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Notice for the PhD Viva Voce Examination

Ms Anagha Joby, Registration Number: 2190032, PhD Scholar at the Department of Physics and Electronics, School of Sciences, CHRIST (Deemed to be University) will defend her PhD thesis at the public viva-voce examination on Monday, 17 August 2026 at 02.00 pm in Room No. 044, Ground Floor, R&D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

Title of the Thesis	:	**Development of Metal Oxide-Carbon Composites for Photocatalytic Applications**
Discipline	:	**Physics**
External Examiner - I	:	**Dr Krishna Moorthi Chintagumpala** Associate Professor Department of Applied Physics Centre for Nanotechnology Research Vellore Institute of Technology Vellore - 632014 Tamil Nadu
External Examiner - II	:	**Dr Ujjwal Pal** Senior Principal Scientist CSIR – Indian Institute of Chemical Technology Tarnaka, Hyderabad - 500007 Telangana
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.

Registrar (Academics)

Place: Bengaluru
Date: 04 August 2026

ABSTRACT

The environmental sustainability and public health are at risk due to the significant threat posed by the increasing contamination of water resources by persistent use of organic pollutants, such as pharmaceuticals, agricultural pesticides, and dyes. The complete degradation of such complex contaminants is usually not achieved by conventional water treatment methods, which is why the development of advanced and efficient remediation technologies is necessary. In this context, semiconductor-based photocatalysis has emerged as a promising approach because of its capacity to convert light energy into non-toxic end products through the mineralization of contaminants. Nevertheless, the practical application of photocatalysis is restricted by factors such as the poor reusability of photocatalysts, rapid charge carrier recombination, and low surface area.

In the present study, in order to obtain controlled morphology and improved physicochemical properties, Mn_3O_4-based photocatalysts were developed through a surfactant-assisted synthesis approach. The synthesized materials were subsequently combined with carbon nanostructures of varying dimensionalities, such as zero, one and two dimensional carbon architectures. The photocatalytic performance was considerably improved by the incorporation of carbon materials, which also improved the adsorption capacity, electron transport, and charge separation. The degradation of organic pollutants under varying operational conditions was used to assess the photocatalytic activity, the mechanistic studies were conducted to gain insight into the role of reactive species in the degradation process. The performance of the synthesized systems in various aqueous environments, including real water matrices, where the presence of ions and competing species affected the efficiency, was evaluated in order to determine their practical applicability. Furthermore, seed germination studies were used to assess agricultural and environmental safety demonstrating the decreased toxicity of treated water. Immobilisation techniques were used to enhance catalyst recovery and long-term performance, and the photocatalyst's stability and reusability were also examined. The present work demonstrated how to construct sophisticated. Mn_3O_4-based photocatalytic systems with increased stability, efficiency, and practicality for sustainable water treatment.

Keywords: Photocatalysis, Nanocarbon composites, Aqueous medium comparison, catalyst immobilization, Water treatment

Publications:

1. **Anagha Joby**, Partha Kumbhakar, Manoj Balachandran, "Magnetic field and light dependant supercapacitor behaviours of Mn3O4-rGO hybrid nanocomposites." Emergent Materials 7, no. 6 (2024): 2393-2406.
2. **Anagha Joby**, Manoj Balachandran, and V. Deepthi. & Surfactant-Guided Synthesis of Mn_3O_4 Nanostructures for Photocatalytic, Photoelectrochemical Applications and Sustainable Water Reuse." Topics in Catalysis (2025): 1-20.