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Notice for the PhD Viva Voce Examination

Ms Meera Varghese, Registration Number: 2071202, PhD Scholar at the Department of Physics and Electronics, School of Sciences, CHRIST (Deemed to be University), Bangalore Central Campus will defend her PhD thesis at the public viva-voce examination on Saturday, 23 August 2025 at 9.00 am in Room No. 05, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru – 560029, Karnataka, India.

Title of the Thesis : **Carbon Dots Derived from Natural Products for Multifunctional Applications**

Discipline : **Physics**

External Examiner - I : **Dr Binoy K Saikia**
Principal Scientist
Coal & Energy Division
CSIR-North East Institute of Science & Technology
Academy of Scientific & Innovative Research
CSIR-Campus, Jorhat - 785006
Assam

External Examiner - II : **Dr K Mohanraj**
Associate Professor
Department of Physics
School of Basic and Applied Sciences
Central University of Tamil Nadu
Neelakudi, Thiruvarur - 610101
Tamil Nadu

Supervisor : **Dr Manoj B**
Professor
Department of Physics and Electronics
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.

Place: Bengaluru

Registrar (Academics)

ABSTRACT

Modern advancements in science and technology have greatly enhanced human life. However, they also pose significant challenges to sustainability and well-being which necessitates immediate and innovative strategies. A crucial aspect of these strategies is the transition from conventional raw materials to sustainable alternatives, which is essential for ensuring global sustainability and securing a resilient future. The present research focuses on the green synthesis of carbon dots (CDs) from natural precursors, specifically the seeds of *Syzygium cumini* and the sap stains of *Cupressus lusitanica* and *Araucaria columnaris*. Carbon dots derived from *Syzygium cumini* were utilized to enhance the photovoltaic performance of dyesensitized solar cells, demonstrating their potential in energy conversion applications. CDs synthesized from *Cupressus lusitanica* were evaluated for fluorescence-based applications, including latent fingerprint detection and white light generation, highlighting their relevance in forensic science and optoelectronics. Additionally, *Araucaria columnaris*-derived CDs were explored for biomedical applications. This thesis underscores the versatility and sustainability of biomass-derived carbon dots, illustrating their promising role in advancing environmentally benign nanomaterials for applications in energy, security, and healthcare.

Keywords: *Carbon dot, Green synthesis, Dye-sensitized solar cell, White Light-Emitting Diode, Fingerprint Analysis, Antibacterial Activity, Anticancer Applications.*

Publications:

1. **M. Varghese** and M. Balachandran, "Antibacterial efficiency of carbon dots against Gram-positive and Gram-negative bacteria: A review," *J. Environ. Chem. Eng.*, vol. 9, no. 6, p. 106821, Dec. 2021, doi: 10.1016/j.jece.2021.106821.
2. **M. Varghese**, S. Jayaram, S. Sarojini, P. Kumbhakar, and M. Balachandran, "Biowaste derived multifunctional carbon dots for white light generation, forensic and antibacterial applications," *J. Photochem. Photobiol. A Chem.*, vol. 450, p. 115456, 2024, doi: 10.1016/j.jphotochem.2023.115456.
3. **M. Varghese**, A. A. Mathew, and M. Balachandran, "Nanocomposites in Combating Antimicrobial Resistance," in *Nanotechnology Based Strategies for Combating Antimicrobial Resistance*, Springer, 2024, pp. 203–229. doi: 10.1007/978-981-97-2023-1_8