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Notice for the PhD Viva Voce Examination

Ms Shilpa Simon, Registration Number: 2090197, PhD Scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend her PhD thesis at the public viva-voce examination on Thursday, 15 May 2025 at 9.00 am in Room No. 044, Ground Floor, Research and Development Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Carbon-Pseudocapacitive Hybrid Materials for Energy Storage Applications**
Discipline	:	**Chemistry**
External Examiner - I	:	**Dr Bindu Krishnan** Professor Autonomous University of Nuevo León UANL Centro de Investigación y Desarrollo Tecnológico (CIDET) San Nicolás de los Garza - 66455 Mexico
External Examiner - II	:	**Dr Renuka N K** Professor Department of Chemistry University of Calicut Thenhipallam Post Malappuram, Kerala - 673635
Supervisor	:	**Dr Sreeja P B** Associate Professor Department of Chemistry School of Sciences CHRIST (Deemed to be University) Bengaluru 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva - voce examination.

Registrar

Place: Bengaluru
Date: 08 May 2025

ABSTRACT

The increasing global demand for advanced energy storage technologies is driven by economic growth, portable electronics, and electric vehicles. These systems capture surplus energy during peak generation, ensuring availability during low-production periods, stabilizing power grids, and promoting sustainability by reducing reliance on non-renewable energy sources. This research focuses on developing carbon-based hybrid composites for high-performance supercapacitors by integrating carbon nanotubes, graphene oxide, and biochar with pseudocapacitive materials such as polyaniline (PANI), polypyrrole (PPy), PEDOT, and metal oxides. Various synthesis methods, including pyrolysis, hydrothermal carbonization, and in-situ polymerization, were employed. Comprehensive characterization using FTIR, XRD, Raman spectroscopy, XPS, SEM, TEM, and BET surface area analysis provided insights into the materials' structure, porosity, and morphology. Electrochemical studies, including cyclic voltammetry, charge-discharge tests, and impedance analysis, demonstrate enhanced capacitance, cycling stability, and rate performance. The synergistic combination of carbon and pseudocapacitive materials offers promising solutions for sustainable energy storage, addressing the growing energy needs of modern society.

Keywords: Carbon Materials, Conductive polymers, Metal Oxides, Supercapacitors

Publications:

1. **Shilpa Simon**, P. B. Sreeja, "Polyaniline/Reduced Graphene Oxide/Zinc Oxide Hybrid Electrodes Fabricate by Combining Electrospinning/Electrospray Technique for Supercapacitors," *Energy Storage*, vol. 6, no. 8, pp. 1–9, 2024, doi: 10.1002/est2.70101.
2. **Shilpa Simon**, & Sreeja, P. B. "Electro-sprayed Quaternary Composite of Poly(aniline-co-pyrrole), Graphene Oxide, and Iron Oxide as an Efficient Electrode for Hybrid Supercapacitor Application". High Energy Chemistry, 2024. DOI: 10.1134/S0018143924700516
3. **Shilpa Simon**, N. James, S. Rajeevan, S. C. George, and P. B. Sreeja, "Sandwich structured pedot-TiO2/GO/PEDOT-TiO2 electrodes for supercapacitor," Results Chem., p. 2023, doi: 10.1016/J.RECHEM.2023.101144.
4. **Shilpa Simon**, N. James, and P. B. Sreeja, "Water hyacinth-poly(3,4-Ethylenedioxythiophene) composite as a facile electrode for supercapacitor application," Mater. Today Proc. 2023, doi:10.1016/j.matpr.2023.10.068.
5. **Shilpa Simon**, Harikumar P, Balakrishnan SP. Green Power: The Role of Plant-Based Biochar in Advanced Energy Storage. ChemPhysChem, 2024. doi: 10.1002/cphc.202400569.

Book Chapter:

1. **Shilpa Simon**, Aswathi, V. P., & Sreeja, P. B. Carbon Nanotube-Polymer Nanocomposites for Energy Storage and Conversion. Springer (2024). https://doi.org/10.1007/978-981-16-5674-4.
2. **Shilpa Simon**, Aswathi, V. P., Sunny, S., & Sreeja, P. B. Carbon Nanotubes for Supercapacitors. In NanoCarbon: A Wonder Material for Energy Applications; Springer, 2024. https://doi.org/10.1007/978-981.