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Notice for the PhD Viva Voce Examination

Mr Aman Sharma B, Registration Number: 2270122, PhD Scholar at the Department of Chemistry, School of Sciences, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Monday, 08 September 2025 at 11.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

Title of the Thesis	:	**Biomass Derived Nanoporous Carbon Materials for Efficient Environmental Pollutant Remediation**
Discipline	:	**Chemistry**
External Examiner - I	:	**Dr Achalkumar A S** Professor Department of Chemistry Indian Institute of Technology Guwahati Guwahati - 781039 Assam
External Examiner - II	:	**Dr B Ramachandra Bhat** Professor Department of Chemistry National Institute of Technology, Surathkal (NITK) Srinivasnagar, Surathkal, Mangalore - 575025 Karnataka
Supervisor	:	**Dr Gurumurthy Hegde** 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 (Academics)

Place: Bengaluru
Date: 03 September 2025

ABSTRACT

Covering nearly 60-70% of the Earth's surface, global water reserves are under escalating threat from industrial effluent discharges. The textile manufacturing sector, in particular, ranks as the second major contributor to water pollution, responsible for approximately 20% of industrial wastewater generation. Inadequate enforcement of environmental regulations, especially in developing nations, has exacerbated the discharge of untreated dye-laden effluents into aquatic systems, necessitating the development of efficient, sustainable remediation technologies. This research investigates the synthesis, characterization, and application of biomass-derived porous carbon nanoparticles (PCNPs) for the adsorption and degradation of industrial dyes from aqueous media. Utilizing pyrolysis, PCNPs were synthesized from diverse biowaste precursors including *Allium cepa* peel, *Arachis hypogaea* skin, *Samanea saman* pods, and *Coffea canephora* leaves. Comprehensive physicochemical characterization employing SEM, XRD, Raman spectroscopy, UV-Vis spectroscopy, FTIR, XPS, and BET analysis confirmed the formation of highly porous structures with elevated surface area and functional group diversity, favorable for dye interaction. Studies were conducted for the removal of multiple dyes, systematically evaluating operational parameters such as pH, contact time, initial dye concentration, and adsorbent dosage. Furthermore, the incorporation of synthesized PCNPs into polysulfone-based mixed matrix membranes (MMMs) facilitated enhanced dye removal efficiency, improved mechanical stability, and minimized nanoparticle leaching, with membrane morphology optimized for maximum adsorption performance. Photocatalytic studies utilizing TiO2-embedded PCNPs demonstrated synergistic adsorption-photocatalysis pathways, significantly improving degradation efficiency. The adsorption kinetics and isotherm models were applied to elucidate the mechanistic pathways governing pollutant removal. This integrated approach offers a scalable, eco-friendly solution for wastewater treatment, aligning with circular economy principles by valorizing biowaste into functional nanomaterials for advanced environmental remediation applications.

Keywords: *Carbon nanoparticles; Biomass; Dye removal; Adsorption; Photocatalysis; Membranes; Environmental remediation*

Publications:

1. **Aman Sharma**, Jyothi M. Shivanna, Navneet K. Gupta, Prashanth W. Menezes, and Gurumurthy Hegde, "*Efficient photocatalytic degradation of methylene blue from aqueous solution using hybrid biomass-derived nanostructured carbon-TiO2 photocatalyst,*" Chemistry, p. e202501564, Jun. 2025, doi: 10.1002/chem.202501564.
2. **Aman Sharma**, Jyothi M. Shivanna, Abdullah Alodhayb, and Gurumurthy Hegde, "*Efficient Cationic Dye Removal in Water through Arachis hypogaea Skin-Derived Carbon Nanospheres: A Rapid and Sustainable Approach," Nanoscale Adv.*, 6(12), 3199-3210, Apr. 2024, doi: 10.1039/D4NA00254G.
3. **Aman Sharma**, Soumi Datta, R. K Sanjana, B. M. Pooja, Suryasarathi Bose, and Gurumurthy Hegde, "*Onion peel derived carbon nanoparticles incorporated polysulfone membranes: Enhanced dye removal from water,*" *RSC Adv.*, 15, 7786-7798, doi: 10.1039/D5RA00025D.
4. **Aman Sharma**, Sachin Sunny, James Arulraj, and Gurumurthy Hegde, *"Exploring the efficiency of green synthesized silver nanoparticles as photocatalysts for organic dye degradation: unveiling key insights," Nano Ex.*, 5(2), 022002, May 2024, doi: 10.1088/2632-959X/ad4d09.