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Notice for the PhD Viva-Voce Examination

Ms Anjana Baby (Registration Number: 1981404), 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 Wednesday, 22 November 2023 at 10.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Modified Carbon-Based Composites and their Electrochemical Studies**
Discipline	:	**Chemistry**
External Examiner (Outside Karnataka)	:	**Dr A Sreekanth** Associate Professor Department of Chemistry National Institute of Technology Tiruchirappalli - 620015 Tamil Nadu
External Examiner (Within Karnataka)	:	**Dr Arun M Isloor** Associate Professor Department of Chemistry NITK - Mangaluru Karnataka - 575025
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: 16 November 2023

ABSTRACT

Energy storage has emerged as the world's most important issue, attracting the focus of researchers and commercial developers due to the economy's rapid growth and the rise in the usage of portable electronics and electronic vehicles. These devices make it possible to efficiently capture and store the excess energy produced during times of high generation, so that it can be used when there is little or no generation. Devices for storing renewable energy contribute to grid stability and lessen the reliance on fossil fuel-based power plants. Moreover, they contribute to the decarbonization of the energy industry, mitigating climate change, and promoting a sustainable future. This thesis explores the potential of modified carbon-based composites as advanced materials for energy storage applications particularly supercapacitors and solar thermal fuels. The research focuses on the careful design and synthesis of ternary composites, incorporating carbonaceous materials such as carbon nanotubes, graphene oxide, and graphitic carbon nitrides, metal sulphides, nitrogen rich moieties, and conductive additives like polyaniline and polypyrrole.

A wide variety of methodologies were used to describe the structural and morphological characteristics of the composite materials. Thermogravimetric analysis, Fourier transform infrared spectroscopy, X-ray diffraction, Raman spectroscopy, X-ray photoelectron spectroscopy, scanning electron microscopy, and other techniques were used. These methods gave important information about the composite materials' chemical structure, type of bonding and arrangements, surface morphology, and thermal stability. Electrochemical techniques, such as cyclic voltammetry, galvanostatic charge-discharge, and electrochemical impedance spectroscopy, have been extensively employed to investigate the performance and behaviour of supercapacitor electrodes and devices. The results demonstrate significant improvements in electrochemical performance, including enhanced specific capacitance, excellent cycling stability, and remarkable rate capability. These findings indicate that the modified carbon-based ternary composites hold promise for high-performance energy storage devices. Ultimately, this research contributes to the development of next-generation energy storage technologies, offering more efficient and sustainable solutions for storing energy.

Keywords: Renewable energy, Carbon materials, Conductive additives, Metal sulphides, Supercapacitors, Solar thermal fuels

Publications:

1. **Anjana Baby**, Saranraj Arumughan, Abhinaya S, Aswathi VP, Sujin P Jose, Sreeja, P B- Capacitive Behaviour of Imidazole Azo Modified Carbon Nanotubes/Polypyrrole Composite in Aqueous Electrolytes, J. Electrochem. Soc., 2023, doi: 10.1149/1945-7111/acdda1
2. **Anjana Baby**, S. Abinaya, Athira Maria John, Sujin P. Jose, Sreeja P. Balakrishnan- Photoresponse and electrochemical behaviour of azobenzene anchored graphene oxide for energy storage application, Mater. Chem. Phys., 301,2023, 127592, https://doi.org/10.1016/j.matchemphys.2023.127592.
3. **Anjana Baby**, Athira Maria John, Sreeja P B – Photoresponsive Carbon-Azobenzene Hybrids: A Promising Material for Energy Devices, chemphyschem, 2022, doi: doi.org/10.1002/cphc.202200676
4. **Anjana Baby**, Athira Maria John, Sreeja P B –Conducting polymers and their composites for supercapacitor applications- Springer-2022