Research Paper Publication

Research paper publication by faculty in indexed journals (CAY 2023 – 24)

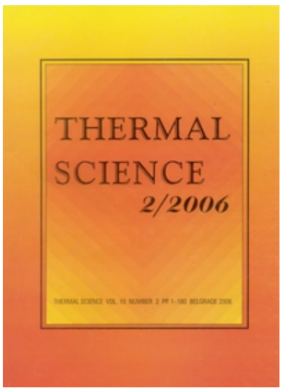
Sr. No.	Name of Faculty	Title of Research paper	Journal Details	Indexing	Journal Impact Factor / Citescore	DOI of research paper
CAY (2023-24)						
1	Mr. Bhushan Behede	Development of rotary dehumidifier with silica-gel-based composite desiccant	Thermal Science (Vinca) ISSN 2334-7163 (online) ISSN 0354-9836 (printed)	SCIE Scopus	IF 1.1	https://doiserbia.nb.rs/Article.aspx?ID=0354-98362400174B
2	Dr Hitesh Thakare	Enhancing energy conservation in power generation in a coal fired thermal power plant through comprehensive energy audit	Energy Volume 301, 13 May 2024, 131661, ELSEVIER, Online ISSN: 1873-6785, Print ISSN: 0360-5442	SCI SCIE Scopus	IF 9.0	https://doi.org/10.1016/j.energy.2024.131661
3	Mr. Bhushan Behede	Performance Analysis of Silica-Gel and Calcium Chloride Composite Desiccant Prepared by Varying Proportions: A Gravimetric Study	Tuijin Jishu/Journal of Propulsion Technology ISSN 1001-4055 Vol. 44 No. 3 (2023) pp. 4446 – 4455	Scopus	Citescore 1.7	https://doi.org/10.52783/tjjpt.v44.i3.2417
4	Mr. Yogesh Sonawane	Effect of NOx and Mechanical Efficiency in Single Cylinder Diesel Engine using Multiple Injection of Biodiesel- An Experimental Investigation	Tuijin Jishu/Journal of Propulsion Technology ISSN 1001-4055 Vol. 44 No. 4 (2023) pp. 6169 – 6178	Scopus	Citescore 1.7	https://doi.org/10.52783/tjjpt.v44.i4.2115
5	Mr. Dattatray Doifode	Experimental analysis of hybrid AM60 magnesium composites reinforced with TiC and TiB2 via stir casting	Materials Today:Proceedings	Scopus	Citescore 4.9	https://doi.org/10.1016/j.matpr.2024.07.004

Research paper publication by faculty in indexed journals (CAYm1 2022 – 23)

Sr. No.	Name of Faculty	Title of Research paper	Journal Details	Indexing	Journal IF / Citescore	DOI of research paper
CAYm1 (2022-23)						
1	Mr. Yogesh Sonawane	Optimization and Modelling of EGR rate and MIS for POME fuelled CRDI diesel engine	Case Studies in Thermal Engineering, Volume 49, September 2023, 103170, ELSEVIER, Online ISSN 2214-157X	SCIE, Web of Science	IF 6.8	https://doi.org/10.1016/j.csite.2023.103170
2	Dr. Modassir Hussain	Tribological study of sunflower TMP ester and silica nanoparticles additives for hydrodynamic journal bearing application under boundary lubrication condition	Industrial Lubrication and Tribology, Vol. 75 No. 2, pp. 190-196, 29 November 2022, ISSN 0036-8792	SCIE Scopus	IF 1.489	https://doi.org/10.1108/ILT-08-2022-0251
3	Mr. Bhushan Behede	Review of Composite Dessicants and Their Properties for Rotary Dehumidifiers	European Chemical Bulletin Vol. 12 Issue 2, pp. 240-252 20/02/2023, ISSN 2063-5346	Scopus	CiteScore 2022 1.6	10.48047/ecb/2023.12.2.024
4	Dr. Nilesh Salunke	Multi objective optimization of diesel engine performance and emission characteristics using Taguchi-grey relational analysis	International Journal of Advanced Technology and Engineering Exploration Vol. 10 Issue 100, pp. 363-376 25/03/2023, ISSN (Print):2394-5443 (Online):2394-7454	Scopus	CiteScore 2022 1.0	http://dx.doi.org/10.19101/IJATEE.2022.10100018
5	Dr. Nilesh Salunke	Effect of nano materials for the nano fluids in solar thermal energy: A review on applications in solar collector	Materials Today: Proceedings Available online 27 April 2023 ELSEVIER, ISSN 2214-7853	Scopus	CiteScore 3.2	https://doi.org/10.1016/j.matpr.2023.04.344
6	Dr. Nilesh Salunke	Phase change materials (PCMs) in solar still: - a review of use to improve productivity of still	Materials Today: Proceedings Available online 5 May 2023. ELSEVIER, ISSN 2214-7853	Scopus	CiteScore 3.2	https://doi.org/10.1016/j.matpr.2023.04.499
7	Mr. Satish Patil	Predicting and forecasting building energy performance using RSM and ANN	Asian Journal of Civil Engineering Vol. 25, pp. 159–165 Accepted 10/06/2023 Electronic ISSN: 2522-011X Print ISSN: 1563-0854	Scopus	-	https://doi.org/10.1007/s42107-023-00765-4

Research paper publication by faculty in indexed journals (CAYm2 2021 – 22)

Sr. No.	Name of Faculty	Title of Research paper	Journal Details	Indexing	Journal Impact Factor / Citescore	DOI of research paper
CAYm2 (2021-22)						
1	Dr. Nilesh Saluke	A Comprehensive Review on Performance Improvement of Diesel and Biodiesel Fuelled CI Engines using Additives	International Journal of Performability Engineering, Volume 17, Issue 9, pp. 815-824, September 2021 ISSN No. 0973-1318	Scopus	IF 1.20	https://doi.org/10.23940/ijpe.21.09.p8.815824
2	Dr. Amol Badgujar	Room Temperature Sputtered Aluminum-Doped ZnO Thin Film Transparent Electrode for Application in Solar Cells and for Low-Band-Gap Optoelectronic Devices	ACS Omega, Vol. 7, pp. 14203−14210, April 2022 ISSN 2470-1343 (print) 2470-1343 (web)	SCI Scopus	IF (2021) 4.132 Citescore (2021) – 5.2	https://pubs.acs.org/doi/pdf/10.1021/acsomega.2c00830
3	Dr. Amol Badgujar	Solution-processed CIGS thin film solar cell by controlled selenization process	Materials Today: Proceedings, Volume 52, Part 3, pp. 829-833, 30 October 2021. ISSN 2214-7853	Scopus	1.8	https://doi.org/10.1016/j.matpr.2021.10.215
4	Mr. Bhushan Behede	Review on nanoporous inorganic desiccant materials in the context of application in rotary dehumidifiers	Materials Today:Proceedings, Volume 57, Part 5, pp. 2174-2179, 29 December 2021, ISSN 2214-7853	Scopus	1.8	https://doi.org/10.1016/j.matpr.2021.12.227
5	Dr. Hitesh Thakare	Application of mixed level design of Taguchi method to counter flow vortex tube	Materials Today:Proceedings, Volume 57, Part 5, pp. 2242-2249, 10 January 2022 ISSN 2214-7853	Scopus	1.8	https://doi.org/10.1016/j.matpr.2021.12.444
6	Dr. Hitesh Thakare	Techno-economic assessment of manufacturing process in small scale industry to evaluate energy saving potential	Materials Today:Proceedings Volume 57, Part 5, pp. 2317-2324, 31 January 2022 ISSN 2214-7853	Scopus	1.8	https://doi.org/10.1016/j.matpr.2022.01.105



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Full text (579 KB)

Development of rotary dehumidifier with silica-gel-based composite desiccant

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The desiccant dehumidification system's key component, the desiccant wheel, can perform effectively using composite desiccant materials. Evaluation of the desiccant wheel's performance using composite desiccant material is the primary goal of this study. Authors have compared the performance of two desiccant wheels; one is packed with traditional Silica-gel, and the other is a composite of Silica-gel and calcium chloride in a ratio of 3:2 by weight. A rotary wheel is developed with rectangular channels parallel to the wheel's axis. The novelty of this research lies in the improved design of the desiccant wheel. Unlike other techniques involving pressure losses and ineffective space utilization, this design offers better space utilization and fewer pressure losses. In addition, wheel fabrication is less costly and easily reusable with other desiccants. Three performance indicators were evaluated through experimentation: dehumidification capability, moisture removal capacity, and dehumidification coefficient of performance. Results show that the Parallel channel desiccant wheel achieves 25% higher dehumidification capability and 55% greater moisture removal capacity. The specific humidity of the air is reduced by 35% using the composite desiccant wheel. Comparing the composite desiccant to traditional Silica-gel, its dehumidification coefficient of performance is 40% higher.

Keywords: Desiccant wheel, composite desiccant, Dehumidification, Adsorption

DEVELOPMENT OF ROTARY DEHUMIDIFIER WITH SILICA-GEL-BASED COMPOSITE DESICCANT

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The desiccant dehumidification system's key component, the desiccant wheel, can perform effectively using composite desiccant materials. Evaluation of the desiccant wheel's performance using composite desiccant material is the primary goal of this study. Authors have compared the performance of two desiccant wheels; one is packed with traditional Silica-gel, and the other is a composite of Silica-gel and calcium chloride in a ratio of 3:2 by weight. A rotary wheel is developed with rectangular channels parallel to the wheel's axis. The novelty of this research lies in the improved design of the desiccant wheel. Unlike other techniques involving pressure losses and ineffective space utilization, this design offers better space utilization and fewer pressure losses. In addition, wheel fabrication is less costly and easily reusable with other desiccants. Three performance indicators were evaluated through experimentation: dehumidification capability, moisture removal capacity, and dehumidification coefficient of performance. Results show that the Parallel channel desiccant wheel achieves 25% higher dehumidification capability and 55% greater moisture removal capacity. The specific humidity of the air is reduced by 35% using the composite desiccant wheel. Comparing the composite desiccant to traditional Silica-gel, its dehumidification coefficient of performance is 40% higher.

Key words: *Desiccant wheel, composite desiccant, Dehumidification, Adsorption*

1. Introduction

Generally, commercial HVAC systems are based on Vapor Compression Refrigeration System (VCRS), designed to simultaneously handle both the sensible and latent load. During sensible load handling in VCRS, the space temperature is reduced below the Dry Bulb Temperature (DBT). During latent load handling, the system needs to minimize temperature well below its dew point temperature, and in addition, reheating is necessary to supply air at the required comfort temperature. Here, a latent load is more significant than a sensible load, and the electrical potential needed for an air conditioner is high, increasing the overall system's operating cost. Implementing solid desiccant systems that use

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Article

Room Temperature Sputtered Aluminum-Doped ZnO Thin Film Transparent Electrode for Application in Solar Cells and for Low-Band-Gap Optoelectronic Devices

Amol C. Badgujar,† Brijesh Singh Yadav,† Golu Kumar Jha, and Sanjay R. Dhage*

Cite This: ACS Omega 2022, 7, 14203−14210

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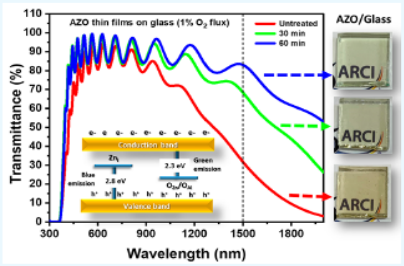
ABSTRACT: Aluminum-doped zinc oxide (AZO) is a popular, low-cost, nontoxic material that finds application as a transparent conducting electrode in photonic, sensing, and photovoltaic devices. We report the AZO thin films with a high figure of merit on large-area glass substrates by direct current magnetron sputtering without any intentional substrate heating. Furthermore, a simple thermal post-treatment to improve the transmittance of AZO thin film in the infrared region for its application in low-band-gap devices is presented. High optoelectronic properties are obtained by optimizing oxygen content during the sputtering process. The structural, morphological, optoelectrical, and photoluminescence characterization of cold sputtered AZO films is investigated for its latent applications. AZO thin films with an electrical sheet resistance of 8.8 Ω/□ and a visible light transmittance of 78.5% with thickness uniformity above 95% are achieved on 300 mm × 300 mm glass substrate. The AZO film with optimized process conditions is employed as a transparent electrode to fabricate a copper−indium−gallium−selenide-based thin film solar cell, demonstrating 11.8% power conversion efficiency. The AZO film with optimized sputter conditions was post-treated in ambient conditions with an Al blanket to suppress the resistivity by proper organization of the defects due to Al^{3+} consumption and point defects, resulting in improved transparency (85%) in the infrared region with a sheet resistance of 40 Ω/□. This has great potential for developing scalable and low-cost AZO thin films for transparent electrodes in a wide range of the spectrum.



1. INTRODUCTION

Aluminum-doped zinc oxide (AZO) is an emergent prevalent transparent conducting oxide-based electrode material owing to its tunable optoelectronic properties, profusion in the earth's crust, as well as nontoxicity.[1] It has analogous electrical and optical properties like conventional indium-doped tin oxides and fluorine-doped tin oxide.[2] AZO-based thin films are widely used in photonic devices such as light-emitting diodes,[3] flat panel displays,[4] thin film solar cells,[5,6] as well as various sensing devices.[7,8] Typically, the above applications demand high transmittance (>80%) in the visible region as well as metal-like conductivity (sheet resistance <10 Ω/□). Various vacuum-based popular techniques such as sputtering,[9] pulsed laser deposition,[10] electron beam evaporation,[11] as well as non-vacuum techniques such as chemical vapor deposition,[12] spray pyrolysis,[13] chemical bath deposition,[14] and sol−gel deposition[15] are well reported for coating AZO thin films on different substrates. Most of the technique's require either high substrate temperature or thermal post-treatment to prepare AZO thin films with high figures of merit (FOM). Of the above processes, direct current (DC) magnetron sputtering[16] is an industrially acceptable technique. It can produce highly transparent conductive thin films with good scalability on a large area with a faster deposition rate. Properties of sputtered AZO thin films are largely determined through controlled process parameters; base vacuum, gas pressure, power density, and substrate temperature during sputtering.[17] In line with this, in our earlier work, we optimized these sputtering process parameters to attain high electrical conductivity and transmission in AZO film while heating the glass substrate during sputtering.[18] However, high-temperature sputtering damages underlying layers/coatings while employing this top contact on devices; therefore, it could not be used for various temperature-sensitive devices such as organic and perovskite-based solar cells or light-emitting diodes.[19,20] Consequently, it is necessary to develop a low/room temperature DC magnetron sputtering process for producing quality AZO thin films without compromising much with its optical and electrical properties. Moreover, to advance optoelectronic properties, oxygen partial pressure during sputtering needs to be perfected

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Tribological study of sunflower TMP ester and silica nanoparticles additives for hydrodynamic journal bearing application under boundary lubrication condition

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Abstract

Purpose – This study aims to study the tribological performance of sunflower TMP ester and silica nanoparticles additives as a biolubricant alternative to the conventional lubricants for hydrodynamic journal bearing applications.

Design/methodology/approach – Nanolubricants were synthesized using an ultrasonicator and a homogenizer. A pin-on-disk tribometer was used to simulate the boundary lubrication condition for hydrodynamic journal bearing application in the presence of the studied lubricants. Surface analysis of the pin (bearing material) was done using scanning electron microscopy and energy dispersive X-ray spectroscopy.

Findings – The sunflower TMP ester performed well in terms of the coefficient of friction compared to commercial lubricants, but its wear performance was poor. The silica nanoparticles improved the wear and friction performance of the sunflower TMP ester. With the addition of 1% silica nanoparticles to sunflower TMP ester, the reduction in the coefficient of friction was 27.92% and the reduction in specific wear rate was 54.79%, making it the best lubricant out of all studied lubricants.

Originality/value – Although there are various available studies on vegetable oil-based lubricants for hydrodynamic journal bearing applications, the studies on the use of vegetable oil-based TMP esters for hydrodynamic journal bearing applications are limited. Also, the effect of silica nanoparticles on the tribological performance of TMP esters under boundary lubrication condition has not been studied extensively in the available literature.

Keywords Biolubricant, Nanolubricant, Silica nanoparticles, Wear, Friction

Paper type Research paper

1. Introduction

Hydrodynamic journal bearings use lubricants to reduce friction between mating parts while supporting the load. These bearings are designed to run in a hydrodynamic lubrication regime, and no metal-to-metal contact between bearing and journal takes place in this regime as both are set apart by a lubricant film. Hence, in this regime, wear does not takes place. But, when hydrodynamic journal bearing operates, it also encounters mixed lubrication regime and boundary lubrication regime where a considerable amount of wear happens. This happens because in these regimes, lubricant film diminishes and metal-to-metal contact takes place. The maximum wear happens in the boundary lubrication regime which is experienced during start and stop conditions or during shock loading conditions. These thin film bearings in modern machinery such as engines are nowadays subjected to higher loads and an increased number of start–stop cycles which is forcing bearing arrangements to operate more in boundary and mixed lubrication regimes (Hernández-Peña *et al.*, 2019; Sander *et al.*, 2017; Hussain *et al.*, 2021a).

The lubricants used in hydrodynamic journal bearings are mostly made up of petroleum mineral oils. These mineral oil-based lubricants are harmful to the environment as they are toxic in nature as well as nonbiodegradable (Luther, 2017; Rasep *et al.*, 2021). Also, the antiwear additives added to these

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Optimization and Modelling of EGR rate and MIS for POME fuelled CRDI diesel engine

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ARTICLE INFO

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Keywords:
Palm oil methyl ester
CRDI
EGR
Multiple injection strategies
Oxide of nitrogen
Performance

ABSTRACT

In the present research work an optimisation stuy of the Exhaust gas recirculation (EGR) rate for MIS adopted POME fueled CRDI Diesel Engine fitted with TRCC was carried out. The engine was operated with injection parameters such as 900 bar, 7 holes and 10° BTDC which have been optimized for better performance and lower emissions from our previous study. The experiments were carried out by employing an RSM-based D-optimal design, and the relationship between input and output was determined using an ANOVA. Using RSM-ANOVA, mathematical models were built for each result, and the predicted and actual outcomes were compared. With an R^2 value greater than 99.34%, the prediction models were discovered to have a strong prediction efficiency. The desirability approach-based optimisation was used to determine the ideal engine operating parameters. EGR rate was varied from 0% to 20% and an MIS of 40 + 20+40 has been adopted for the engine. An EGR rate of 10% is optimized from the viewpoint of NO_x reduction and penalty in power output which results in a decrease in brake thermal efficiency by 2.90%, peak pressure by 4.8%, heat release rate by 8.8% and oxides of nitrogen (NO_x) by 1.35%. A drastic increase in emissions such as carbon monoxide by 5.8%, unburnt hydrocarbon by 13.3% and smoke by 20.6% was also observed. Both the ANN and RSM models correctly fit the experimental data, producing R^2 values that ranged from 95.5% to 98.5%, respectively. The findings show that RSM and ANN are both highly accurate modelling approaches. Additionally, as compared to RSM, the

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Enhancing energy conservation in power generation in a coal fired thermal power plant through comprehensive energy audit

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ARTICLE INFO

Keywords:
Energy audit
Thermal power plant
Variable frequency drive
APH leakage
Insulation

ABSTRACT

Current work presents salient insights from energy audit of a 1050 MW thermal power plant by BEE Certified Energy Auditors. It provides insights into grassroot level data instead of relying only on theoretical calculations, unlike previously published literature.

Arresting the air leakages in air-preheater has given total saving of 10.72 million kWh/year, saved 398,978.97 kJ/year, thus saving of 25,322.80 MT of coal/year. Upgradation of insulation resulted in total saving of 6632.208 Million kJ/year, i.e. saving of 510 MT/year of coal. Replacing cooling tower blades material proposed saving of 15,242.4 kWh/year. Installation of Variable Speed Drives for pumps provided saving of 274,836 kWh/year. Replacement of old inefficient pumps with energy efficient pumps has saving potential of 739,632 kWh/year. Pressure reduction in compressors has given saving of 344,794 kWh/year.

Thus, in total, this energy audit helped to conserve 12.098 Million kWh & 25,832.80 MT coal/year and consequently, 104,243 tCO_2/year. Such savings not only help the plant management/decision makers on the monetary front but also identify the avenues for improvement and channelize the resources such time and investment, prudently. Consequently, it has been established that energy audit is a pragmatic tool to achieve energy conservation at grassroot level.

1. Introduction

After the industrial revolution, the energy consumption of mankind has increased substantially due to improved standard of living. A typical modern-day citizen owns multiple electrical and technological appliances essential for his/her day-to-day life functioning. These appliances consume electrical energy and need to be charged almost every day. Besides, energy demand and subsequent consumption of industrial sector is consistently rising. These changes in the way of life have altered earth's ecosystem, thereby causing environmental concerns such as global warming, melting of glaciers, rising sea level, frequent and intense heat waves etc.

To ensure continued sustenance of human race on earth, we need to promote and ensure rational utilization of our resources such as fossil fuels and consequently, electrical and thermal energy. Such judicious utilization of energy is also essential for economic development and growth of any country through enhanced energy security. The energy security can be ensured through diverse ways such as stockpiling the resources, developing multiple suppliers, technological innovations, use of renewable energy and improving energy efficiency of existing systems. Out of these options, energy efficiency improvement is an immediate solution which can reduce the burden on utilities and create widespread awareness among people which will contribute towards sustainable production and consumption of resources.

Power plants need to operate round the clock to ensure uninterrupted power supply to households, industries and commercial establishments. The continuous depletion of fossil fuel reserves has emphasized the significance of higher efficiency measures not only in reducing unit cost of generation but also the environmental pollution. Taking into consideration the cascade efficiency of electricity distribution, energy conservation at the source i.e., power plant itself can be immensely helpful to supply the electricity efficiently downstream. Energy audit serves as a pragmatic tool in an industrial facility to achieve energy conservation and greenhouse gas mitigation.

A thermal power plant of 4 × 200 MW capacity was the subject of an energy audit by Li et al. [1], who observed higher power consumption in case of auxiliary equipment such as water circulating pump. Authors assessed energy saving potential of coal by 4.7 g/kWh. During the energy audit of a coal fired thermal power plant, Mandi and Yaragatti [2]

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Available online 14 May 2024

Citation details of department faculty

Sr. No.	Name of faculty	Citations	H-Index	i10-Index	Link to Google Scholar Profile
1	Dr. Nilesh Salunke	93	5	1	Dr. Nilesh Salunke - Google Scholar
2	Dr. Hitesh Thakare	419	7	7	Dr. Hitesh Thakare - Google Scholar
3	Dr. Amol Badgujar	236	9	9	Amol C. Badgujar - Google Scholar
4	Dr. Modassir Hussain	23	3	1	Md Modassir Hussain - Google Scholar
5	Mr. Mohd. Juneduddin	0	0	0	Mohammed. Juneduddin - Google Scholar
6	Mr. Dattatray Doifode	0	0	0	Dattatray Doifode - Google Scholar
7	Mr. Yogesh Sonawane	6	2	0	Yogesh Diliprao Sonawane - Google Scholar
8	Mr. Satish Patil	0	0	0	Satish Patil - Google Scholar
9	Mr. Dhiraj Bhandarkar	20	2	1	Dhiraj Bhandarkar - Google Scholar
10	Mr. Bhushan C. Behede	16	3	0	Bhushan Chandrakant Behede - Google Scholar