DEPARTMENT OF PHYSICS

Faculty Achievements

Faculty Research Details

Ph.D
Completed
5

Ph.D
Supervisors
3

Faculty Publications

S.No	Year	No. of SCI Journals	No. of ESCI Journals	No. of Scopus Indexed Journals	No. of UGC and Other Journals	Total
1	2025-2026	1		3		4
2	2024-2025	3	-	-	-	3
3	2023-2024	1	-	-	-	1

Conference publications (2020-2025) : 38

Sl No	Faculty Name	Title of the Paper	Name of the Journal	Vol.No. Issue No., Page No., Month & Year
1.	K.Sakthiraj & Dr.M.Hema	Hidden Defects Unveiled: Solvent-Driven Kinetic Accessibility in Anatase TiO2 Pseudocapacitance	Electrochimica Acta,	Vol. 559, (2026) 148647
2.	K.Sakthiraj & Dr.M.Hema	Electrochemical performance of magnesium-doped strontium carbonate nanoparticles for energy storage applications	Russian Journal of Electrochemistry	Vol.61, 250–264(2025)
3.	Dr. K. M. Manikandan	Fabrication of titanium dioxide nanoparticle-doped polymer electrolytes for dye-sensitized solar cell modules: self-powered internet of things applications.	"Materials for Renewable and Sustainable Energy- Springer"	14 (2025) (Open Access)
4	K.Sakthiraj	Electrochemical Behavior of MgO-PPy-AC Composite Material for Energy Storage Devices	Chemistryselect	Vol. 10(47) (2025) e04543

Research Paper Published 2024-25

Sl No	Faculty Name	Title of the Paper	Name of the Journal	Vol.No. Issue No., Page No., Month & Year
1	M. Hema	Gum Arabic-based blend biopolymer electrolyte for electric double layer capacitor applications	International Journal of Biological Macromolecules	307 (2025) 141956
2	M. Hema	Cellulose acetate-based polymer electrolyte for energy storage application with the influence of BaTiO3 nanofillers on the electrochemical properties: A progression in biopolymer-EDLC technology	International Journal of Biological Macromolecules	281 (2024) 136416
3	M. Hema	Hybrid glass/Kevlar fiber reinforced phenolic matrix composites: Thermal degradation and flammability studies	Polymer Composites.	2024;1–12

Research Paper Published 2023-24

Sl No	Faculty Name	Title of the Paper	Name of the Journal	Vol.No. Issue No., Page No., Month & Year
1	K Sakthiraj	Structural, morphological, and electrochemical studies of Mg2SiO4-Pr6O11 nanocomposite for energy storage applications	Physica Scripta	98.2 (2023): 025826

Book Chapters Published

Fabrication of Three-Electrode Lithium Cell Using Solid Polymer Electrolyte

P. Tamilselvi, **M. Hema**

Book title: Advances in Systems Engineering (Jan'2021) 679-686

[Part of the Lecture Notes in Mechanical Engineering book series (LNME)]

Editors: V. H. Saran Rakesh Kumar Misra

Publisher: Springer

Patent Granted

- **Sakthiraj, K.,** and B. Karthikeyan, “A SIMPLE METHOD TO SYNTHESIZE CERIUM OXIDE NANOMATERIAL WITH ENHANCED ELECTROCHEMICAL PROPERTIES”, Patent No. : 377808, Date of grant: 24/09/2021.

Copyrights Granted

LABORATORY MANUAL FOR UNDER GRADUATE STUDENTS

Diary No. 12069/2022-CO/L

"A QUICK SUMMARY OF ULTRASONIC WAVES", Registration number: **L-124638/2023, Registration date: :09/06/2023**

"Innovations in BioTechnology at the nanoscale" Registration number: 5523/2025-CO/L **Registration date: :17/02/2025**

Copyrights Granted

“Determination of Young’s modulus of rectangular beam using python program”, Registration number: SW-29604/2025-CO, Date: 24/07/2025

Faculty Awards

Dr.M.Hema is one among listed in the World scientist and University rankings of AD scientific index 2022 - 2025.

Listed one among the World Scientist and University rankings of AD Scientific Index 2023 -2025.

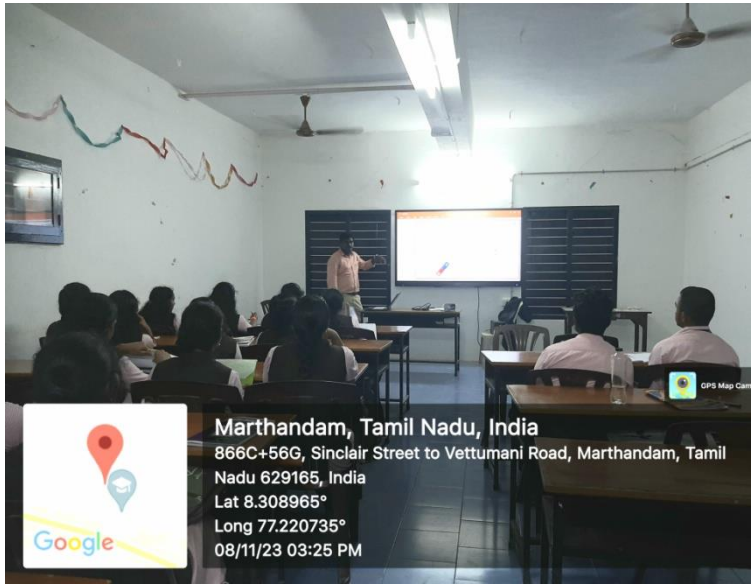
CONFERENCE AWARDS

- **Dr.M.Hema** received Best Oral presentation Award in DST – SERB sponsored International Seminar on Modern Functional Materials and its Applications (ICMFM 2023) held during 21.07.2023 and 22.07.2023.
- **Dr.M.Hema** received Best Oral presentation Award for the paper "Structural and Spectroscopic analysis of Nanocomposite polymer electrolyte for energy storage device" in "VIRTUAL INTERNATIONAL CONFERENCE ON FUNCTIONAL MATERIALS AND ITS APPLICATION ASPECTS (ICFMAA – 2021) ", 29th & 30th October 2021 Department of Physics, Saveetha School of Engineering, SIMATS, Chennai.
- **Dr.G. Bharathy** received Best Oral presentation Award for the paper "NiO Nanoparticles: an efficient electrode material for Supercapacitors" Dr B R Ambedkar National Institute of Technology Jalandhar, APRIL 5-6, 2024

RESOURCE PERSONS

- **Dr.M.Hema** delivered a guest lecture in the Sponsored National seminar on Emerging Technology in Lithium-ion battery for Electric vehicle applications, Department of Chemical Engineering, Kongu Engineering college (Autonomous), Perundurai on 03.03.2023

- **Dr.M.Hema** delivered a guest lecture for the M.Sc students registered for the certificate course on Energy and Environment-A pathway from research to industry offered by the Department of Applied Physics, Karunya Institute of Technology and Sciences, Coimbatore 27.04.2021.



- **Dr. K. M. Manikandan** acted as a resource person for one day seminar on "Nano materials and Nanotechnology" organized by Department of Chemistry (PG) & Research centre , Nesamony Memorial Christian College, Marthandam held on 8/11/2023.
- **Dr. K. M. Manikandan** acted as a resource person for one day seminar on “Properties and Applications of Nano materials" organized by Department of Chemistry (PG) & Research centre , Nesamony Memorial Christian College, Marthandam held on 14/02/2025.

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CELEBRATING 25 YEARS ANNIVERSARY

SEED MONEY GRANT 2023

Title of the Project : FABRICATION OF CO POLYMER BASED COMPOSITE AND GEL POLYMER ELECTROLYTES FOR HIGH ENERGY DENSITY BATTERIES

Sanctioned Amount: Rs. 20,000

Dr. M.Shanthi
HoD/ Physics

SEED MONEY GRANT 2024

Title of the Project : DESIGN AND DEVELOPMENT OF 50 W FUEL CELL FOR HOUSE HOLD APPLICATION.

Sanctioned Amount: Rs. 2,35,000

Dr. M.Hema
Associate Professor

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SEED MONEY GRANT 2022

Title of the Project : Development of Biopolymer based blend electrolytes using Ultrasound assisted Solution casting Technique and its application in Electric Double Layer Capacitor (EDLC)

Sanctioned Amount: 25,000

Name and Designation of PI

Dr. M.Hema
Associate Professor
Department of Physics
Kamaraj College of Engineering and Technology

Outcome of the Project

DST-SERB Sponsored International Conference on
Modern Functional Materials and its Multifunctional Applications
(ICMFM-2023) 21st – 22nd July 2023
Department of Physics, Erode Sengunthar Engineering College
PERUNDURAI -638 057, TAMILNADU, INDIA.

OP 12

EFFECT OF BIOPOLYMER ON POLY (VINYL ALCOHOL) [PVA] BASED PROTON CONDUCTING POLYMER ELECTROLYTE

M.Hema[a*], C.Bhavyasree[b], D.Shalini[b]

[a*]Department of Physics, Kamaraj College of Engineering and Technology, K. Vellakulam, Near Virudhunagar - 625 701, Tamilnadu, India.

[b]Department of Electrical and Electronics Engineering, Kamaraj College of Engineering and Technology, K.Vellakulam, Near Virudhunagar - 625 701, Tamilnadu, India

* Corresponding author E-mail: hemaphy@kamarajengg.edu.in

Proton conducting Polymer electrolytes are very promising candidate for the constructing flexible and slim solid Supercapacitor. Recent research is hotly pursued to replace liquid electrolytes by solid polymer electrolytes to overcome the leakage problem associate with it. The ionic conductivity for Poly (Vinyl alcohol) [PVA] as prepared by solution casting technique to be 1.9 x 10^{-6} Scm^{-1}. Biopolymers are renewable and good alternate to synthetic polymers owing to their cost effectiveness, eco friendly and user friendly nature. In this aspect, a good attempt has been made to incorporate the biopolymer, Gum Arabic in PVA. Different composition of the blend polymer electrolytes was prepared using Solution casting method. AC impedance spectroscopic technique is implemented on the prepared samples for analyzing the proton conduction. The calculated highest ionic conductivity from conductance plot is of the order of $10^{-5}Scm^{-1}$at 303K which is high compared to pure PVA. The DC polarization method implemented on the prepared samples shows the transference number to be 0.93-0.95 which reveals that the conduction is mainly due to proton.

Keywords: Polymer electrolyte, Ion conductivity, AC impedance, polarization method

Acknowledgement: The corresponding author, Dr.M.Hema acknowledge Kamaraj college of Engineering and Technology for providing financial assistance under KAMARAJ SEED MONEY SCHEME (KSMG'2022) to carry out the above Research work.

8/25/23, 2:49 PM Mail - Hema.M - Outlook

Acknowledgement of receipt of Proposal under CSIR - ASPIRE

CSIR - ASPIRE <hrdgemr2@csirccmb.org>
Sun 4/30/2023 12:17 AM
To:Hema.M <hemaphy@kamarajengg.edu.in>
Dear M Hema,

Your research proposal titled: ' High performance Electric Double Layer Capacitor EDLC using hybrid biopolymer based electrolyte ' has been registered on CSIR - ASPIRE Portal.

The registration/reference no. of your submitted research proposal is as follows:

Proposal ID:'.56863.'

CSIR - ASPIRE

Note: This is an auto generated Email, please do not reply to this mail.
For further assistance, you may please contact
Email: nsemr2@csirhrdg.res.in
Phone.No: 011-25842850

Received Best ORAL PRESENTATION AWARD in International Conference

Project proposal submitted (Extension of the Seed Money work) : "High performance EDLC using hybrid biopolymer based electrolyte"
CSIR-ASPIRE

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SEED MONEY GRANT 2022

Title of the Project : Zinc Oxide nanoparticles: An efficient electrode material for supercapacitor

Sanctioned Amount:

Name and Designation of PI

Dr.G.Bharathy

AP / Physics

Outcome of the Project : Presented in International conference and submitted to journal

DST-SERB Sponsored International Conference on
Modern Functional Materials and its Multifunctional Applications
(ICMFM-2023) 21st – 22nd July 2023
Department of Physics, Erode Sengunthar Engineering College
PERUNDURAI -638 057, TAMILNADU, INDIA.

OP 17

ZnO nanoparticles as an efficient electrode material for Supercapacitor

G.Bharathy[1*], V.Chandra[2]

[1]Department of Physics, Kamaraj College of Engineering & Technology, Virudhunagar-626001.Tamilnadu, India
[2]Department of Electrical & Electronics Engineering, AAA College of Engineering and Technology, Amathur, Sivakasi-626005.Tamilnadu, India

*Corresponding author's e-mail bharathyv.rajasri@gmail.com

Sources of renewable energy and technologies for energy storage are needed to solve the problem of energy crisis in future. Supercapacitors are one of the new technologies for energy storage. In this work an effort taken to study the electrochemical characteristics of pure and ZnO nanoparticles along with their structural, optical properties. ZnO nanoparticles shows a good electrochemical performance as super capacitors. Only very few research works were carried out on ZnO nanoparticles as an electrode material for supercapacitors. ZnO nanoparticles were synthesized by Sol-gel method with different calcinations temperatures. XRD spectra reveals the purity of the samples. The crystallite size of pure ZnO nanoparticles are 31 nm and it decreases with the increase in calcinations temperature. SEM analysis reveals the agglomerated clusters of nanoparticles. EDAX spectrum shows the nonstoichiometric nature of the samples. The maximum value of specific capacitance was achieved as 741 F/g for 600°C calcinated sample. For all scan rates, this sample shows maximum specific capacitance value and it can withstand for maximum number of cycles. Hence ZnO nanoparticles are efficient electrode material for supercapacitor.

Acknowledgement:
The Authors would like to thank the Management of Kamaraj College of Engineering & Technology for the financial support of this work under the Kamaraj Seed Money Grant – 2022.

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SEED MONEY GRANT 2022

Title of the Project : Fabrication of Dye sensitized solar cell module for wireless IoT sensors

Sanctioned Amount: Rs. 30,569

Dr. K. M. Manikandan

Assistant Professor/ Physics

Outcome of the Project :
International Hybrid Conference On Nano Structured Materials and Polymers (ICNP 2023), 12-14 May 2023 at Mahatma Gandhi University, Kottayam, Kerala, India


International Hybrid Conference on Nano Structured Materials and Polymers
May 12-14, 2023
ICNP 2023

Jointly Organized by
Mahatma Gandhi University, Kottayam, Kerala, India
Gdansk University of Technology, Poland,
Wroclaw University of Technology, Wroclaw, Poland
University of Johannesburg, Johannesburg, South Africa
&
University of Lorraine, Nancy, France

CERTIFICATE

This is to certify that Dr. K. M. Manikandan Department of Physics, Kamaraj College of Engineering and Technology, Tamil Nadu, India has done an "Invited Talk" in the International Hybrid Conference on Nano Structured Materials and Polymers (ICNP 2023) held at Mahatma Gandhi University, Kottayam, Kerala, India. from 12th -14th May 2023

Prof. Dr. Sabu Thomas
Chairman ICNP-2023

Springer

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SEED MONEY GRANT 2022

Title of the Project : Fabrication of Dye sensitized solar cell module for wireless IoT sensors

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International Hybrid Conference on Nano Structured Materials and Polymers
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Gdansk University of Technology, Poland,
Wroclaw University of Technology, Wroclaw, Poland
University of Johannesburg, Johannesburg, South Africa
&
University of Lorraine, Nancy, France

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Prof. Dr. Sabu Thomas
Chairman ICNP-2023

Springer

NPTEL-TOPPERS

➢ **Dr.M.Shanthi** Successfully completed the course “Design Thinking” with **Topper .**

- Successfully completed “Stress Management” with a **topper of 5%**
- NPTEL- Selection of Nanomaterials for Energy Storage devices- Jul-Aug 2024 (IIT-Roorkee) Elite + Silver

NPTEL-TOPPERS

TOPPER – TOP 5% in Moral Thinking: An Introduction to Values and Ethics (Aug-Sep 2025)

Outcome Based Pedagogic Principles For Effective Teaching (Feb-Mar 2024) – Elite

Stress Management (Aug-Sep 2023) – Elite + Silver

Body language: Key to professional Success (Aug-Sep 2022) -Elite + Silver

Nanomaterials and their Properties (Jul-Oct 2021) – Elite

Selection Of Nanomaterials For Energy Harvesting And Storage Application (Sep-Oct 2020) - Elite + Silver

NPTEL-TOPPERS

Dr.K.Sakthiraj Successfully completed the course “Selection of nanomaterials for energy harvesting and storage applications” with a topper of 1%.

NPTEL-Design Thinking-A Primer- Sep-Oct 2020 - **Elite+ Silver**

NPTEL-Solar Photovoltaics Fundamentals, Technology and Applications- Jul-Sep 2021-**Topper**.

NPTEL- Selection of Nanomaterials for Energy Harvesting and Storage Application-IIT Roorkee, July-Aug 2022- **Elite + Gold & TOPPER**.

NPTEL-Physics of Renewable Energy Systems-IIT-Kharagpur-July-Oct 2022-**Elite+ Silver & Topper**.

NPTEL-Structural Analysis of Nanomaterials – Jul-Aug-2024- **Elite+ Silver**

Dr.G.Bharathy successfully completed the swayam online course certification in “Advanced Instructional Methods “ with Elite+ Silver grade conducted by NITTTR, Chennai during January 2025.

Dr.G.Bharathy successfully completed the NPTEL online course on “Design Thinking - A Primer “ with Elite + Silver grade conducted by IIT, Madras during September 2022.

Faculty Industrial Training

Atomic Power Plant, Kudankulam

CSIR, Chennai

Aravind Herbal Company

Electrochemical energy storage and conversion Lab at Sri Kaliswari College

GUEST LECTURE ON THE TOPIC “Quantum for Future Technology” held on 15-04-2025
Resource Person: Dr.P.Mani / Anna University, Regional Campus, Trichy