

GC-RASM 2022

2022 Second Global Conference on  
**Recent Advancements in  
Sustainable Materials  
(GC-RASM 2022)**

**Book of Abstracts**

**28 - 29, July 2022**

**A.J. Institute of Engineering & Technology  
Mangaluru, Karnataka, India.**

Publication Partner



---

2022 Second Global Conference on  
**RECENT ADVANCEMENTS IN SUSTAINABLE  
MATERIALS (GC-RASM 2022)**

28 - 29, July 2022 | A.J. Institute of Engineering & Technology  
Mangaluru, Karnataka, India.

---

# **GC-RASM 2022**

Organized by



**A.J. Institute of Engineering and Technology  
Mangaluru, Karnataka, INDIA.**

Ph: +91 824 286 2200 E-mail : [ajengcollege@gmail.com](mailto:ajengcollege@gmail.com)

**Partners**

Publishing Partner



CMS Partner



Media Partner



RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS (RASM 2022)

RASM 2025	Studies on structural and magnetic properties of Nanoporous Li <sup>+</sup> substituted MgFe <sub>2</sub> O <sub>4</sub> nanomaterials for its application in hydroelectric cell with other areas of Science & Technology <i>Aniket Manash, Rakesh Kumar Singh*, Vivek Kumar, Jyoti Shah, Shashank Bhushan Das, Singh Sonu Kumar, Nishant Kumar and R. K. Kotnala</i>	044
RASM 2026	Effect of Fuel Flow Analysis on a ECU controlled RCCI Engine with ETBE Blends <i>DVVS B Reddy Saragada, Vinjamuri SNCh Dattu, Puli Danaiah</i>	045
RASM 2028	Artificial Neural Network and Evolutionary Algorithms Based Optimization of Electrochemical Discharge Micromachining Process during Micro-channel Fabrication on Glass <i>Krishnendu Mondal, SK Hikmat, Bijan.Mallick*, Jayanta Mahato, Pijush Dutta</i>	046
RASM 2030	Numerical Performance Analysis of a Twin Blade Drone Rotor Propeller <i>Pandiyarajan Rajendran and Agnishwar Jayaprakash</i>	047
RASM 2031	Calculate the approximate volume of complex-shape solids <i>Majd Raad, Oleg Eremin, Moudar Kiwan and Nedal Raed</i>	047
RASM 2035	Analysing a YSF precision locknut with the tighten loads of three fixed coppers and screws <i>Kuan-Yin Lee, Prasana kumar Samanta*, Liao-Neng-Tung</i>	048
RASM 2036	Study on Self-curing concrete using Polyethylene Glycol 600 for highway infrastructure project <i>Makendran C, Karunanidhi S, Shiferaw Garoma, Bekesha Merea</i>	048
RASM 2037	A Bibliometric Analysis on Graphene Nanoplatelet for Sustainable Material <i>Weng Siew Lam*, Pei Fun Lee, Weng Hoe Lam</i>	049
RASM 2039	Influence of E-Coli on Workability and Strength Characteristics of Self-Consolidating Geopolymer Concrete Based On GGBFS, Flyash and Alccofine <i>Nishanth L, Nivedita Kumbhar, Sravani Kaveti, Dr. Nayana N.Patil, Dr. Debasish. Kar</i>	050
RASM 2041	Optical properties of polymer blend of polymethyl methacrylate and polyvinyl chloride copolymer <i>R Y Bakale, Y G Bakale, Y S Tamgadge, R P Ganorkar, S V Khangar and A B Patil</i>	051
RASM 2042	Fabrication of Aloe vera Nanopowder by High energy ball mill process <i>Sabyasachi Mukherjee, Rahul Kanti Nath, Puspendu Chandra Chandra, Sutanu Samanta, Manapuram Muralidhar</i>	052
RASM 2044	Investigation of Tribological and Corrosion Performance of Duplex Electroless Ni-P/Ni-Cu-P Coatings <i>Palash Biswas, Suman Kalyan Das* and Prasanta Sahoo</i>	053
RASM 2046	Compact, Robust and Low-Profile Textile Antennas for Bio-Medical Applications with Upgraded Bandwidth for Integration of Easy Garment <i>D.Ramesh Varma, M.Murali, M.Vamshi Krishna, G.Pavani</i>	054



**3rd International Conference  
on**

**Recent Developments in  
Sustainable Infrastructure**  
Engineering, Technology & Innovation

Date : December 16-18, 2022

**Conference  
OBJECTIVES**

ICRDSI 2022 is the 3rd edition of International Conference on Recent Developments in Sustainable Infrastructure to be organized by School of Civil Engineering, KIIT Deemed to be University, Bhubaneswar, India.

The objective of this conference is to bring academicians, technocrats, engineers, researchers and students to a common platform to discuss and disseminate the recent developments in research and application for sustainable Infrastructure.

**VENUE:**

**KIIT DEEMED TO BE UNIVERSITY, BHUBANESWAR, INDIA**

KIIT Deemed to be University, founded by noted Social and Educational Entrepreneur, Prof. Achyuta Samanta. It was established in 1997 as an institution and declared as University (U/S 3 of UGC Act, 1956) by Ministry of HRD, Govt. of India in 2004 within only 7 years of its inception. There are 22 constituent schools, located in impeccably landscaped and modern technology enabled campuses offering graduate, post graduate, doctoral and post-doctoral programs in a wide range of disciplines. KIIT Deemed to be University (<http://www.kiit.ac.in>) is unique in integrating professional education with social concern. Its protégé, Kalinga Institute of Social Sciences (KISS) Deemed to be University (<http://www.kiss.ac.in>), provides holistic education from KG to PG, food, accommodation, health care and all basic necessities absolutely free to more than 30,000 poorest tribal children.



**SCHOOL OF  
CIVIL ENGINEERING**



School of Civil Engineering is the oldest school of the University and accredited by NBA in the Tier I category of Washington Accord. The School offers undergraduate, post-graduate and PhD programme in all major specializations.

(<https://civil.kiit.ac.in>)

**ICRDSI 2019**

# 300 international and national delegates attended the conference  
# Out of 150 presented technical papers, 94 papers got published in scopus indexed springer proceedings.

The conference proceedings of ICRDSI-2019 can be accessed through the following weblink;  
[https://www.springer.com/gp/book/9789811545764#aboutBook/.](https://www.springer.com/gp/book/9789811545764#aboutBook/)

**ICRDSI 2020**

# 1200 international and national delegates attended the conference  
# Out of 247 presented technical papers, 150 papers got published in scopus indexed springer proceedings.

The conference proceedings of ICRDSI-2020 can be accessed through the following weblinks; ,  
<https://link.springer.com/book/10.1007/978-981-16-8433-3> (Volume-1)  
<https://link.springer.com/book/10.1007/978-981-16-7509-6> (Volume-2).

**IMPORTANT DATES**

Abstract submission begins	25 July 2022
Last date of abstract submission:	16 September 2022
Intimation of abstract acceptance:	20 September 2022
Last date submission of full-length paper:	05 November 2022
Last date Intimation of full-length paper acceptance for presentation:	20 November 2022
Early bird registration:	15-30 November 2022
Conference Sessions:	16-18 December 2022

# Call for FULL LENGTH PAPER

Authors are invited to submit full length paper in ICRDSI 2022 using the template available in the website to prepare manuscript. During the preparation of the manuscript, the author should emphasize on description of the background of the subject, methodology, author's work, result & discussion and concluding remarks.

Mail your abstract or full length paper to conference email id: [icrdsi.civil@kiit.ac.in](mailto:icrdsi.civil@kiit.ac.in)

## REGISTRATION DETAILS

Delegate participation, category/type of organization	Early bird discounted upto 30 Nov 2022	After 30 Nov 2022
Academicians	₹4000	₹4500
R & D/Industry/Corporate Executives,	₹5000	₹6000
Student	₹3500	₹4000
Foreign Delegates	\$75	\$100
Accompanying Person	₹3000 (Indian) \$65 (Foreigners)	₹3500 (Indian) \$90 (Foreigners)

## PUBLICATION

Accepted and registered papers will be invited for oral presentation at ICRDSI 2022. The presented papers will be further peer reviewed and selected papers will be published in Scopus Indexed Proceedings.

## SPONSORSHIP

For the conference, sponsorships are invited from the different Government, private organizations, manufacturers and suppliers dealing with various civil engineering products. Appropriate space will be provided to the sponsors in conference website, backdrop and proceedings of ICRDSI 2022 for display of sponsor materials. For detail about the sponsorship, kindly visit the conference website (<http://civil.kiit.ac.in/icrdsi-2022/>)

## PLAGIARISM POLICY

Authors should submit their original and unpublished research work, which is not under consideration for publication elsewhere. Manuscripts found to be plagiarized during any stage of the review process will be rejected.

## FOR ALL CORRESPONDENCE, PLEASE CONTACT:

### Contact us:

Mobile No. +91 9437377786, +917894470698, +91 9437230562 & +91 7002799717  
Email: [icrdsi.civil@kiit.ac.in](mailto:icrdsi.civil@kiit.ac.in)  
Website: <http://civil.kiit.ac.in/icrdsi-2022/>

Organizing Secretary (ICRDSI-2022)  
School of Civil Engineering  
Kalinga Institute of Industrial Technology (KIIT)  
Deemed to be University, Bhubaneswar  
Odisha - 751024

## Conference THEME & SUBTHEME



### BLENDED TECHNOLOGIES IN CIVIL ENGINEERING

- ✓ Smart cities
- ✓ Green building and technology
- ✓ Forensic engineering
- ✓ Sustainable energy
- ✓ Nano-materials and nano-technologies
- ✓ Genetic programming for large-scale structures
- ✓ Application of internet of things (IoT)
- ✓ Application of artificial intelligence (AI)
- ✓ Smart sensing technology in civil engineering

### SUSTAINABLE WATER RESOURCE MANAGEMENT

- ✓ Water resources planning and management
- ✓ Rainwater harvesting analysis and design
- ✓ Sustainability in water supply
- ✓ Geospatial techniques (Remote sensing and GIS)
- ✓ Energy harvesting
- ✓ Ground water potential and recharging

### SUSTAINABLE STRUCTURAL MANAGEMENT

- ✓ Greenconcrete
- ✓ Sustainable materials and construction
- ✓ Utilisation of waste in concrete
- ✓ Composite and sandwiched structures
- ✓ Offshore structures
- ✓ Earthquake engineering and structural dynamics
- ✓ Structural health monitoring

### SUSTAINABLE ENVIRONMENT

- ✓ Air quality monitoring and management
- ✓ Aerosol and air quality
- ✓ Water and waste water treatment
- ✓ Solid and hazardous waste management
- ✓ CDM, green economy, environmental & health impact
- ✓ GHG, low carbon & climate Issues

### SUSTAINABLE TRANSPORTATION SYSTEM

- ✓ Sustainable pavement
- ✓ Recycling and reusing of materials
- ✓ Environmental issues in transportation
- ✓ Traffic safety and security
- ✓ Traffic flow theory, operation and facilities
- ✓ Transportation planning
- ✓ Intelligent transportation system

### SUSTAINABILITY IN CONSTRUCTION MANAGEMENT

- ✓ Cost Effective construction technologies
- ✓ Innovative construction methods
- ✓ Construction planning and control
- ✓ Construction safety
- ✓ Time and cost optimization in project management
- ✓ Risk and safety management
- ✓ Sustainable design and construction

### SUSTAINABILITY IN GEOTECHNICAL ENGINEERING

- ✓ Characterization of geomaterials and physical modeling
- ✓ Foundations, slope stability and landslides
- ✓ Earthquake geotechnical engineering
- ✓ Ground improvement
- ✓ Geo-environmental engineering
- ✓ Offshore geotechnical engineering

# Conference Convenor

## Chief Patron

**Prof. Achyuta Samanta**

Founder, KIIT & KISS

## Patron

**Prof. Ved Prakash**

Chancellor, KIIT DU

**Prof. Sasmita Samanta**

Vice Chancellor, KIIT DU

## Conference Advisor

**Dr. B. Das**

Sr. Professor, SCE KIIT DU

## Organizing Chairman

**Dr. Sanjib Moulick**

Professor & Dean, SCE KIIT DU

## Mentors

**Prof. Saranjit Singh**

Pro-Vice Chancellor

**Prof. J. R. Mohanty**

Registrar

## Conference Co-Advisor

**Dr. B. G. Mohapatra**

Professor & Director, Consultancy Services, KIIT-DU

## Co-Organizing Chairman

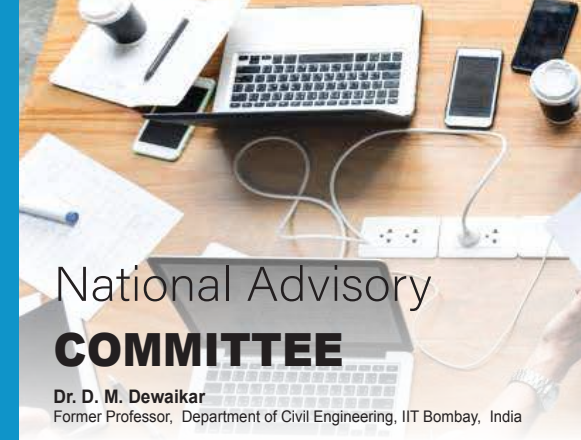
**Dr. P. C. Saha**

Asso. Professor, SCE, KIIT DU

**Dr. S. Nanda**

Asso. Professor, SCE, KIIT DU

<b>Organizing Secretaries</b>	<b>Dr. P. K. Acharya</b> Asso. Professor		<b>Dr. D. K. Bera</b> Asso. Professor	
	<b>Dr. T. B. Mohanty</b> Asso. Professor		<b>Dr. Madhu Lisha Pattanaik</b> Asst. Professor	
<b>Chairmen, Technical Committee</b>	<b>Dr. J. Padhi</b> Asso. Professor		<b>Dr. D. R. Biswal</b> Asso. Professor	
<b>Co-Chairmen, Technical Committee</b>	<b>Dr. K. P. Samal</b> Asso. Professor	<b>Dr. N. C. Moharana</b> Asst. Professor	<b>Dr. B. Paikaray</b> Asst. Professor	
	<b>Dr. A. K. Pani</b> Asst. Professor	<b>Dr. R. Chattaraj</b> Asst. Professor	<b>Dr. P. Chakraborty</b> Asst. Professor	
	<b>Dr. M. Mohanty</b> Asst. Professor	<b>Dr. D. Bharath Kumar</b> Asst. Professor	<b>Mr. Mohibullah</b> Asst. Professor	
<b>Co-organizing Secretaries</b>	<b>Mr. S. R. Samal</b> Asst. Professor	<b>Dr. B. Beriha</b> Asst. Professor	<b>Dr. Kundan Samal</b> Asst. Professor	
	<b>Ms. Ipsita Mohanty</b> Asst. Professor	<b>Dr. K. K. Sahoo</b> Asst. Professor	<b>Dr. Amit Das</b> Asst. Professor	
<b>Secretaries</b>	<b>Ms. Ipsita Panda</b> Asst. Professor	<b>Dr. A. Pani</b> Asst. Professor	<b>Ms. Kalpana Sahoo</b> Asst. Professor	
	<b>Mr. S. Jaiswal</b> Asst. Professor	<b>Ms. P. N. Nanda</b> Asst. Professor	<b>Mr. Gaurav Udgata</b> Asst. Professor	
<b>Member, Technical Committee</b>	<b>Dr. B. Jena</b> Professor	<b>Dr. B. Das</b> Senior Professor	<b>Dr. B. G. Mohapatra</b> Professor	
	<b>Dr. C. K. Kundu</b> Asso. Professor	<b>Dr. P. C. Saha</b> Asso. Professor	<b>Dr. S. Moulick</b> Professor	
	<b>Dr. D. B. Kumar</b> Asst. Professor	<b>Dr. P. Chakraborty</b> Asst. Professor	<b>Dr. A. K. Pani</b> Asst. Professor	
	<b>Dr. R. Chattaraj</b> Asst. Professor	<b>Dr. D. R. Biswal</b> Asso. Professor	<b>Dr. M. Mohanty</b> Asst. Professor	
	<b>Ms. S. Sarkar</b> Asst. Professor	<b>Dr. N. C. Moharana</b> Asst. Professor	<b>Mr. Mohibullah</b> Asst. Professor	



## National Advisory COMMITTEE

### Dr. D. M. Dewaikar

Former Professor, Department of Civil Engineering, IIT Bombay, India

### Dr. A. K. Rath

Former Professor, School of Civil Engineering, KIIT Deemed to be University

### Dr. R. S. Jangid

Professor, Department of Civil Engineering, IIT Bombay, India

### Dr. N. R. Patra

Professor, Department of Civil Engineering, IIT Kanpur, India

### Dr. V. R. Desai

Professor, Department of Civil Engineering, IIT Kharagpur, India

### Dr. Sarat Kumar Das

Professor, Department of Civil Engineering, IIT (ISM) Dhanbad, India

### Dr. G. R. Dodagoudar

Professor, Department of Civil Engineering, IIT Madras, India

### Dr. Vasant Matsagar

Professor, Department of Civil Engineering, IIT Delhi, India

### Prof. Sudhindra Nath Panda

Director, National Institute of Technical Teachers Training & Research (NITTTR), Chennai.

### Dr. S. K. Patro

Professor, Department of Civil Engineering, VSSUT, Burla, Odisha, India

### Dr. P. K. Parhi

Professor, Department of Civil Engineering, CET, Bhubaneswar, India

### Dr. V. A. Sawant

Professor, Department of Civil Engineering, IIT Roorkee, India

### Dr. B. C. Panda

Professor, Department of Civil Engineering, IGIT, Sarang, Odisha, India

### Dr. Bimlesh Kumar

Professor, Department of Civil Engineering, IIT Guwahati, India

### Dr. Subash Yaragal

Professor, Department of Civil Engineering, NITK Surathkal.

### Dr. P. K. Parida

Scientist, ORSAC, Bhubaneswar

### Dr. Rajan Choudhary

Professor, Department of Civil Engineering, IIT Guwahati, India

### Dr. U. C. Sahoo

Asst. Professor, School of Infrastructure, IIT Bhubaneswar.

### Dr. Bhargab Maitra

Professor, Department of Civil Engineering, IIT Kharagpur, India

## International Advisory COMMITTEE

### Dr. Gajanan M. Sabnis

Emeritus Professor, Depart. of Civil Engg., Howard University Washington DC, USA..

### Dr. Achintya Bezbaruah

North Dakota State University, USA

### Dr. Gangadhara B. Prusty

Professor, School of Mechanical and Manufacturing Engg., Kensington, Australia.

### Prof. Jean-Louis Roubaty

Professor, Université Paris Diderot Paris

### Dr. Vinayagamoorthy Sivakumar

Professor, School of Natural and Built Environment, Queen's University Belfast, U.K.

### Dr. Shane Donohue

Associate Professor, School of Civil Engineering, University College, Dublin

### Dr. Sanjay K. Shukla

Program Leader, Department of Civil Engineering, Edith Cowan University, Australia.

### Dr. Solomon Tesfamariam

Professor, University of British Columbia, Okanagan Campus, Canada

### Dr. Dillip Kumar Das

Associate Professor, Civil Engineering, Central University of Technology Free State, South Africa

### Dr. Hong Yao-ming

Dean, Master Program of Green Technology for Sustainability, Nanhua University, Taiwan

### Dr. Salim Barbhuiya

School of Civil Engineering, Leeds University, United Kingdom

### Prof. Suranjan Panigrahi

Professor, Purdue University, USA

### Dr. Debkant Mishra

Associate Professor, School of Civil and Engineering Oklahoma State University

6<sup>th</sup> International Online Conference on  
Electronics, Materials Engineering &  
Nano-Technology

# **IEMENTech 2022**

organized by

**Dept. of Electronics & Comm. Engg.  
Institute of Engineering & Management**

**2<sup>nd</sup> to 4<sup>th</sup> December 2022**

## Contents Contributory Papers

<b>EDAS ID</b>	<b>Paper Title</b>	<b>Author Name</b>
1570861435	<i>Using an RFID Card with a Password to Open a Door</i>	Mohamed El-Amine Ouesse
1570867364	<i>Feedback Linearization for Nonlinear Control of a Magnetic Levitation System</i>	Raghuwansh Singh
1570854351	<i>Modeling of Deposition of Small Particles from the Vapour State on a Thin Film</i>	Rahul Basu
1570858238	<i>Effect of Mixed Modifiers on Electrical Mechanism of Zinc-Phosphate Amorphous Semiconducting Glass</i>	Arpan Mandal
1570859312	<i>Effect of Transition Metal Oxides on Optical and DC Conduction Mechanism of Zinc-Phosphate Amorphous Semiconducting Glass</i>	Souvik Brahma Hota;
1570862067	<i>Influence of Multi Walled Carbon Nanotubes (MWCNTs) on Parameters Affecting Charge Injection Process at Metal-Organic Contact</i>	Sudipta Sen
1570854566	<i>Stabilization and Control of Quadcoptor</i>	Jayati Dey
1570868936	<i>FPGA Based Smart Home Automation Device Controller</i>	Hiranmayi Mannem
1570866731	<i>Review of DC Arc Fault Detection</i>	Krunal Shivkumar Panpaliya
1570871205	<i>Prediction of Forest Fires Using Machine Learning</i>	Suswan Biswas, Sayantan Sarkar
1570871197	<i>Studies on Programmable Metasurfaces Using Deep Learning Techniques</i>	Trina Dwibedi
1570869887	<i>Instance Segmentation for Car Damage Detection with Mask-RCNN</i>	Romit Maity; Rahul Rudra
1570871194	<i>Malignant Tumor Detection Performance Analysis Using Convolutional Neural Networks and SVM Classifier Model</i>	Avik Pathak
1570871208	<i>Predictive Analytics for Financial Forecasting - past and Present</i>	Partha Paul



1570871195	<i>Codebook Optimization Using Jaya Algorithm for Image Compression</i>	Suvojit Acharjee
1570866146	<i>Haze Wireless Sensor System Development and Measurement</i>	Kama Azura Othman
1570871199	<i>Effect Of Modulation Index On Total Harmonic Distortion And Individual Harmonics In A Single-Phase Five Level SPWM Based CHML Inverter-A</i>	Gautam Ghosh
1570871212	<i>Null Placement in Uniform Linear Array by Phase Control of Edge Elements</i>	Sandipan Mitra
1570871279	<i>Comparative Study of GaN HEMT on Recent Trends and Future Scope Along with It's Applications</i>	Avishek Saha
1570871228	<i>Optical Property Study of Electro-Deposited Tin Oxide Thin Film</i>	Uddipan Agasti
1570865994	<i>To Produce High Resolution Deep Space Images Using Real-Enhanced Super Resolution General Adversarial Networks</i>	Varad Abhijit Joshi
1570866584	<i>Optimizing Deep Learning Neural Networks: Brain to Computer Interface EEG-Based Imagined Word Prediction for Speech Disability</i>	Babu Chinta
1570870334	<i>9's Complement Encoder Using QCA Schematics</i>	Ratna Chakrabarty
1570871277	<i>Development &amp; Property Study of Partially Depleted Silicon-On-Insulator MOSFET</i>	Bidyendu Ghoshal

---

# Effect of Mixed Modifiers on Electrical Mechanism of Zinc-Phosphate Amorphous Semiconducting Glass

---

<sup>1,2</sup>Arpan Mandal, <sup>3,\*</sup>Dipankar Biswas, <sup>4</sup>Rittwick Mondal, <sup>5</sup>Bidyut Kumar Ghosh, <sup>2</sup>Nipu Modak

<sup>1</sup> Mechanical Engineering Department, Regent Education and Research Foundation, Kolkata 700121, India

<sup>2</sup> Mechanical Engineering Department, Jadavpur University, Kolkata-700032, India

<sup>3,\*</sup> Electronics & Communication Engineering Department, Regent Education and Research Foundation, Kolkata 700121, India

<sup>4</sup>Chowhatta High School, Birbhum, West Bengal 731201, India

<sup>5</sup>Electrical Engineering Department, Regent Education and Research Foundation, Kolkata 700121, India

Email: [dipankar\\_aec@rediffmail.com](mailto:dipankar_aec@rediffmail.com)

## Abstract.

The impact of MoO<sub>3</sub> and TeO<sub>2</sub> inclusion on electrical and dielectric mechanisms of the zinc-phosphate host glass matrix has been reported in this communication. The well-known melt quenching route has been employed to produce glass nanocomposite systems. The formation of superimposed nanocrystallites of ZnMoO<sub>4</sub>, Mo<sub>5</sub>TeO<sub>16</sub> and TeO<sub>3</sub> within the amorphous glass matrix is established by XRD spectra. The well-known Debye-Scherrer approach has been used to estimate the typical nanocrystallite size (d<sub>c</sub>). The semiconducting nature of glasses has been demonstrated from their DC conductivity. The small polaron hopping process causes nonlinearity in DC conductivity, which is different from AC conductivity. The modified correlated barrier-hopping (CBH) model explains the mechanism of AC conduction. The DC and AC activation energies are found to decrease with the accumulation of TeO<sub>2</sub> in glass matrices.

**Keywords.** Glass nanocomposite; Almond-West formalism; Small polaron hopping; AC and DC Conductivity; Modified CBH model

## 1. INTRODUCTION

Recent years have seen a rise in interest in zinc-phosphate glasses due to its low UV cut-off wavelength, exceptional chemical strength, thermal constancy, and outstanding electrical conduction [1, 2]. Because of their high thermal expansion coefficient, lower melting temperature, and excellent UV transmission, phosphate glasses are of tremendous technological and scientific attention for both practical and theoretical applications [3]. When compared to Pb-based glasses, their weak chemical stability frequently limits their ability for real-world sealing applications. To improve the poor chemical stability of phosphate glasses, the controlled accumulation of oxides such as CuO, MoO<sub>3</sub>, SnO, Sb<sub>2</sub>O<sub>3</sub>, and V<sub>2</sub>O<sub>5</sub> [3] has already been found to be effective.

Due to the remarkable modifications in the physical and structure properties seen in ZnO-P<sub>2</sub>O<sub>5</sub> system, the presence of ZnO into phosphate glasses is quite fascinating [4]. Better chemical stability is achieved by using ZnO such as a network modifier or former, which also results in a wider glass-forming region and lower glass transition temperatures [5]. The glass doped with TeO<sub>2</sub> is challenging to make at large concentrations because of the potential for quick amorphization and phase separation during cooling. As a result, different kinds of defects may occur in TeO<sub>2</sub>-doped glass during the melt quenching procedure. To improve the tellurite glassy network's ability to create glass, metaphosphate can be added [6, 7]. As a result, after being doped with P<sub>2</sub>O<sub>5</sub> as a glass making agent, MoO<sub>3</sub> as a network modifier, and ZnO as network stabilizer, TeO<sub>2</sub>-doped glass can be made utilizing the quench of melt method. Electro-optical applications are made possible by the electrochromism properties and improved ionic conductivity of phosphate glass systems doped with MoO<sub>3</sub>. Mo ions can be found inside glass network as octahedral and tetrahedral structural units because they can exist in two unique valence states, Mo<sup>6+</sup> and Mo<sup>5+</sup> [8, 9]. Due to the development of TeO<sub>4</sub> trigonal bipyramids, doping ZnO-P<sub>2</sub>O<sub>5</sub> glasses with TeO<sub>2</sub> results in changing structural. To determine the most suitable glassy system for more effective applications, we have investigated the results of including both MoO<sub>3</sub> and TeO<sub>2</sub> as mixed modifiers in ZnO-P<sub>2</sub>O<sub>5</sub> glasses in the present work. The purpose of this research is to use the melt quenching method to synthesise three quaternary glassy systems that have the chemical formula 0.60ZnO-0.10P<sub>2</sub>O<sub>5</sub>-0.30[(1-x) MoO<sub>3</sub>-xTeO<sub>2</sub>]. One of the main objectives of this communication is to examine the X-ray diffraction (XRD) patterns to investigate the microstructure. In order to evaluate each sample's semiconducting nature and DC conductivity, the small polaron hopping hypothesis is applied. Almond-West formalism and the well-known Jonscher's Universal Law have both been used to analyze the conductivity of the present glassy systems.

6<sup>th</sup> International Online Conference on  
Electronics, Materials Engineering &  
Nano-Technology

# **IEMENTech 2022**

organized by

**Dept. of Electronics & Comm. Engg.  
Institute of Engineering & Management**

**2<sup>nd</sup> to 4<sup>th</sup> December 2022**

## Contents Contributory Papers

<b>EDAS ID</b>	<b>Paper Title</b>	<b>Author Name</b>
1570861435	<i>Using an RFID Card with a Password to Open a Door</i>	Mohamed El-Amine Ouesse
1570867364	<i>Feedback Linearization for Nonlinear Control of a Magnetic Levitation System</i>	Raghuwansh Singh
1570854351	<i>Modeling of Deposition of Small Particles from the Vapour State on a Thin Film</i>	Rahul Basu
1570858238	<i>Effect of Mixed Modifiers on Electrical Mechanism of Zinc-Phosphate Amorphous Semiconducting Glass</i>	Arpan Mandal
1570859312	<i>Effect of Transition Metal Oxides on Optical and DC Conduction Mechanism of Zinc-Phosphate Amorphous Semiconducting Glass</i>	Souvik Brahma Hota;
1570862067	<i>Influence of Multi Walled Carbon Nanotubes (MWCNTs) on Parameters Affecting Charge Injection Process at Metal-Organic Contact</i>	Sudipta Sen
1570854566	<i>Stabilization and Control of Quadcoptor</i>	Jayati Dey
1570868936	<i>FPGA Based Smart Home Automation Device Controller</i>	Hiranmayi Mannem
1570866731	<i>Review of DC Arc Fault Detection</i>	Krunal Shivkumar Panpaliya
1570871205	<i>Prediction of Forest Fires Using Machine Learning</i>	Suswan Biswas, Sayantan Sarkar
1570871197	<i>Studies on Programmable Metasurfaces Using Deep Learning Techniques</i>	Trina Dwibedi
1570869887	<i>Instance Segmentation for Car Damage Detection with Mask-RCNN</i>	Romit Maity; Rahul Rudra
1570871194	<i>Malignant Tumor Detection Performance Analysis Using Convolutional Neural Networks and SVM Classifier Model</i>	Avik Pathak
1570871208	<i>Predictive Analytics for Financial Forecasting - past and Present</i>	Partha Paul

1570871195	<i>Codebook Optimization Using Jaya Algorithm for Image Compression</i>	Suvojit Acharjee
1570866146	<i>Haze Wireless Sensor System Development and Measurement</i>	Kama Azura Othman
1570871199	<i>Effect Of Modulation Index On Total Harmonic Distortion And Individual Harmonics In A Single-Phase Five Level SPWM Based CHML Inverter-A</i>	Gautam Ghosh
1570871212	<i>Null Placement in Uniform Linear Array by Phase Control of Edge Elements</i>	Sandipan Mitra
1570871279	<i>Comparative Study of GaN HEMT on Recent Trends and Future Scope Along with It's Applications</i>	Avishek Saha
1570871228	<i>Optical Property Study of Electro-Deposited Tin Oxide Thin Film</i>	Uddipan Agasti
1570865994	<i>To Produce High Resolution Deep Space Images Using Real-Enhanced Super Resolution General Adversarial Networks</i>	Varad Abhijit Joshi
1570866584	<i>Optimizing Deep Learning Neural Networks: Brain to Computer Interface EEG-Based Imagined Word Prediction for Speech Disability</i>	Babu Chinta
1570870334	<i>9's Complement Encoder Using QCA Schematics</i>	Ratna Chakrabarty
1570871277	<i>Development &amp; Property Study of Partially Depleted Silicon-On-Insulator MOSFET</i>	Bidyendu Ghoshal

---

# Effect of Transition Metal Oxides on Optical and DC Conduction Mechanism of Zinc-Phosphate Amorphous Semiconducting Glass

---

<sup>1,3</sup>Souvik Brahma Hota , <sup>2</sup>Ashes Rakshit , <sup>3</sup>Debasish Roy,  
<sup>2</sup>Debtanu Patra , <sup>4,\*</sup> Dipankar Biswas

<sup>1</sup>Department of Mechanical Engineering, Techno India University, Bidhannagar, Salt Lake, Kolkata 700091, West Bengal, India.

<sup>2</sup>Department of Mechanical Engineering, Regent Education and Research Foundation, Barrackpore, Kolkata 700121, India

<sup>3</sup>Department of Mechanical Engineering, Jadavpur University. Kolkata-700032, India,

<sup>4,\*</sup>Department of Electronics & Communication Engineering, Regent Education and Research Foundation, Barrackpore, Kolkata 700121, India,

Mail id: [dipankar\\_aec@rediffmail.com](mailto:dipankar_aec@rediffmail.com)

## Abstract.

It has been investigated how the incorporation of transition metal oxides impacts on physical, electrical and optical characteristics of zinc phosphate glasses developed by the standard melt quenching method. Some nanophases  $ZnP_4O_{11}$ ,  $Zn_{2.5}MoVO_8$ ,  $Zn[MoO_4]$  and  $MoV_2O_8$  have been found to superimpose on amorphous glassy matrices. The acquired X-ray diffraction data have been used to determine the polycrystalline structure, crystallinity levels, and formed nanocrystallites's average size. UV-visible spectra of glass systems have been examined, which shows that the electronic transition is indirect. On the basis of their ultraviolet edges, the Optical Band Gap Energy and Urbach Energy have been estimated. The current glassy systems exhibit semiconducting characteristics, as evidenced by the non linear nature of DC conductivity and various activation energies at high and low temperatures. In addition, tiny polarons that hop via defect or localized sites are accountable for the DC conduction mechanism. Using Mott and Greaves variable range hopping models, DC conductivity has been explained.

**Keywords.** Glass nanocomposite; Optical Band gap; DC Conductivity; Mott's and Greaves model.

## 1. INTRODUCTION

In countless technological fields, including electronics, sensors, reflecting windows, optical filters, optical switches, and electro-optic devices, glass nanocomposites are being used extensively [1,2]. Addition of transition metal ions (TMI) leads to the structural and characteristics changes of glass nano-composites have recently been identified as promising research areas in non-linear optics. Due to their potential to yield several valence states, TMI incorporation in glass networks has been one of the methods used to create incredibly cheap luminous devices [3]. Due to their inherent ability in adopting many structural forms, such as octahedral, bipyramidal and polyhedral coordination environments in different oxidation states, vanadates have drawn a significant amount of attention. They have remarkable optical and electrical properties as a result of the compositions' formation of a  $V_2O_5$  layered structure [4]. The  $V^{5+}$  ion is bonded in a  $VO_4^{3-}$  group with the number of four  $O^{2-}$  ions in tetrahedral symmetry, as seen by the structural behaviour of  $V_2O_5$ . The vanadate glass system's structure is composed of a layered chain of  $VO_4$  polyhedron units [4]. Transition metal oxide (TMO) such as molybdenum trioxide modifies the structure of the glass instead of acting normally as a glass-forming oxide by merging octahedral  $MoO_6$  or tetrahedral  $MoO_4$  structural parts along with some other glass-forming oxides, as for example phosphorus pentoxide ( $P_2O_5$ ), vanadium pentoxide ( $V_2O_5$ ) etc. As Mo ions have existence in both the stable  $Mo^{6+}$  (acceptor level) and  $Mo^{5+}$  (donor level) valence states and form  $MoO_4$  tetrahedral units, the addition of  $MoO_3$  can result in more packed glassy systems [5].  $MoO_3$ -doped glasses made of phosphate have electro-optical characteristics that are advantageous for a number of technological applications [6].

On the other hand, zinc oxide (ZnO) modifies the sensitive features of the glass while also influencing its structure and stabilizing the glass network. In view of the fact that zinc cations in glassy materials can adopt both four and

Smart Innovation, Systems and Technologies 301

Biplab Das  
Ripon Patgiri  
Valentina Emilia Balas *Editors*



# Advances in Smart Energy Systems

  
KES  
International

 Springer

# Contents

<b>1 Optimization Analysis of a Stand-Alone Hybrid Energy System for the Class Room at RLJIT, Doddaballapur, Southern Part of India</b> .....	1
Jagannath Reddy, Jagadish, and Biplab Das	
<b>2 A Study of Internet of Things in Smart Grid and Smart Grid Security</b> .....	15
Kaushik Kalita, Partha Pratim Borah, and Kankan Kishore Pathak	
<b>3 An Overview of Quantum Computing Approach in the Present-Day Energy Systems</b> .....	39
Chiranjit Biswas, Jayanta Pal, and Swanirbhar Majumder	
<b>4 Symbiotic Organisms Search Algorithm-Based Optimal Allocation and Sizing of Capacitor Bank in Radial Distribution Networks</b> .....	55
Saubhagya Ranjan Biswal and Gauri Shankar	
<b>5 Optimization of the Mechanical Properties of Energy-Efficient Natural Fiber-Reinforced Polymeric Composites</b> .....	77
Satadru Kashyap and Jahidul Islam	
<b>6 Extended State Observer-Based Controller Design Application in a Two-Link Robotic Manipulator</b> .....	101
Piyali Das, Ram Krishna Mehta, and Om Prakash Roy	
<b>7 Optimisation of Energy and Exergy Analysis of 100 W Solar Photovoltaic Module Using ANN Method</b> .....	125
I. R. Ganesh Kumar, S. Vijay Kumar, Jagannath Reddy, G. Rajendra, Yoga Sainath Reddy, Sai Ranjith Reddy, and Biplab Das	



<b>8</b>	<b>Obstructed Material Classification Using mmWave Radar with Deep Neural Network for Industrial Applications</b> .....	147
	Yi Sheng Leong, Sukanta Roy, and King Hann Lim	
<b>9</b>	<b>Modeling and Simulation of Plain and Corrugated Shell and Tube Heat Exchanger</b> .....	163
	A. Bora, A. P. Kalita, M. Bardalai, and Partha P. Dutta	
<b>10</b>	<b>Computational Fluid Dynamics Analysis of Wind Turbine Blades at Various Angles of Attack</b> .....	175
	Nabanikha Das, Amir Sohail, Rajesh Doley, and Shikha Bhuyan	
<b>11</b>	<b>Computational Analysis of Air Energy Extractors for Guided Flow Exhaust Applications</b> .....	185
	Enderaaj Singh, Sukanta Roy, Yam Ke San, Ming Chiat Law, and Perumal Kumar	
<b>12</b>	<b>Computational Simulations on the Performance of Savonius Turbines in a Solar Chimney Power Plant</b> .....	205
	Pavitri Apparavoo, Sukanta Roy, and Yam Ke San	
<b>13</b>	<b>Presentation of Real-Time Lab Analysis for Multiple-Area Renewable Sources-Thermal-Hydro System by Implementation of Cat Swarm Optimization</b> .....	221
	Arindita Saha, Lalit Chandra Saikia, Naladi Ram Babu, Sanjeev Kumar Bhagat, Manoja Kumar Behera, Satish Kumar Ramoji, and Biswanath Dekaraja	
<b>14</b>	<b>Impact of Electric Vehicles and Wind Turbine in Combined ALFC and AVR Studies Using AFA-Optimized CFPD-PIDN Controller</b> .....	233
	Biswanath Dekaraja, Lalit Chandra Saikia, Satish Kumar Ramoji, Manoja Kumar Behera, Sanjeev Kumar Bhagat, Arinditi Saha, and Naladi Ram Babu	
<b>15</b>	<b>A QSSA Optimized Fractional-Order Controller for Improving Transient Response in AC Autonomous Microgrid VSC System</b> .....	255
	Manoja Kumar Behera, Lalit Chandra Saikia, Satish Kumar Ramoji, Biswanath Dekaraja, Arindita Saha, Sanjeev Kumar Bhagat, and Naladi Ram Babu	
<b>16</b>	<b>Conflated Voltage–Frequency Control of Multi-area Multi-source System Using Fuzzy TID Controller and Its Real-Time Validation</b> .....	277
	Satish Kumar Ramoji, Lalit Chandra Saikia, Biswanath Dekaraja, Manoja Kumar Behera, Sanjeev Kumar Bhagat, Naladi Ram Babu, and Arindita Saha	

# Chapter 13

## Presentation of Real-Time Lab Analysis for Multiple-Area Renewable Sources-Thermal-Hydro System by Implementation of Cat Swarm Optimization



**Arindita Saha, Lalit Chandra Saikia, Naladi Ram Babu, Sanjeev Kumar Bhagat, Manoja Kumar Behera, Satish Kumar Ramoji, and Biswanath Dekaraja**

**Abstract** This work explores automatic generation control learning under traditional situation for a three-area system: Sources in area-1 are thermal–solar thermal (ST); thermal–geothermal power plant (GPP) in area-2; and thermal-hydro in area-3. The work involves various assessments in the presence of constraints such as governor rate constraint, governor dead band, and time delay. An original endeavor has been set out to execute cascade controller with amalgamation of proportional-derivative and fractional order integral-derivative (FOID), hence named as PD-FOID. The performance of PD-FOID has been compared with varied controllers like integral (I), proportional-integral (PI), and proportional-integral-derivative (PID). Various investigation express excellency of PD-FOID controller over other controller from outlook regarding lessened level of peak\_overshoot (P\_O), peak\_undershoot (P\_U), settling\_time (S\_T). A swarm-based meta-heuristic cat swarm optimization (CSO) algorithm is applied to acquire the controller’s gains and parameters. Action in existence of redox flow battery is also examined which provides with noteworthy outcome. PD-FOID parameter values at nominal condition are appropriate for higher value of disturbance without the need for optimization.

---

A. Saha

Department of Electrical Engineering, Regent Education and Research Foundation Group of Institutions, Kolkata, India

L. C. Saikia (✉) · S. K. Bhagat · M. K. Behera · S. K. Ramoji · B. Dekaraja  
Department of Electrical Engineering, NIT Silchar, Silchar, India  
e-mail: [lcsaikia@yahoo.com](mailto:lcsaikia@yahoo.com)

N. R. Babu

Department of Electrical and Electronics Engineering, Aditya Engineering College, East-Godavari, Andhra Pradesh 533437, India