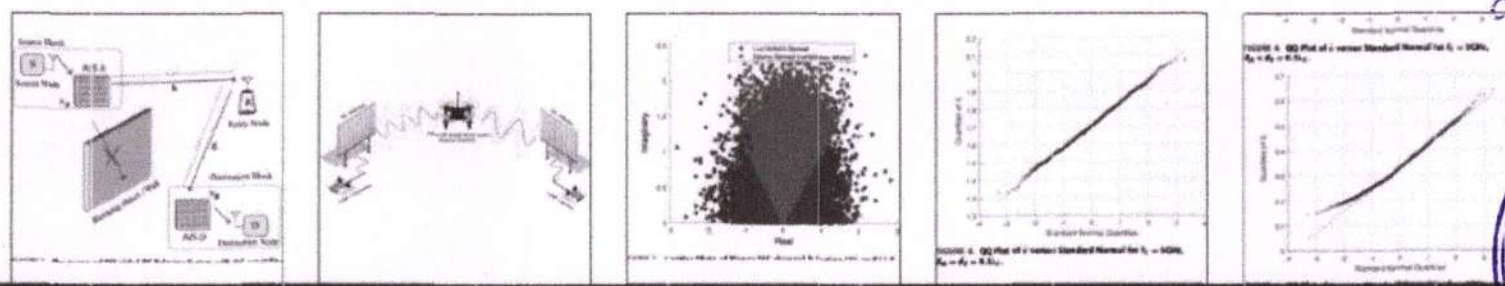
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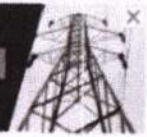
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Smitha P. S., Jitha S. Jayan, Saritha Appukuttan, Suresh Babu V., Shiny G.

DOI: 10.1049/mna2.12038

CORRESPONDING AUTHOR

Smitha P. S.

✉ smithaps@cet.ac.in

Department of Electronics and Communication Engineering, College of Engineering Trivandrum, APJ Abdul Kalam Technological University, Kerala, India

Correspondence

P. S. Smitha, Department of Electronics and Communication Engineering, College of Engineering Trivandrum, APJ Abdul Kalam Technological University, Kerala, India.

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particularly metal-insulator-metal capacitors are of high specific capacitance. The insulator material Ba_{0.5}Sr_{0.5}TiO₃ is chosen owing to its high relative permittivity. In this paper, capacitors are synthesized using commercially available TiO₂ nanopowder from Ti isopropoxide as well as using synthesized TiO₂ nanopowder from Ti isopropoxide with different grain sizes of commercially available and synthesized TiO₂ nanopowder on the effect of grain size and crystallinity on the performance of Ba_{0.5}Sr_{0.5}TiO₃ ceramic based metal-insulator-metal capacitors synthesized in this paper. An 88 % reduction in grain size of TiO₂ nanopowder synthesized from Ti isopropoxide compared to commercially available TiO₂ nanopowder. A 45 % enhancement in specific capacitance and 57 % enhancement in leakage current are achieved in Ba_{0.5}Sr_{0.5}TiO₃ ceramic based metal-insulator-metal capacitor synthesized using TiO₂ nanopowder with lower grain size. The lower leakage current of metal-insulator-metal capacitor with Ba_{0.5}Sr_{0.5}TiO₃



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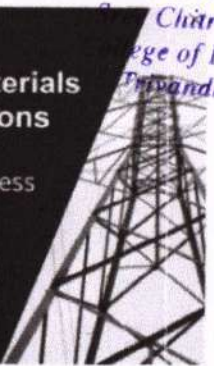
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Investigations on Electrical Properties of Al₂O₃, ZnO and MgO Doped Ba_{0.7}Sr_{0.3}TiO₃ Ceramics Based MIM Capacitor for Energy Storage Application

P. S. Smitha ✉
a Department of Electronics and Communication Engineering, College of Engineering Trivandrum, APJ Abdul Kalam Technological University, Kerala, India

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Investigation on dielectric properties of Al₂O₃, ZnO and MgO doped Ba_{0.7}Sr_{0.3}TiO₃ ceramics

P.S. Smitha^a, Jitha S. Javan^b, Appukuttan Saritha^c, V. Suresh Babu^d, G. Shiny^a

- ^a College of Engineering Trivandrum, APJ Abdul Kalam Technological University, Kerala, India
- ^b Amrita School of Arts & Sciences, Amrita Vishwa Vidyapeetham, Amritapuri Campus, Kollam, Kerala, India
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Collusion resistant secret sharing scheme for secure data storage and processing over cloud

Lakshmi V.S.¹, Deepthi S.², Deepthi P.P.

Department of Electronics and Communication Engineering, National Institute of Technology Calicut, Kerala, India

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R. Kamal Krishna^{a, b, c}, M. Unnikrishnan^{a, c, d}, Jayaraj Kochupillai^{a, c, e}

- ^a Advanced Dynamics and Control Lab, College of Engineering Trivandrum, India
- ^b Assistant Professor of Mechanical Engineering, SCT College of Engineering, Trivandrum, Kerala
- ^c Affiliated to APJ Abdul Kalam Kerala Technological University, India
- ^d Associate Professor of Mechanical Engineering, College of Engineering, Trivandrum, India
- ^e Principal, Mar Baselious College of Engineering & Technology, Pallikkunnu P O, Peermade, Idukki, 685531, Kerala, India

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Dynamics of stretched flexible tubes conveying fluid

R. Kamal Krishna^a, M Unnikrishnan^b, Jayaraj Kochupillai^c

- ^a Department of Mechanical Engineering, College of Engineering Trivandrum, India
- ^b Associate Professor of Mechanical Engineering, College of Engineering Trivandrum, India
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Abstract

Silicone polymer tubes offer improved resistance to erosion, light in weight, non-toxic and corrosion-resistant, and hence they are used in many pharmaceuticals as well as medical applications. Usually, the evaluation of the fundamental frequency and the mode shape of fluid conveying pipes are vital in the dynamic analysis of tubes, where the flow



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Fuel

Volume 236, Part 1, 15 February 2021, 119294



Full Length Article

Hexanol: A renewable low reactivity fuel for RCCI combustion

Justin Jacob Thomas, V.R. Sabu, G. Basrin, G. Nagarajan

Internal Combustion Engineering Division, Anna University, Chennai 600025, Tamilnadu, India

Received 2 May 2020, Revised 16 July 2020, Accepted 20 September 2020, Available online 11 October 2020, Version of Record 11 October 2020.

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Highlights

- Hexanol as low reactivity fuel in RCCI combustion.
- Energy conversion from agricultural/food industry waste.

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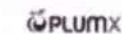
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2021-04-06

Residual Cooking Oil Biodiesel and Hexanol as Alternatives to Petroleum-Based Fuel in Low-Temperature Combustion: Parametric Study 2021-01-0520

Environmental pollution as a result of improper disposal of agricultural and food industry waste has been a concern lately. In the present study, an attempt has been made to produce energy from these wastes. Biodiesel produced from residual cooking oil (RCOB) and hexanol produced from agricultural waste have been investigated as alternatives to petroleum-based fossil fuels in a dual-fuel low-temperature combustion engine. Hexanol was injected in the inlet port at 3 bar injection pressure whereas RCOB was injected directly inside the combustion chamber using a common rail direct injection system. The proportion of Hexanol to RCOB was varied from 40% to 60% at rated load. The operating parameters such as intake air temperature, exhaust gas recirculation (EGR) quantity along with multiple injection timing, duration, quantity, and pressure were optimized for lower oxides of nitrogen (NO_x) and smoke emissions. Intake air temperature of 40 °C, EGR rate of 30 %, and direct injection timings at 47 °bTDC and 7 °bTDC exhibited the lowest nitric oxide (NO) and smoke emissions. Similarly, the injection quantity share of 50:50 for the two direct injections at an injection pressure of 400 bar was observed to be optimum for the lowest NO and smoke emissions. Accordingly, the test engine was operated at optimized conditions, and the combustion, performance, and emission data were collected and compared with that of Diesel operation. A reduction in NO emission by 97%, smoke emission by 70%, and carbon dioxide (CO₂) emissions by 19% were observed. A marginal increase in the thermal efficiency of about 2% was also observed with 40% hexanol replacement. From the investigation, it is inferred that with proper optimization, renewable fuels such as RCOB and hexanol can give a diesel-like performance with reduced emissions by low-temperature combustion.



DOI: <https://doi.org/10.4271/2021-01-0520>

Citation: Thomas, J., Nagarajan, G., VR, S., and Sharma, V., "Residual Cooking Oil Biodiesel and Hexanol as Alternatives to Petroleum-Based Fuel in Low-Temperature Combustion: Parametric Study," SAE Technical Paper 2021-01-0520, 2021, <https://doi.org/10.4271/2021-01-0520>.

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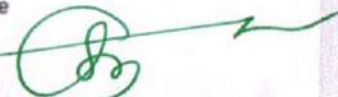
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Volume 59, Part 1, 2022, Pages 510-515

A comparative study of Mechanical, morphological and vibration damping characteristics of wood fiber reinforced LLDPE processed by rotational moulding

S.S. Abhilash, Roshan Lal A, D. Lenin Singaravelu

- ^a Production Engineering Department, National Institute of Technology Tiruchirappally 620015, India
- ^b Mechanical Engineering Department, Sree Chitra Thirunal College of Engineering Trivandrum 695018, India

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Abstract

The present work investigates the mouldability of Linear Low-Density Polyethylene



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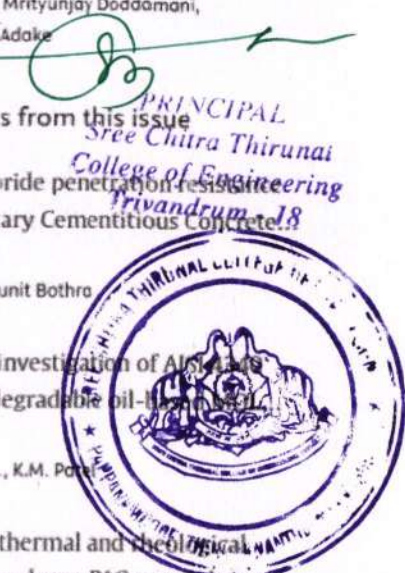
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Composites Communications Volume 24, April 2021, 100605



An investigation to study the combined effect of different infill pattern and infill density on the impact strength of 3D printed polylactic acid parts

Pradeep Kumar Mishra, P. Senthil, S. Adarsh, M.S. Anoop

Department of Production Engineering, National Institute of Technology, Tiruchirappalli, 620015, India

Received 23 April 2020, Revised 12 December 2020, Accepted 22 December 2020, Available online 29 December 2020, Version of Record 1 January 2021.

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- Impact energy absorbing capability of 3D printed specimen depends on infill

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An investigation on viscoelastic characteristics of 3D-printed FDM components using RVE numerical analysis

M. S. Anoop

Department of Production Engineering, National Institute of Technology, Tiruchirappalli, India

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Abstract

Fused deposition modelling (FDM) has emerged as an economical additive manufacturing method having the potential to fabricate functional components. Dynamic behaviour of FDM components is of great interest while designing and printing them for functional applications. This paper presents a methodology to describe the dynamic characteristics of FDM, combining the features of thermoplastic material and build parameters adopted in fabrication. The viscoelastic characteristics of thermoplastic filament induce time-temperature dependence in FDM components. The viscoelastic characteristic of the



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Volume 39, Part 1, 2021, Pages 563-571

Microscale representative volume element based numerical analysis on mechanical properties of fused deposition modelling components

Anoop M.S., Senthil P.

Department of Production Engineering, National Institute of Technology, Thiruchirappalli, India

Received 24 July 2020, Revised 11 August 2020, Accepted 19 August 2020, Available online 29 September 2020, Version of Record 5 March 2021.

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Abstract

Among additive manufacturing techniques, Fused Deposition Modelling (FDM) has emerged as an economical method capable of fabricating functional components. The

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Abstract

Thermal management of electric motor is a significant criterion concerning the performance of the motor since it relies on the working temperature. This paper presents an experimental investigation of a thermal management system with a design based on the passive action of closed-loop pulsating heat pipes (CLPHP). The evaporator is a curved copper section termed the cooling pad, which inculcates the pulsating fluid regime and directly contacts the motor surface. Four such sets of CLPHPs are mounted on a test bench to study the performance characteristics of the system. Water–acetone binary mixture is selected as the working fluid and is tested for optimum mixing ratio by varying the acetone

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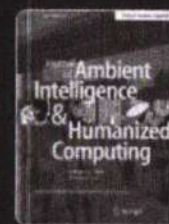
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A combined big data analytics and Fuzzy DEMATEL technique to improve the responsiveness of automotive supply chains



Rinu Sathyan

Department of Production Engineering, National Institute of Technology, Tiruchirappalli, 620015, India

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The vital task of improving the Responsiveness of the automotive supply chains is to forecast the demand and analyze the vehicle's most influential attributes. The purpose of this paper is to develop a model to forecast the demand and analyzing the vehicle attributes using a combined approach of big data analytics and fuzzy decision-making trial and evaluation laboratory (DEMATEL) technique. The forecasting process includes the sentiment analysis of product review and creating a predictive model using an artificial neural network algorithm. The most influential attributes of the vehicle were extracted from online customer reviews and these attributes were analyzed using the Fuzzy

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Thermal Science and Engineering Progress

Volume 26, 1 December 2021, 101116

Experimental investigation on thermophysical properties of Therminol® 55 based hybrid nanofluids with alumina and graphene nanoplatelets for medium temperature applications

S. Shojan ^{a, b}, V. Baiju ^a, T.S. Krishnakumar ^a, Godwin Andrew ^a, Linia Thomas ^a, Manu Alex ^a, Muadh Bin Safer ^a

- ^a Energy Research Lab, Department of Mechanical Engineering, TKM College of Engineering, Kollam, Kerala, India
- ^b A P J Abdul Kalam Technological University, Kerala, India

Received 10 August 2021, Revised 9 October 2021, Accepted 16 October 2021, Available online 31 October 2021, Version of Record 13 November 2021.

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Anup Thomas,^a Chennu Ji,^b B. Siddlingeshwar,^{†c} Prashant Uday Manohar,^d Fuming Ying^b and Wei Wu^{*b}

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^a Center for Computational Research in Clean Energy Technologies, Sree Chitra Thirunal College of Engineering, Pappanamcode, Trivandrum 695018, India

^b Fujian Provincial Key Laboratory of Theoretical and Computational Chemistry, The State Key Laboratory of Physical Chemistry of Solid Surfaces, and College of Chemistry and Chemical Engineering, Xiamen University, Xiamen, Fujian 361005, China

E-mail: weiwu@xmu.edu.cn

^c Department of Physics, M. S. Ramaiah Institute of Technology, Bengaluru 560054, India

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28 Sep 2020

The Importance of Geometrical Parameters on the Mechanical Stability of Roebel Cables

Author: IEEE [Cite This] [PDF]

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Abstract:
AC loss from Roebel cables with high-temperature superconducting strands are comparatively less, and they possess high current carrying capacity since they have a transposed structure. However, the strands should be strong enough to withstand various types of external loads during their operation. The present work simulates the performance of the Roebel strand against an external tensile load using 3-D finite element analysis, and the importance of geometrical parameters on the mechanical stability of Roebel cables is investigated. Results were then compared with another work where the analyses were performed on a monolithic Roebel strand. We concluded that the typical twisting of the strands is an important parameter that cannot be ignored when optimizing a Roebel cable. Hence, the stress induced in a Roebel strand against an external load depends not only on the geometrical parameters but also on the typical twisting of the strand.

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Engineering Failure Analysis

Volume 118, December 2020, 104804



Influence analysis of the geometrical parameters on the electro-mechanical stability of HTS Roebel cables

S. Gijoy, K.E. Reby Roy

Department of Mechanical Engineering, TKM College of Engineering, Kollam, Kerala, India

Received 2 May 2020, Revised 29 July 2020, Accepted 4 August 2020, Available online 6 August 2020, Version of Record 24 August 2020.

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Highlights

- Providing outer fillet adversely affects the performance of the Roebel cable.
- Providing an inner fillet avoids the stress concentration.

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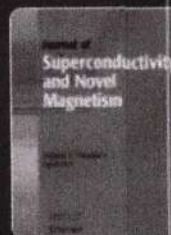
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Abstract

Roebel cables with HTS strands exhibit reduced AC losses and possess large current carrying capacity. Even though works on several 2D and 3D numerical modelling and simulations are available, little efforts are made on computer-aided design (CAD) modelling, finite element analysis (FEA) and simulation of Roebel strands and cables. In this paper, finite element electromagnetic analysis and simulations of a 14-strand HTS Roebel cable is performed. The results obtained are then compared with another work which uses an H-formulation technique to model the problem. Although several numerical

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International Journal of Biological Macromolecules

Volume 151, 15 May 2020, Pages 36-46



Anti-oxidative effect of mangiferin-chitosan nanoparticles on oxidative stress-induced renal cells

Rohini Samadarsi, Debjani Dutta

Department of Biotechnology, National Institute of Technology Durgapur, Mahatma Gandhi Avenue, Durgapur 713209, West Bengal, India

Received 20 November 2019, Revised 4 February 2020, Accepted 11 February 2020, Available online 15 February 2020, Version of Record 20 February 2020.

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Highlights

- MCNs act synergistically with ROS scavenging antioxidant enzymes, such as catalase and peroxidase.

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Synthesis and Performance Evaluation of $Ba_xSr_{1-x}TiO_3$ Ceramic-Based MIM Capacitor for Energy Storage Application

Smitha P. S. Department of Electronics and Communication Engineering, College of Engineering Trivandrum, APJ Abdul Kalam Technological University, Kerala, India; Correspondence smthaps@cet.ac.in http://orcid.org/0000-0002-0217-0383

Smitha Saritha, V. Suresh Babu & Shiny G. 2020, Published online: 11 Nov 2020 10584587.2020.1819032

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Metal-insulator-metal (MIM) capacitor with high-k insulator such as BST enhances specific capacitance. The effects of barium mole fraction (x) of $Ba_xSr_{1-x}TiO_3$ ceramic-based MIM capacitor on specific capacitance and leakage current density are reported in this article. $Ba_xSr_{1-x}TiO_3$ nanopowder for various x are synthesized using solid-state reaction method and the performance parameters of $Ag/Ba_xSr_{1-x}TiO_3/Ag$ MIM capacitors are evaluated. The mean crystallite sizes are in 20 to 60 nm range. $Ba_{0.7}Sr_{0.3}TiO_3$ ceramics show higher relative permittivity owing to its higher mean crystallite size. The insulator with higher crystallite size at dominant orientation shows enhanced leakage performance. $Ba_{0.1}Sr_{0.9}TiO_3$ ceramic capacitor shows optimum performance altogether.

Keywords: Energy storage ceramic capacitor crystallite size specific capacitance leakage current

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P. S. Smitha et al. Integrated Ferroelectrics Published online: 28 Feb 2021

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Effect of Sagging on Dynamic Characteristics of Silicone Tube Conveying Fluid



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R. Kamal Krishna ✕

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R. Kamal Krishna, M. R. Mahesh, Madhusudanan Unnikrishnan & Jayaraj Kochupillai

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Abstract

Flexible silicone tubes are nowadays broadly employing in medical applications such as drugs or blood-conveying tubes, various infusions as well as medical pumps, and ventilators tubes. Due to better resistance to corrosion and erosion, the subsequent diminishing of wall thickness and change in stiffness of silicone tubes are negligibly small. Hence, these tubes provide trouble-free operations for a prolonged period. Commonly, the fundamental frequency of fluid conveying tubes is influenced by various flow parameters. Recognizing the parameters affecting the fundamental frequency and estimating the

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Dynamic Behaviour of Flexible Silicone Tube Subjected to Pulsatile Flow

Original Contribution | Published: 07 September 2020
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Advanced Dynamics and Control Lab, College of Engineering, Trivandrum, India

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Abstract

Flexible Silicone tubes possess superior qualities such as higher corrosion resistance, purity, strength, and inertness compared to other flexible tubes. Hence, these tubes own broad applicability in medical applications as well as other industrial applications. An unsteady flow through the flexible tube can induce severe internal excitation, which results in the flow-induced vibrations. Such vibrations at resonance can cause severe damage to the structure. Concerning the flexible tubes used in sophisticated medical applications, it is imperative to eliminate the structural vibrations, as far as possible. The



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Kamal Krishna R ✕

Advanced Dynamics and Control Lab, College of Engineering Trivandrum, Trivandrum, India

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Abstract

This paper explores the vibratory behavior of fluid-conveying flexible shells using a new generic finite element formulation employing the first-order shear deformation theory. The flexible tube conveying fluid is modeled using eight-noded curved Mindlin shell elements, which incorporate the effects such as shearing deformations and rotary inertia. The fluid is modeled using twenty noded isoparametric acoustic fluid elements. Solving the wave equation for an abstract scalar field velocity potential, we get the equations of motion for the fluid element. The energy transfer within the fluid and the shell is idealized with

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Justin Jacob Thomas, V.R. Sabu, G. Nagarajan, Suraj Kumar, G. Basrin

Internal Combustion Engineering Division, Anna University, Chennai, 600025, Tamilnadu, India

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Development and validation of a reduced chemical kinetic model for used vegetable oil biodiesel/1-Hexanol blend for engine application

Justin Jacob Thomas, C.V. Manojkumar, V.R. Sabu, G. Naagarajan

Department of Mechanical Engineering, CEG Campus, Anna University, Chennai, TN, India

Received 25 January 2020, Revised 3 March 2020, Accepted 2 April 2020, Available online 11 April 2020, version of Record 11 April 2020.



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Experimental investigation on the effects of multiple injections and EGR on *n*-pentanol-biodiesel fuelled RCCI engine

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Sabu V. R.,^{1*} Justin Jacob Thomas¹ and Nagarajan G.²

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* Corresponding authors

¹ ICE Division, Anna University, Chennai, India

E-mail: sabuvr@gmail.com

Tel: +91 9447388555

Abstract

Stringent emissions and fuel economy regulations have necessitated the need to boost the research interest in oxygenated alternate fuels such as *n*-pentanol and biodiesel under low-temperature combustion strategies due to their renewability and cleaner combustion characteristics. Being higher alcohol, *n*-pentanol has desirable fuel properties that are comparable to mineral diesel, which enable easy blending of these fuels. In the present study, the Reactivity Controlled Compression Ignition (RCCI) operation in a modified single-cylinder diesel engine operating at the rated speed of 1500 rpm and 50% load was investigated with non-edible karanja oil-based biodiesel–diesel blend with B20 as high reactivity fuel (HRF) and *n*-pentanol as low reactivity fuel (LRF). The intake temperature was maintained constant at 40 °C, intake pressure was ambient and the LRF was varied from 20% to 50%. The engine's

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Article

A comparative study of mechanical, dynamic mechanical and morphological characterization of tampico and coir fibre-reinforced LLDPE processed by rotational moulding

SS Abhilash and D Lenin Singaravelu

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Abstract

Natural fibres find their application as a reinforcing agent for polymer composites to obtain parts with improved mechanical properties. Manufacturing of non-metallic products is incorporated with natural fibres for better strength and to reduce cost. Rotational moulding is a process used for the manufacturing of hollow plastic products, especially water tanks, plastic fuel tanks, barrels, kayaks, refrigerated panels, etc. Incorporation of natural fibres to reinforce polymers in rotational moulding process is a tedious task, since there is no control over fibre and polymer powder mixture, which is rotating bi-axially, it may lead to fibre agglomeration. The present work investigates the mouldability of linear low density polyethylene composites with tampico and coir fibre as the reinforcement agents using a bi-axial rotomoulding machine. NaOH-treated fibres with 5, 10 and 15% by weight have been added to the linear low density polyethylene matrix, and the composites were prepared by rotational moulding process. Mechanical properties such as tensile strength, flexural strength, impact strength and hardness have been investigated. Dynamic mechanical behaviour such as storage modulus, loss modulus and $\tan \delta$ of the different composites has been investigated with dynamic mechanical analyser. Fractured surfaces were examined qualitatively with the help of a scanning electron microscope for determining the interfacial properties and fibre adhesion between the fibres and the linear low density polyethylene matrix.



Keywords

Rotational moulding, composite materials, natural fibre, LLDPE, coir fibre, tampico fibre

National Institute of Technology Tiruchirappalli, Tiruchirappalli, India

Corresponding author(s):

D Lenin Singaravelu, National Institute of Technology Tiruchirappalli, Tanjore Main Road, Tiruchirappalli, Tamil Nadu 620015, India.
Email: dlenin@nitt.edu

Introduction

Rotational moulding, otherwise called as rotomoulding or slush moulding, is a well-known technology to produce hollow stress-free plastic products [1–3]. Natural fibres find their application as reinforcement for polymeric materials, and the adhesion of these fibres with matrix depends upon the

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Effect of Fiber Content on Mechanical and Morphological Properties of Bamboo Fiber-Reinforced Linear Low-Density



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S. S. Abhilash ✕
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Abstract

Rotational molding or rotomolding is a powder processing technique used for the manufacturing of hollow plastic products. The present work investigates the moldability of long bamboo fiber as the reinforcement for linear low-density polyethylene (LLDPE) matrix. The temperature of the mold, oven and internal air temperature of the mold has been recorded to study the heat transfer rate while processing composites with different weight percentage. Mechanical properties were found to be improved by 5% fiber addition, and beyond that, the properties were reverted. Morphological characterization was done to

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Enhancement of oxidative stability and cold flow properties of coconut oil using natural antioxidant additives for development of bio-lubricant

S. Anoop Kumar, Gautham Suresh, et al. and PS Akhii [View all authors and affiliations](#)

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Coconut oil is less preferred for lubrication purposes, particularly, in high-temperature applications, due to their low thermal stability. Chemical additives for improvements tend to make coconut oil less bio-sustainable and more hazardous. Using natural antioxidants for enhancing oxidative stability has been successfully implemented in food industry. The present study investigates the application of three natural additives – ginger, black pepper and garlic, as possible substitutes for chemical additives in enhancing lubrication properties of coconut oil. In addition to enhancing thermal stability, these natural additives mixed in small proportions could help bring down pour point of coconut oil. Adding traces of food additive, propylene glycol, lubricant samples showed impressive performance in terms of viscosity, friction and wear.

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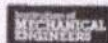
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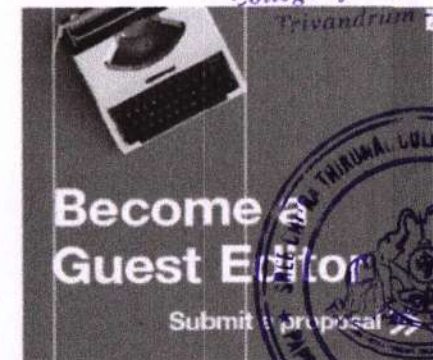
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Abstract

Bio-lubricants are commonly manufactured from vegetable oils. Rice bran oil is found to be an ideal choice as a base stock for industrial lubricants, among many other vegetable oils, based on its fatty acid composition capable of yielding favourable tribological properties. To improve the chemical properties of rice bran oil, chemical modification through transesterification is attempted. Even though transesterified rice bran oil exhibits better chemical properties, the tribological and rheological properties are found to be compromised. The addition of bio-additive stearic acid is found to substantially improve the wear properties of transesterified rice bran oil. A novel bio-lubricant for medium-temperature applications is thus formulated based on rice bran oil.

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


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A review of stress concentration studies on fibre composite panels with holes/cutouts


S Anoop Kumar , R Rajesh, and S Pugazhendhi [View all authors and affiliations](#)
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Abstract


Composite panels are widely used as structural members due to their high strength-to-weight ratio. In order to reduce further weight, cutouts or notches are introduced in these members. These cutouts also serve utility requirements such as man-holes for purpose of service as well as for passing electric or fuel lines. An aircraft wing rib is a typical example of such a composite panel. Even while composites with holes or cutouts provide great savings in weight compared to metallic structures, the presence of holes itself leads to strength reduction. The reduction in strength is due to the concentration of stress around the vicinity of the hole while the structure is under loading. Different-sized and shaped holes/cut-outs are used in composites structural members, which may serve for different purposes. They, in turn, introduce their own versions of stress concentrations effects in such members leading to weakening of the structure. The stress concentration effect in fibre composites also depends on other factors like fibre orientation, fibre material, matrix material, etc. Loading can also influence stress concentration. This review pursues vast research




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A review on advancements in applications of fused deposition modelling process

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Senthil P. (Department of Production Engineering, National Institute of Technology, Tiruchirappalli, India)
Anoop M.S. (Department of Production Engineering, National Institute of Technology, Tiruchirappalli, India)


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Abstract

Purpose

Fabrication of customized products in low volume through conventional manufacturing incurs a high cost, longer processing time and huge material waste. Hence, the concept of additive manufacturing (AM) comes into existence and fused deposition modelling (FDM), is at the forefront of researches related to polymer-based additive manufacturing. The purpose of this paper is to summarize the research works carried on the applications of FDM.

Design/methodology/approach

In the present paper, an extensive review has been performed related to major application areas (such as a sensor, shielding, scaffolding, drug delivery devices, microfluidic devices, rapid



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Aerodynamic noise from an asymmetric airfoil with perforated extension plates at the trailing edge

CK Sumesh and TJS Jothi View all authors and affiliations

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Abstract

This paper investigates the noise emissions from NACA 6412 asymmetric airfoil with different perforated extension plates at the trailing edge. The length of the extension plate is 10 mm, and the pore diameters (D) considered for the study are in the range of 0.689 to 1.665 mm. The experiments are carried out in the flow velocity (U_∞) range of 20 to 45 m/s, and geometric angles of attack (α_g) values of -10° to $+10^\circ$. Perforated extensions have an overwhelming response in reducing the low frequency noise (<1.5 kHz), and a reduction of up to 6 dB is observed with an increase in the pore diameter. Contrastingly, the higher frequency noise (>4 kHz) is observed to increase with an increase in the pore diameter. The dominant reduction in the low frequency noise for perforated model airfoils is within the Strouhal number (based on the displacement thickness) of 0.11. The overall sound pressure levels of perforated model airfoils are observed to reduce by a maximum of 2 dB compared to the base airfoil. Finally, by varying the geometric angle of attack from -10° to $+10^\circ$, the lower frequency noise is seen to increase, while the high frequency noise is observed to

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Rohini Samadarsi, Divyani Mishra, Debjani Dutta

Rohini Samadarsi

Department of Biotechnology, National Institute of Technology Durgapur, Mahatma Gandhi Avenue, Durgapur, 713209 West Bengal, India

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Design and characterization of mangiferin nanoparticles for oral delivery

Rohini Samadarsi, Debjani Dutta

Department of Biotechnology, National Institute of Technology Durgapur, Mahatma Gandhi Avenue, Durgapur, 713209, West Bengal, India

Received 28 August 2018, Revised 15 October 2018, Accepted 26 November 2018, Available online 28 November 2018, Version of Record 10 December 2018.

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Processing and characterization of HDPE and MDPE processed by rotational moulding

S.S. Abhilash, Rosh Luckose, D. Lenin Singaravelu

Production Engineering Department, National Institute of Technology, Tiruchirappalli 620015, India

Received 10 August 2019, Accepted 12 September 2019, Available online 15 October 2019, Version of Record 29 June 2020.

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Abstract

Rotational moulding otherwise called as roto moulding is a process used to produce hollow plastic products with nearly stress free objects with the help of a bi axial rotational moulding machine which rotates the mould in two axes with minimum speed of rotation. Plastic granules pulverized into fine powders are used to produce hollow parts such as water tanks, fuel tanks, kayak boats, refrigerated panel etc. The present work investigates the mouldability of High Density Poly Ethylene (HDPE) and Medium Density Poly Ethylene (MDPE) powders by rotational moulding process. A lab model roto



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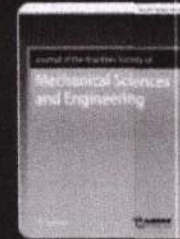
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Abstract

Fused deposition modelling (FDM) is an additive manufacturing method having the potential to fabricate functional components. As the inherent nature of additive structures, the component stiffness depends on the build parameters such as layer height and raster orientation in addition to the filament material properties. Even on FDM prints with 100% infill density, voids are formed along the interface of rasters and contribute to the characteristics of the component. The primary role of the present work is to determine elastic characteristics such as Young's modulus, shear modulus and Poisson's ratio of FDM

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V. K. Chithrakumar

Advanced Thermo Fluid Research Lab, Department of Mechanical Engineering, College of Engineering Trivandrum, Trivandrum, India

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V. K. Chithrakumar, G. Venugopal & M. R. Rajkumar

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Abstract

A combined experimental and numerical study was conducted to understand the effect of rotation of outer cylinder on heat transfer from a vertical heated inner cylinder. The dimensionless analysis carried out for this problem underlines that the non dimensional heat transfer depends on the rotation parameter, radius ratio and aspect ratio. Experiments were conducted for the rotational parameter ranging from $0 \leq \zeta \leq 526$ at different heat loads, keeping the aspect ratio and radius ratio unchanged. Numerical simulations have been performed (for a wide range of rotation parameter $0 \leq \zeta \leq 526$ and fixed radius ratio) using a commercial computational fluid dynamics package ANSYS CFX 14. The heat



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Powder Technology
Volume 356, November 2019, Pages 39-49



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S.S. Sanukrishna^{a, b, c}, Muhammed Shafi^b, Maneesh Murukan^b, M. Jose Prakash^b

- ^a University of Kerala, Thiruvananthapuram, Kerala, India
- ^b Department of Mechanical Engineering, T.K.M. College of Engineering, Kollam, Kerala 691005, India
- ^c Sree Chitra Thirunal College of Engineering, Thiruvananthapuram, Kerala 695018, India

Received 11 March 2019, Revised 20 July 2019, Accepted 23 July 2019, Available online 24 July 2019,
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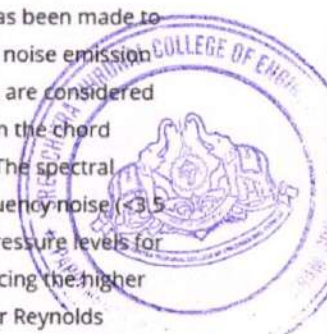
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Abstract

This paper investigates the noise emissions from thin airfoils experimentally. An attempt has been made to study the effect of line distribution of 3 mm diameter holes adjacent to the trailing edge on noise emission characteristics. Thin airfoils having chord length and span of 150 and 240 mm, respectively, are considered for the investigation. The airfoil is subjected to the flow Reynolds number (defined based on the chord length of airfoil) in the range of 2.0×10^5 to 5.0×10^5 , and angles of attack of 0° , 2° , and 4° . The spectral results indicate that the modified airfoil with holes is effective in minimizing the lower frequency noise (<3.5 kHz) compared to that of the reference airfoil. The reduction in the low-frequency sound pressure levels for the modified airfoil is found up to 5 dB. The modified airfoil with holes is ineffective in reducing the higher frequency noise components, and in fact, generated a broadband frequency noise at higher Reynolds number. From the spectral studies, a critical Strouhal number is estimated to be around 0.15 that defines the limiting value for the effectiveness of the modified airfoil. The overall sound pressure level studies depicted that the modified airfoil is effective at higher angles of attack with the reduction of around 1–2 dB



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Experimental and theoretical insights on the effect of solvent polarity on the photophysical properties of a benzanthrone dye

Shivraj^a, B. Siddlingeshwar^a, Anup Thomas^b, Elena M. Kirilova^c, Darshan Devang Divakar^d, Abdulaziz Abdullah Alkheraif^d

- ^a Department of Physics, M.S. Ramaiah Institute of Technology, Bengaluru 560054, India
- ^b Centre for Computational Research in Clean Energy Technologies, Sree Chitra Thirunal College of Engineering, Trivandrum, India
- ^c Department of Chemistry, Daugavpils University, Vienibas 13, Daugavpils, Latvia
- ^d Dental Biomaterials Research Chair, Dental Health Department, College of Applied Medical Sciences, King Saud University, Riyadh 11433, Saudi Arabia

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Journal of Molecular Liquids
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Photoinduced electron transfer in non-covalent free-base octaethylporphyrin and 2-nitrofluorene donor-acceptor system: A combined experimental and quantum chemical study

Mihir Ghosh^a, Shivraj^b, B. Siddlingeshwar^b, Anup Thomas^c, Subrata Sinha^a

- ^a Integrated Science Education and Research Centre, Siksha-Bhavana, Visva-Bharati, Santiniketan 731 235, India
- ^b Department of Physics, M S Ramaiah Institute of Technology, Bengaluru, India
- ^c Center for Computational Research in Clean Energy Technologies, Sree Chitra Thirunal College of Engineering, Pappanamcode, Trivandrum, India

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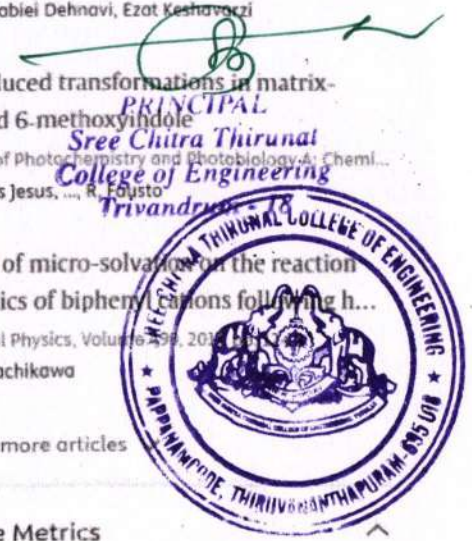
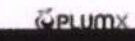
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Numerical simulation of the effect of aluminum foam on sorption induced wall strain in vertical, metal hydride based hydrogen storage container

Sidharth Shaji, G. Mohan

Center for Computational Resecrch in Clean Energy Technologies, Sree Chitra Thirunal College of Engineering, Thiruvananthapuram, Kerala, India

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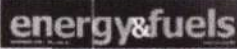

Reduced Chemical Kinetic Mechanism for a Waste Cooking Oil Biodiesel/*n*-Pentanol Mixture for Internal Combustion Engine Simulation

C. V. Manojkumar*, Justin Jacob Thomas, V. R. Sabu, and G. Nagarajan


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V. R. Sabu
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SUBJECTS: Alcohols, Alkyls, Biodiesel, Fossil fuels, Redox reactions

Abstract

With increasing pollution concerns and stringent emission regulations, it has become difficult to meet the emission standards with the use of single, binary and ternary fuel mixtures are being investigated all over the globe to satisfy the emission norms. In the present work, a reduced reaction mechanism for a waste cooking oil (WCO) biodiesel/*n*-pentanol mixture is proposed for the chemical kinetic simulation of an internal combustion engine. The mechanism consists of 146 species and 500 reactions. WCO biodiesel and *n*-pentanol are biofuels with many advantages. WCO biodiesel has properties (cetane number, viscosity, etc.) that are similar to those of diesel fuel, whereas *n*-pentanol has a high boiling temperature, low heat of vaporization, high lower heating value, and low autoignition temperature compared to other shorter chain alcohols. Mixing of higher molecular weight alcohols (*n*-pentanol) with diesel/biodiesel lowers the knock resistance as a result of their high reactivity at low as well as high temperatures. This characteristic makes them suitable for a diesel engine and advanced engine combustion modes, such as homogeneous charge compression ignition and reactivity controlled compression ignition engines.

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Thermal and rheological characteristics of refrigerant compressor oil with alumina nanoparticles—An experimental investigation

S.S. Sanukrishna^{a,b}, M. Jose Prakash^b

- ^a University of Kerala, Kerala, India
- ^b Department of Mechanical Engineering, TKM College of Engineering, Kollam, Kerala 691005, India

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S.S. Sanukrishna^{a,b}, Maneesh Murukan^b, Prakash M. Jose^b

- ^a University of Kerala, Kerala, India
- ^b Department of Mechanical Engineering, TKM College of Engineering, Kollam, Kerala 691005, India

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Effect of oxide nanoparticles on the thermal, rheological and tribological behaviours of refrigerant compressor oil: An experimental investigation

Étude expérimentale sur l'effet des nanoparticules d'oxyde sur le comportement thermique, rhéologique et tribologique de l'huile du compresseur frigorifique

S.S. Sanukrishna ^a, S. Vishnu ^b, T.S. Krishnakumar ^a, M. Jose Prakash ^b

^a University of Kerala, Kerala, India, 695034

^b Department of Mechanical Engineering, TKM College of Engineering, Kollam, 691005, Kerala, India

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Journal of Molecular Liquids

Volume 261, 1 July 2018, Pages 411-422



Experimental investigation on thermal and rheological behaviour of PAG lubricant modified with SiO₂ nanoparticles

S.S. Sanukrishna^{a,b}, S. Vishnu^b, M. Jose Prakash^b

- ^a University of Kerala, Kerala, India
- ^b Department of Mechanical Engineering, TKM College of Engineering, Kollam, Kerala 691005, India

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S.S. Sanukrishna^{a,b}, M. Jose Prakash^b

- ^a University of Kerala, Thiruvananthapuram, Kerala, 695034, India
- ^b Department of Mechanical Engineering, TKM College of Engineering, Kollam, Kerala 691005, India

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Can Chaotic Analysis of Electroencephalogram Aid the Diagnosis of Encephalopathy?

Jisu Elsa Jacob, Ajith Cherian, K. Gopakumar, Thomas Iype, Doris George Yohannan, K. P. Divya

CORRESPONDING AUTHOR

Jisu Elsa Jacob

jisuelsa@gmail.com

orcid.org/0000-0002-8317-4967

Department of Electronics and Communication Engineering, SCT College of Engineering, Thiruvananthapuram, Kerala, India

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in the study of physiological signals. Chaotic has been analyzed in various disease states like disorders, and depression. All these diseases have study examines the chaotic parameters in metabolic encephalopathy, where the brain functions are involved secondary to a metabolic disturbance. Our analysis clearly showed significant lower values for chaotic parameters, correlation dimension, and largest Lyapunov exponent for EEG in patients with metabolic encephalopathy compared to normal EEG. The chaotic features of EEG have been shown in previous studies to be an indicator of the complexity of brain dynamics. The smaller values of chaotic features for encephalopathy suggest that normal complexity of brain function is reduced in encephalopathy. To the best knowledge of the authors, no similar work has been reported on metabolic encephalopathy. This finding may be useful to understand the neurobiological phenomena in encephalopathy. These chaotic features are then utilized as feature sets for Support Vector Machine classifier to identify cases of encephalopathy from normal healthy subjects yielding high values of accuracy. Thus, we infer that chaotic measures are EEG parameters sensitive to functional alterations of the brain, caused by encephalopathy.

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Diagnosis of Encephalopathy Based on Energies of EEG Subbands Using Discrete Wavelet Transform and Support Vector Machine

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CORRESPONDING AUTHOR

Jisu Elsa Jacob

jisuelsa@gmail.com

orcid.org/0000-0002-8317-4967

Department of Electronics and Communication Engineering, SCT College of Engineering, Thiruvananthapuram, Kerala, India

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customarily done using frequency domain. Complex biomedical signal such as EEG is best handled in the time-frequency domain. Wavelet decomposition based analysis is a powerful tool for extracting its subbands. This work aims at exploring the use of discrete wavelet transform for extracting EEG subbands in cases of encephalopathy. The subband energies were then calculated and given as feature sets to SVM classifier for identifying cases of encephalopathy from normal healthy subjects. Out of various combinations of subband energies, energy of delta subband yielded highest performance parameters for SVM classifier with an accuracy of 90.4% in identifying cases of encephalopathy.

1. Introduction

Electroencephalogram (EEG) is a signal which represents the electrical activity of millions of neurons in the brain. The signal is acquired from the surface of the scalp. Since it reflects the

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Automated Diagnosis of Encephalopathy

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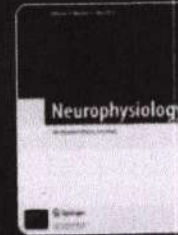
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In this study, an empirical mode decomposition (EMD) technique has been applied for EEG signals to identify a neurological disease state qualified as encephalopathy. The EMD technique is an efficient method for decomposing nonstationary and nonlinear signals, which makes it suitable for biosignal processing. This technique generates various components of the signal called intrinsic mode functions (IMFs) whose features are examined for the diagnosis of the disease. We found significant differences between the healthy and patient groups for both statistical and nonlinear parameters of IMFs of the recorded EEGs, which makes those suitable for the diagnosis of encephalopathy. Statistical values, namely minimum, maximum, mean, and standard deviation, and nonlinear parameters, namely approximate entropy and sample entropy of the IMFs, were calculated. Both these features were fed to a Support Vector Machine (SVM) classifier, and their



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D. Bharathi, B. Siddlingeshwar, Shivraj, Anup Thomas, Elena M. Kirilova, Irena Nikolajeva

First published: 12 January 2018 | <https://doi.org/10.1002/bio.3442>

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Anup Thomas

Centre for Computational Research in Clean Energy Technologies, Sree Chitra Thirunal College of Engineering, Trivandrum, India

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Abstract

The change in photophysical properties of the organic molecule due to solvatochromic effect caused by different solvent environments at room temperature gives information about the dipole moments of 3-N-(N'-methylacetamido)benzanthrone (3-MAB). The quantum yield, fluorescence lifetime of 3-MAB was measured in different solvents to calculate radiative and non-radiative rate constants. The results revealed that the excited state dipole moment (μ_e) is relatively larger compared to the ground state dipole moment (μ_g), indicating the excited state of the dye under study is more polar than the ground state and the same trend is noticed with theoretical calculations performed using the CAM-B3LYP/6-311+G(d,p) method. Further, the study on preferential solvation was



Volume 33, Issue 3

May 2018

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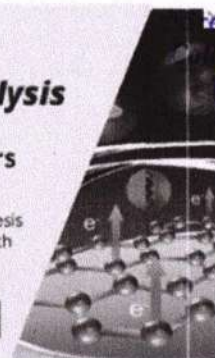
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