

DEPARTMENT OF PHYSICS



Faculty Achievements

Faculty Research Details



**Ph.D
Completed
5**

**Ph.D
Supervisors
3**

Faculty Publications

S.No	Year	No. of SC I Journals	No. of ES CI Journals	No. of Scopus Indexed Journals	No. of UGC and Other Journals	Total
1	2025-2026	3				3
2	2024-2025	3	-	-	-	3
3	2023-2024	1	-	-	-	1
4	2022-2023	3	-	-	-	3
5	2021-2022	2	-	-	-	2
6	2020-2021	3	-	-	-	3

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	Dr.K.Sakthiraj	Electrochemical Behavior of MgO-PPy-AC Composite Material for Energy Storage Devices	ChemistrySelect	Volume10, Issue47, e04543 (2025)
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"	Volume 14, article number 64, (2025)

Research Paper Published 2024-25

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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 BaTiO ₃ 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	<u>K Sakthiraj</u>	<u>Structural, morphological, and electrochemical studies of Mg₂SiO₄-Pr₆O₁₁ nanocomposite for energy storage applications</u>	Physica Scripta	98.2 (2023): 025826

Research Paper Published 2022-23

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Sl No	Faculty Name	Title of the Paper	Name of the Journal	Vol.No. Issue No., Page No., Month & Year
1	Sakthiraj, K., and B. Karthikeyan.,	“Effect of Reducing Agent on The Electrochemical Performance of The AgxO/PVA Nanocomposite”,	”, Analytical & Bioanalytical Electrochemistry	Volume 15, Issue 11, (2023), 956-966.
2	Karthikeyan, B., Sakthiraj, K. and Sakthivel, A	Structural, Morphological, and Electrochemical Studies of Mg ₂ SiO ₄ -Pr ₆ O ₁₁ Nanocomposite for Energy Storage Applications”,	Physica Scripta,	Volume 98, Issue 2, id.025826 (2023)
3	K.M.Manikandan	Effect of ionic liquids on the performance of dye-sensitized solar cells using poly(vinyl alcohol)/ polypyrrole based polymer electrolytes.	ENERGY SOURCES, PART A: RECOVERY, UTILIZATION, AND ENVIRONMENTAL EFFECTS,	45,1, 2027-2043, 2023

Research Paper Published 2021-2022

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Sl No	Faculty Name	Title of the Paper	Name of the Journal	Vol.No.Issue No., Page No., Month & Year
1	K. Sakthiraj	Investigation of Indium Trihydride Molecule and Its Clusters Using Density Functional Theory for Semiconductor Application”	Acta Physica Polonica A	Vol. 139 (1) (2021): 14-19
2	K.M.Manikandan,	The Effect of Plasticizers on the Polypyrrole-Poly(vinyl alcohol)-Based Conducting Polymer Electrolyte and Its Application in Semi-Transparent Dye-Sensitized Solar Cells.	Membranes	Vol.11, Issue.10,791,2021
3	M. Shanthi	Bio –Synthesised drug loaded Silver nano particles – A vivid Agent for drug delivery	BioScience Biotechnology Research Communications	Vol 14 No(4) Oct- Nov-De(2021)

Research Paper Published 2020-2021

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Sl No	Faculty Name	Title of the Paper	Name of the Journal	Vol.No. Issue No., Page No., Month & Year
1	Sakthiraj, K., and B. Karthikeyan	Synthesis and characterization of cerium oxide nanoparticles using different solvents for electrochemical applications."	Applied Physics A	126:52 (2020): 1-10
2	B. Balavairavan, S.S. Saravanakumar & K.M.Manikandan	Physicochemical and Structural Properties of Green Biofilms from Poly (Vinyl alcohol)/Nano Coconut Shell Filler	Journal of Natural Fibers	Pages 2112-2126 February 2020
3	K.M. Manikandan & A. Yelilarasi	Effect of different dosage of gamma irradiation on quasi-solid-state conducting polymer electrolyte and its application as high performance dye-sensitized solar cells	Radiation Effects and Defects in Solids	VOL. 176, NOS. 7-8, 651-661 March 2021

Book Chapters Published



17

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

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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



A copyright has been registered for the work titled "**Determination of Young's Modulus of a Rectangular Beam Using Python**"

Certificate No.: SW-2025021673

Date of ROC: 23/09/2025

Dr.K.M.MANIKANDAN

&

Dr.M.SHANTHI



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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AUTONOMOUS



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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AUTONOMOUS



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

Outcome of the Project



Name and Designation of PI

Dr. M. Hema

Associate Professor

Department of Physics

Kamaraj College of Engineering and Technology

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.

QP.12 EFFECT OF BIOPOLYMER ON POLY (VINYL ALCOHOL) [PVA] BASED PROTON CONDUCTING POLYMER ELECTROLYTE

M.Hema^a, C.Bhagyni^b, D.Shalin^c

^aDepartment of Physics, Kamaraj College of Engineering and Technology, K. Vellakulam,
Near Virudhunagar - 625 701, Tamilnadu, India.

^bDepartment of Electrical and Electronics Engineering, Kamaraj College of Engineering and Technology,
K. Vellakulam, Near Virudhunagar - 625 701, Tamilnadu, India

^cCorresponding author E-mail: hemagphy@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 $1.9 \times 10^{-4} \text{ S cm}^{-1}$. 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 $10^{-5} \text{ S cm}^{-1}$ 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 protons.

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

Acknowledgment: 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

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

Received Best ORAL PRESENTATION AWARD in CSIR-ASPIRE International Conference



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AUTONOMOUS



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.Bharathy¹, V.Chander²

¹Department of Physics, Kamaraj College of Engineering & Technology, Virudhunagar-626001, Tamilnadu, India

²Department of Electrical & Electronics Engineering, AAA College of Engineering and Technology, Annur, Sivakasi-626005, Tamilnadu, India

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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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AUTONOMOUS



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



Dr.M.Shanthi Successfully completed the following NPTEL courses

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



Dr.M.Shanthi



NPTEL-TOPPERS

Dr.M.HEMA successfully completed the following NPTEL courses

- **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



Dr.M.HEMA

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

Dr.K.Sakthiraj Successfully completed the course “Surface Engineering of Nanomaterials” with Elite+Silver.

Dr.K.Sakthiraj Successfully completed the course “Structural Analysis of Nanomaterials” with a topper of 5%.

Dr.K.Sakthiraj Successfully completed the course “Technical Communication for Engineers” with a topper of 2%.



Dr.K.Sakthiraj

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.



Dr.G.Bharathy



Dr. K. M. Manikandan

Dr. K. M. Manikandan successfully completed the following courses

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**

Fundamentals of Electronic Device Fabrication, IIT Madras - Elite

Faculty Industrial Training

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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



Guest lecture on Role of Nuclear Energy in Climate Change – 16.11.2025

