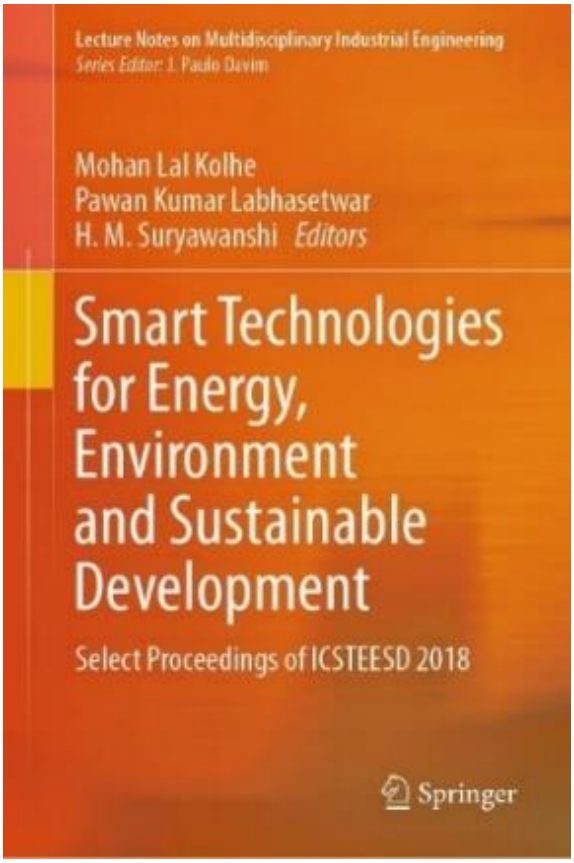
Books and Book Chapter Publication by Faculty

Details of Books / Book Chapters publication by faculty

Sr. No.	Name of Faculty	Title of Book / Book Chapter	Book/Book Chapter Details	Indexing	URL / DOI
1.	Mr. Bhushan Behede	Development of Finned Tube Type Adsorber Bed for Adsorption Cooling System	Smart Technologies for Energy, Environment and Sustainable Development, Part of the Lecture Notes on Multidisciplinary Industrial Engineering book series **Publisher – Springer** pp 533–552, 03rd July 2019 Hardcover ISBN - 978-981-13-6147-0 Series E-ISSN - 2522-5030	INSPEC	https://doi.org/10.1007/978-981-13-6148-7_52
2.	Mr. Bhushan Behede	Performance Analysis of Desiccant Material Prepared by Simple Mixing of Silica Gel and Calcium Chloride	Book series "Recent Advances in Mechanical Infrastructure" published by Springer as a part of Book series "Lecture Notes in Intelligent Transportation and Infrastructure" **Publisher – Springer** E ISSN – 2523-3459, Print ISSN – 2523-3440 01st January 2022	INSPEC	https://doi.org/10.1007/978-981-16-7660-4_1
3.	Dr. Amol Badgujar	Nano-inks based on metal oxides for electronic industries	Smart Multifunctional Nano-inks, Fundamentals and Emerging Applications, Pages 249-276 **Publisher – Elsevier** 1st Edition - October 26, 2022 Editors: Ram K. Gupta, Tuan Anh Nguyen Paperback ISBN 978-0-323-91145-0 eBook ISBN: 9780323984959	Scopus	Book DOI https://doi.org/10.1016/C2020-0-04563-9 Chapter DOI https://doi.org/10.1016/B978-0-323-91145-0.00005-0
4.	Dr Amol Badgujar	Monolithic Integration of Cu (In, Ga) Se2 Thin Film Solar Modules by all Nanosecond Laser Scribing	Recent Advances in Materials and Manufacturing Technology Pages 907 – 915 Publisher – Springer (Lecture Notes in Mechanical Engineering) First Online: 05 July 2023 Print ISBN 978-981-99-2920-7 Online ISBN 978-981-99-2921-4	Scopus	Book DOI https://doi.org/10.1007/978-981-99-2921-4 Chapter DOI https://doi.org/10.1007/978-981-99-2921-4_81
5.	Dr Amol Badgujar	Thin-Film Photovoltaics Using Cu (In, Ga) Se2 Nanomaterials	Thin Film Nanomaterials: Synthesis, Properties and Innovative Energy Applications, Publisher: Bentham Science ISBN: 978-981-5256-09-3 (Print)	-	https://doi.org/10.2174/9789815256086124010005

			ISBN: 978-981-5256-08-6 (Online)		
6.	Dr. Hitesh Thakare Dr. Nilesh Salunke	Role of Energy and Materials in Industry 4.0 - A Pragmatic Deliberation	Advancements in Materials Processing Technology, Volume 1 **Publisher – Springer Proceedings in Materials** First Online: 01 October 2024 Print ISBN 978-981-97-4957-7 Online ISBN 978-981-97-4960-7	Scopus	https://link.springer.com/book/9789819749577
7.	Dr. Hitesh Thakare Dr. Nilesh Salunke	Computational analysis of various fin configurations – a comprehensive assessment	Advancements in Materials Processing Technology, Volume 1 **Publisher – Springer Proceedings in Materials** First Online: 01 October 2024 Print ISBN 978-981-97-4957-7 Online ISBN 978-981-97-4960-7	Scopus	https://link.springer.com/book/9789819749577
8.	Dr. Hitesh Thakare	Energy Performance Assessment of Industries and Buildings: A Review of State of the Art	Advancements in Materials Processing Technology, Volume 2 **Publisher – Springer Proceedings in Materials** First Online: 21 November 2024	Scopus	https://link.springer.com/book/9789819768745
9.	Dr. Hitesh Thakare	Computational Analysis of Pin Fin to Study the Effect of Temperature and Fin Material	Advancements in Materials Processing Technology, Volume 2 **Publisher – Springer Proceedings in Materials** First Online: 21 November 2024	Scopus	https://link.springer.com/book/9789819768745
10.	Dr. Hitesh Thakare	Analysis of Vortex Tube	Publisher: Notion Press Ltd. Chennai 10th April 2023	-	ISBN No. 9-798890-028136
11.	Mr. Yogesh Sonawane & Mr. Dattatraya Doifode	A Textbook on Electrical Vehicles Technology	Publisher Scientific International Publishing House 11th November 2023.	-	ISBN 978-93-5757-585-0



Development of Finned Tube Type Adsorber Bed for Adsorption Cooling System

Bhushan C. Behede and Uday S. Wankhede

Abstract Adsorption cooling system consists of the specifically designed heat exchanger which is filled with adsorbents (silica gel). The flow of refrigerant is regulated inside the heat exchanger by regulating valves. Heat exchanger filled with adsorbents called a 'Thermal compressor' is used to build the pressure in the system. It is a replacer for the mechanical compressor in a Vapor Compression Refrigeration System (VCRS). This heat exchanger is experimentally evaluated in the adsorption cooling system which is developed for air-conditioning of subcompact vehicle of 1 TR capacity. Coefficient of Performance (COP) and Specific Cooling Power (SCP) are the performance parameters evaluated from the experimentation. Temperature of hot source is varied from 45 to 60 °C and for 15 min of cycle time, maximum COP obtained is up to 0.55, whereas minimum obtained is 0.14. On another hand, SCP is observed up to 348 W/kg. Here, the design of thermal compressor plays an important role. SCP and COP of the system are to be maximized by increasing heat transfer and mass transfer rates. Poor design of heat exchanger leads to decrease in heat transfer and mass transfer rates which will reduce SCP and COP of the system. Heat transfer rate of the heat exchanger is enhanced by increasing heat transfer area, and mass transfer rate is enhanced by decreasing the thermal resistance between adsorbent–adsorbate particles.

Keywords Adsorption · Adsorbent · Thermal compressor · Heat transfer rate · Mass transfer rate

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Performance Analysis of Desiccant Material Prepared by Simple Mixing of Silica Gel and Calcium Chloride

Bhushan C. Behede, Siddhartha S. Chakrabarti, and Uday S. Wankhede

Abstract To increase the performance, reliability, and economic feasibility of the desiccant-based dehumidification system, it is required to use good desiccant material in the system. In this research work, five samples of desiccant material are prepared by simple mixing of silica gel granules and calcium chloride by varying percentages of their contribution by weight. To calculate the percentage increase in MRR in five samples, one sample is prepared using stand-alone silica gel as a desiccant. An analysis is done by the gravimetric method to calculate its moisture removal rate (MRR) against the operating conditions of the air in the hot and humid environments. The goal of the current research work is to select the best suitable proportion of silica gel and calcium chloride in the composite desiccant as per as MRR is concerned. Different performance indicators were also determined and discussed in this paper. It is found that there is a 92% increase in the MRR when the sample contains 60% of silica gel and 40% of calcium chloride by weight in the desiccant instead of stand-alone silica gel.

Keywords Desiccant · Dehumidification · Adsorption · Desorption

1 Introduction

[V01] Dehumidification is an important process in air-conditioning. Typically, dehumidification can be achieved by removing water vapor present in the air, and to do so, the temperature of the air is reduced well below its dew point temperature. To reduce the temperature, vapor compression refrigeration system (VCRS) is used which consumes electrical energy. Energy-consuming potential is very high for the VCRS systems, and it is increasing day by day; several buildings are adopting air-conditioning devices based on VCRS. We can reduce energy-consuming potential if

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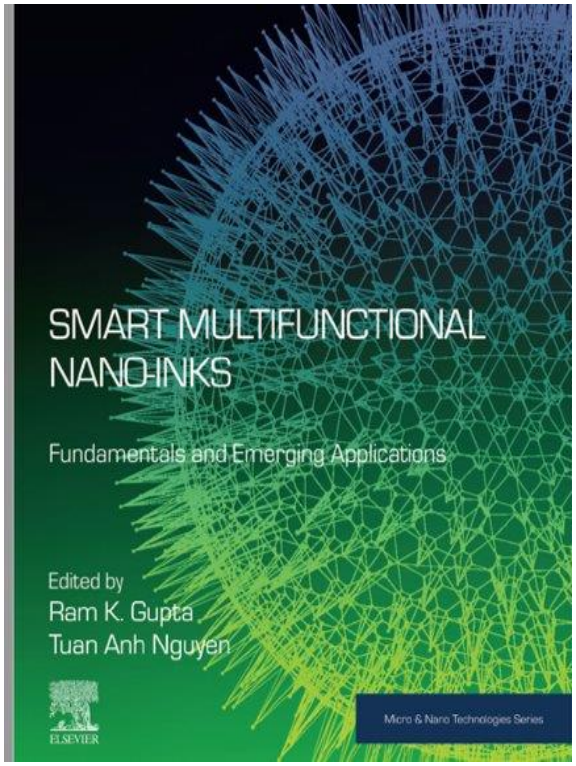

CHAPTER 10

Nano-inks based on metal oxides for electronic industries

Brijesh Singh Yadav[1], Amol C. Badgujar[2] and Sanjay R. Dhage[1]
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1. Introduction

Miniaturization and flexibility have become essential features for developing electronic devices in the modern world, which stimulates a new strategies to fabricate them. Printed flexible electronics have emerged as the fastest-growing market due to rapid production and inexpensive electronic devices utilizing conductive inks and flexible substrates [1,2]. Flexible printed electronics are distinct from typical microelectronics in two ways. Firstly, the manufacture of electronic devices uses low cost, simple, benign, and rapid approaches owing to the direct deposition of material on the substrate with minimal material wastege [3]. Secondly, it provides flexibility in substrate selection from polymers to the paper, permitting additional attributes for the electronic devices [4]. Paper and plastic substrates, for example, make electronic devices flexible, whilst fabric materials add wearability [3]. Printing on flexible substrates enables electronics to be placed on curved surfaces, such as solar cells on vehicle roofs or integrating buttons and switches into a single part, such as a vehicle door; lowering material, assembly and overall part count costs [4]. Although the cost is not reduced under some circumstances, such as with traditional semiconductors, the increased cost is compensated by significantly improved performance. Printed electronics on flexible substrates lower production costs and enable mechanically flexible circuit fabrication. In the medical and health sectors, printed electronics are crucial for enhancing health outcomes by addressing cleanliness, infection, and transmission and developing nonintrusive wearables and monitoring devices [5]. It also facilitate the creation of integrated touch-less interfaces using hygienic materials, enabling the construction of easily cleaned and disinfected surfaces such as keypads, controllers, and light switches [6]. These switches can also be integrated directly into furniture or walls, allowing for monitoring of occupancy and cleaning events.

Additionally, printed electronics are exclusively being used in circuit boards [7], new generation thin-film solar cells [8], flexible displays [8], and various kinds of sensors [9], targeting applications ranging from medicine and biology to electronics and energy technology [10], and in space exploration [11]. Other areas where these flexible electronics

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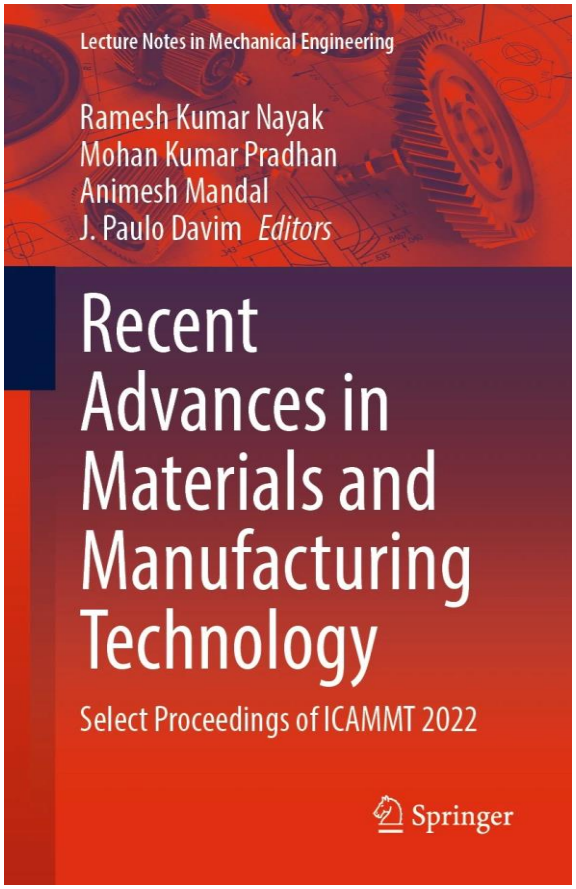

Monolithic Integration of $Cu(In,Ga)Se_2$ Thin Film Solar Modules by all Nanosecond Laser Scribing

Amol Badgujar, Bhushan Nandwalkar, and Sanjay Dhage

Abstract $Cu(In,Ga)Se_2$ (CIGSe) thin film solar cell (TFSC) is an emerging photovoltaic technology with lab-scale device efficiency surpassing 23% and monolithically integrated module efficiency ranging from 17–19%; it is anticipated to meet escalating global electricity demand. The division of a large photovoltaic cell into serially interconnected smaller devices is known as monolithic integration. To reduce shunting losses, a monolithic integration configuration of CIGSe TFSC comprising stacks of Al:ZnO/i:ZnO/CdS/CIGSe/Mo/Glass is adapted, often by combination of laser-mechanical scribing operations during the device fabrication process. The traditional mechanical scribing procedure, which engages sharp ceramic tips, is sluggish (< 0.2 m/s) and produces broader scribing widths (> 100 µm). The module's scribing area is a dead zone and a loss of active photovoltaic region that must be minimized. Given this, we report rapid (1 m/s) nanosecond pulsed fiber laser-driven micro-patterning of CdS/CIGSe/Mo/Glass (P2 scribing) and Al:ZnO/i:ZnO/CdS/CIGSe/Mo/Glass (P3 scribing) stacks, which replaces typical sub-optimal mechanical scribing. The electrical, morphological and compositional analysis of scribed structures confirmed a significant reduction in scribe widths (< 50 µm) using a laser with 1064 nm wavelength and pulse width 25 ns, a commonly utilized configuration for scribing of Mo thin film electrodes. The process eventually reduces the dead zone and increases the overall active area in the module.

Keywords Scribing · CIGSe · Thin films · Solar modules · Laser · Nanosecond

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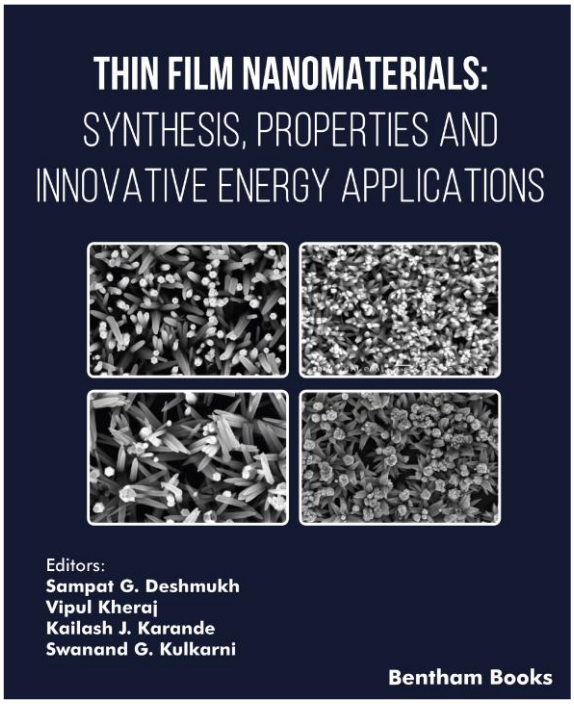

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CHAPTER 2

Thin-Film Photovoltaics Using $Cu(In,Ga)Se_2$ Nanomaterials

Amol C. Badgujar[1,*], Brijesh S. Yadav[2], Rajiv O. Dusane[3] and Sanjay R. Dhage[4,*]

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Abstract: $Cu(In,Ga)Se_2$ (CIGS) is a promising absorber material for thin film solar cells because of its excellent thermo-chemical stability and high power conversion efficiency. Despite the excellent performance, commercialization of CIGS solar cell technology has been hindered due to issues related to the preparation of the absorber layer. The manufacturing of CIGS absorbers needs innovative technological development to make them commercially competitive, simplified and cost-effective. In this connection, the solution process utilizing CIGS nanomaterial precursor is a non-vacuum, low-cost, non-toxic and scalable approach with a high potential for developing an absorber layer. The typical processes comprise the synthesis of high-quality CIGS nanomaterials followed by printing constituent precursors in thin film form. Subsequently, thermal/photonic post-treatments of the printed precursors transform into a high-quality photovoltaic-grade absorber. The chapter critically reviews CIGS nanomaterial synthesis methods and discusses various printing techniques. The discussion follows an investigation of printed thin film's thermal and photonic processing to realize a high-quality CIGS absorber layer suitable for thin film photovoltaics. The processing parameters such as annealing profile, post-treatment, annealing atmosphere, Selenium source, photonic fluences, and alkali doping are discussed to understand their impact on the absorber's composition, morphology, and optoelectronic properties. The findings and related reviews afford critical insight into the absorber thin film design to improve the performance of solution-processed chalcopyrite solar cells. Finally, current challenges and prospects for effective technology implementation are discussed.

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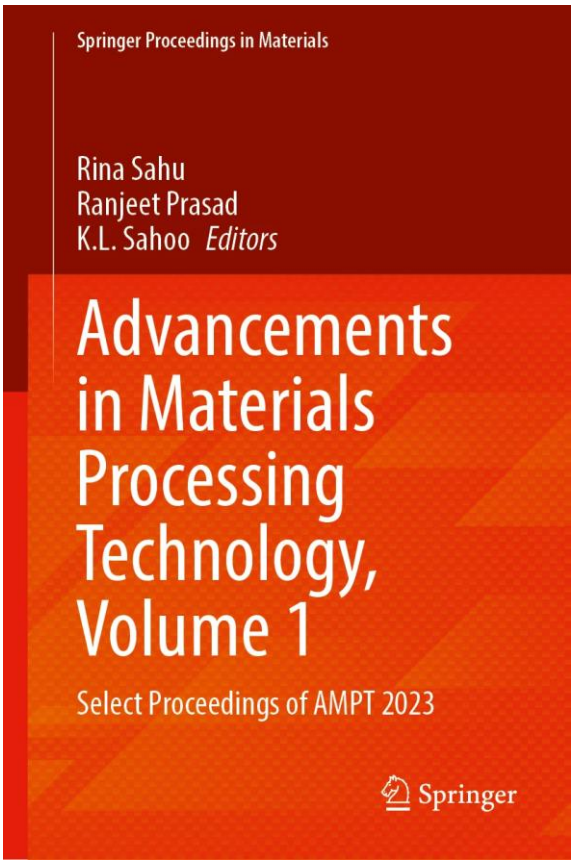

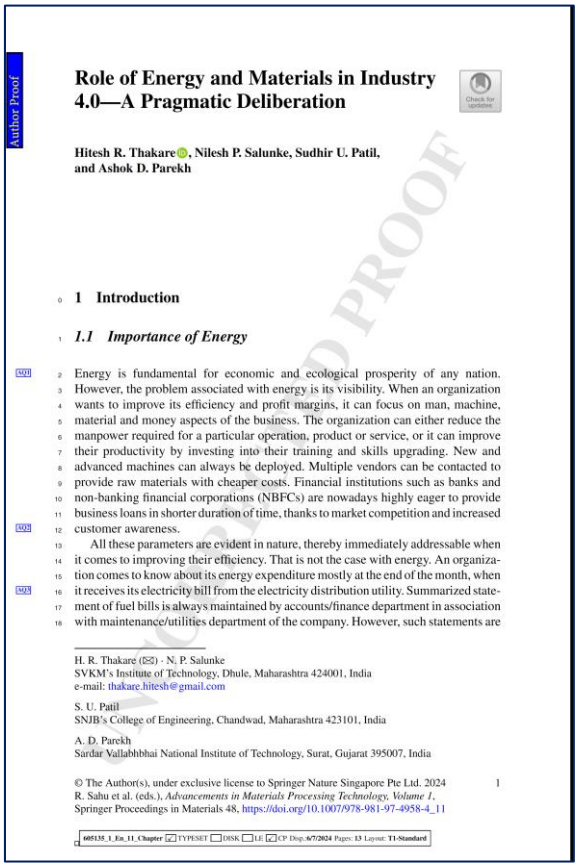

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Role of Energy and Materials in Industry 4.0—A Pragmatic Deliberation

Hitesh R. Thakare, Nilesh P. Salunke, Sudhir U. Patil, and Ashok D. Parekh

1 Introduction

1.1 Importance of Energy

Energy is fundamental for economic and ecological prosperity of any nation. However, the problem associated with energy is its visibility. When an organization wants to improve its efficiency and profit margins, it can focus on man, machine, material and money aspects of the business. The organization can either reduce the manpower required for a particular operation, product or service, or it can improve their productivity by investing into their training and skills upgrading. New and advanced machines can always be deployed. Multiple vendors can be contacted to provide raw materials with cheaper costs. Financial institutions such as banks and non-banking financial corporations (NBFCs) are nowadays highly eager to provide business loans in shorter duration of time, thanks to market competition and increased customer awareness.

All these parameters are evident in nature, thereby immediately addressable when it comes to improving their efficiency. That is not the case with energy. An organization comes to know about its energy expenditure mostly at the end of the month, when it receives its electricity bill from the electricity distribution utility. Summarized statement of fuel bills is always maintained by accounts/finance department in association with maintenance/utilities department of the company. However, such statements are

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Computational Analysis of Various Fin Configurations—A Comprehensive Assessment

Hitesh R. Thakare, Nilesh P. Salunke, Bhavesh Deore, Kunal Karankal, Pranav Gujar, and Rohit Patil

1 Introduction

1.1 Importance of Fins as Extended Surfaces for Heat Transfer

It is well known from the science of heat transfer that fins are helpful to enhance the effective area available for heat interaction and thereby improve the heat transfer coefficient as well as heat transfer rate. Fins are mainly beneficial because they do not require any active source of energy to establish the fluid motion. This mechanism particularly addresses the needs of devices which are located outside such as high-power LED street lamps as well as thin client computers [1]. However, observation of temperature distribution profile of a fin indicates exponential decrement of temperature towards the fin tip, which results in reduced temperature differential between fin and surrounding fluid, thus ultimately reducing the heat transfer rate. Due to high applicability of fins in enhancement of gas side heat transfer coefficient, there has been immense interest in the research pertaining to fin performance improvement. Some notable works which involve study of input power required for array of LEDs [2], fins spacing for large fin arrays [3], providing holes in the fin base of a fin array [4], to name a few.

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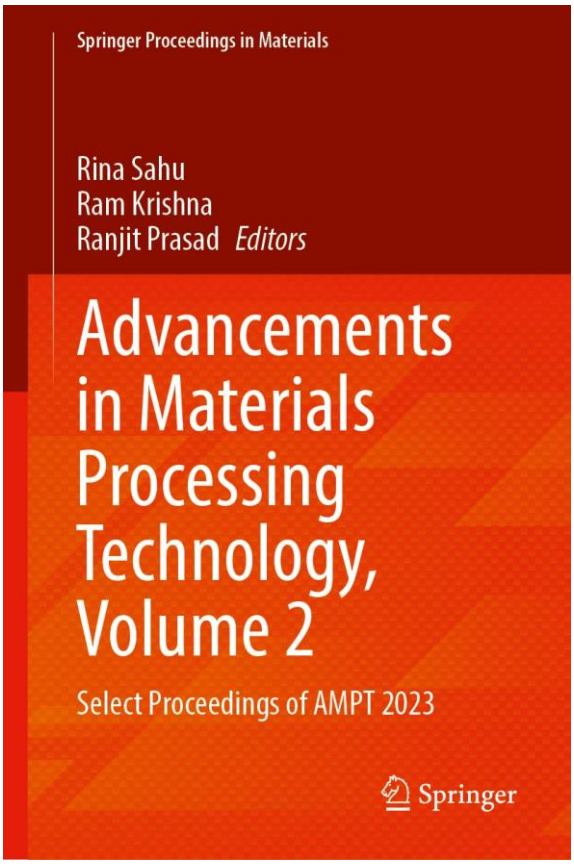

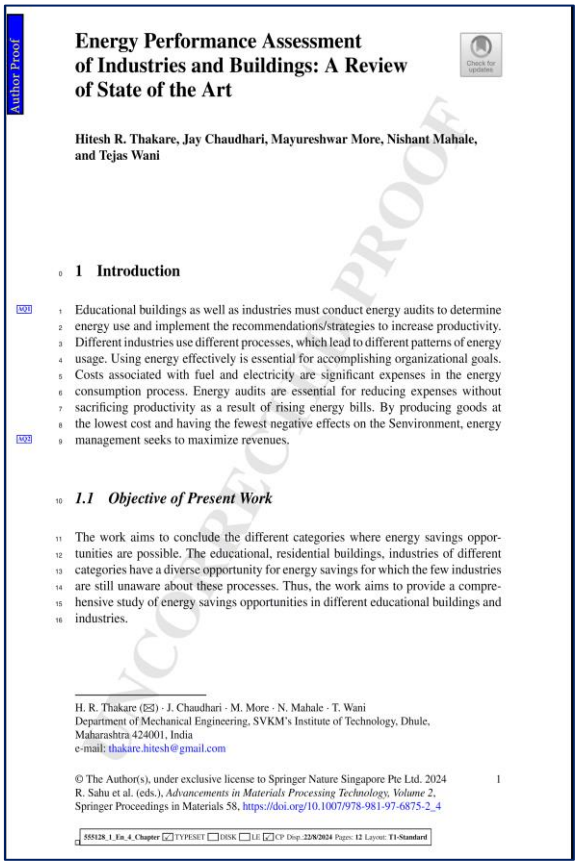

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Energy Performance Assessment of Industries and Buildings: A Review of State of the Art

Hitesh R. Thakare, Jay Chaudhari, Mayureshwar More, Nishant Mahale, and Tejas Wani

1 Introduction

Educational buildings as well as industries must conduct energy audits to determine energy use and implement the recommendations/strategies to increase productivity. Different industries use different processes, which lead to different patterns of energy usage. Using energy effectively is essential for accomplishing organizational goals. Costs associated with fuel and electricity are significant expenses in the energy consumption process. Energy audits are essential for reducing expenses without sacrificing productivity as a result of rising energy bills. By producing goods at the lowest cost and having the fewest negative effects on the Senvironment, energy management seeks to maximize revenues.

1.1 Objective of Present Work

The work aims to conclude the different categories where energy savings opportunities are possible. The educational, residential buildings, industries of different categories have a diverse opportunity for energy savings for which the few industries are still unaware about these processes. Thus, the work aims to provide a comprehensive study of energy savings opportunities in different educational buildings and industries.

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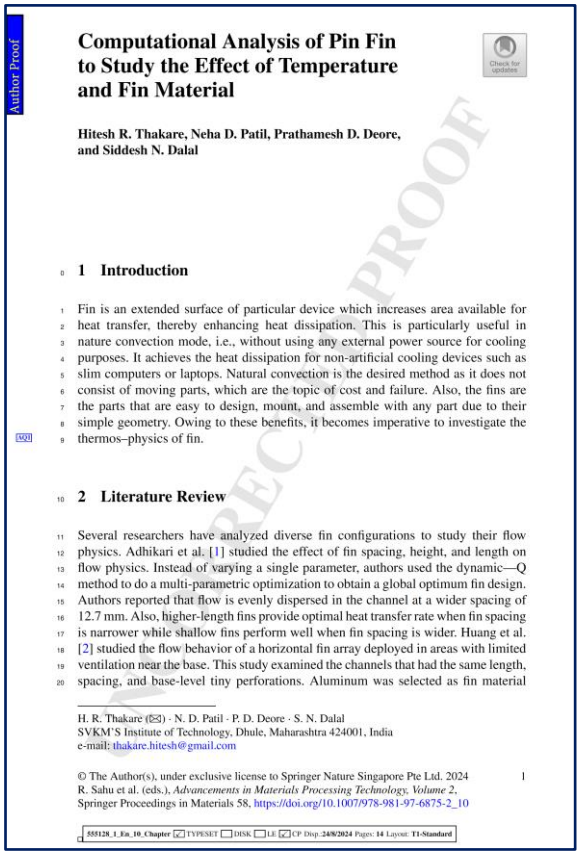

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Computational Analysis of Pin Fin to Study the Effect of Temperature and Fin Material

Hitesh R. Thakare, Neha D. Patil, Prathamesh D. Deore, and Siddesh N. Dalal

1 Introduction

Fin is an extended surface of particular device which increases area available for heat transfer, thereby enhancing heat dissipation. This is particularly useful in nature convection mode, i.e., without using any external power source for cooling purposes. It achieves the heat dissipation for non-artificial cooling devices such as slim computers or laptops. Natural convection is the desired method as it does not consist of moving parts, which are the topic of cost and failure. Also, the fins are the parts that are easy to design, mount, and assemble with any part due to their simple geometry. Owing to these benefits, it becomes imperative to investigate the thermos–physics of fin.

2 Literature Review

Several researchers have analyzed diverse fin configurations to study their flow physics. Adhikari et al. [1] studied the effect of fin spacing, height, and length on flow physics. Instead of varying a single parameter, authors used the dynamic—Q method to do a multi-parametric optimization to obtain a global optimum fin design. Authors reported that flow is evenly dispersed in the channel at a wider spacing of 12.7 mm. Also, higher-length fins provide optimal heat transfer rate when fin spacing is narrower while shallow fins perform well when fin spacing is wider. Huang et al. [2] studied the flow behavior of a horizontal fin array deployed in areas with limited ventilation near the base. This study examined the channels that had the same length, spacing, and base-level tiny perforations. Aluminum was selected as fin material

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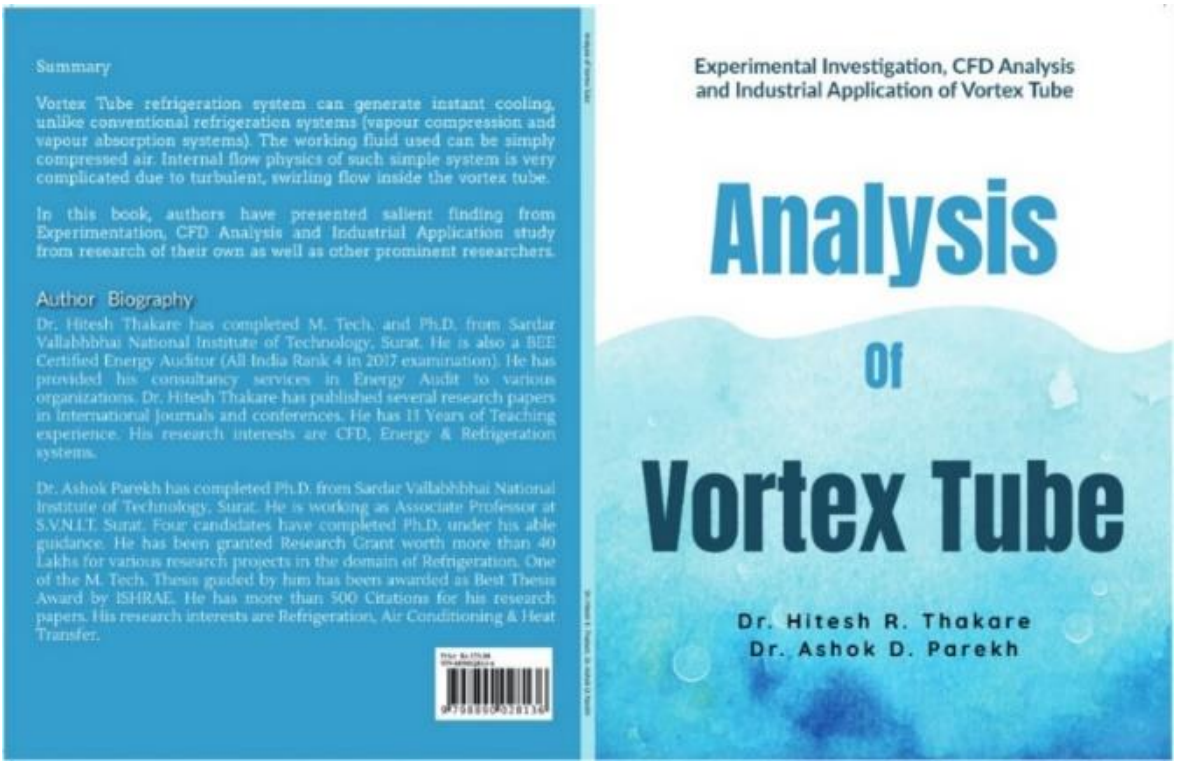

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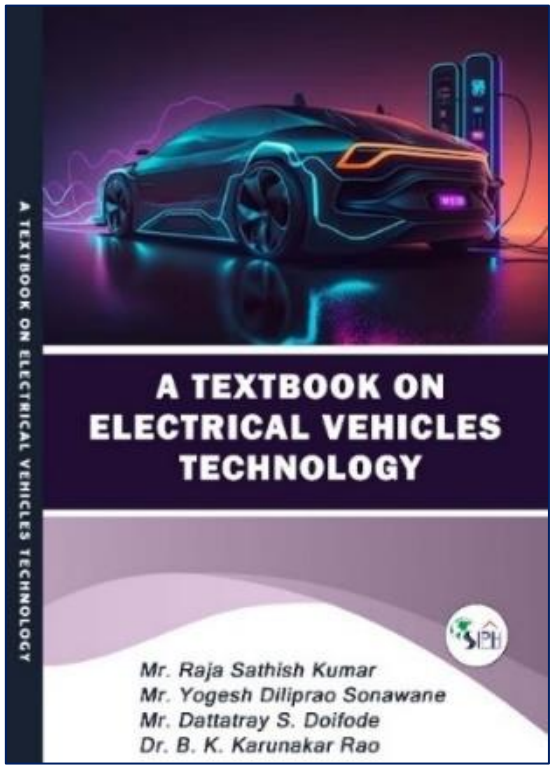

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