

**CHRIST**(DEEMED TO BE UNIVERSITY)  
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## Notice for the PhD Viva Voce Examination

Ms Apoorva Shetty, Registration Number: 2190027, PhD Scholar at the Department of Chemistry, School of Sciences, CHRIST (Deemed to be University) will defend her PhD thesis at the public viva-voce examination on Thursday, 09 April 2026 at 10.30 am in Room No. 044, Ground Floor, R&D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

- Title of the Thesis** : **Synthesis of Bio-Waste Derived Porous Nanomaterials and their Application as Efficient Heterogeneous Catalysts**
- Discipline** : **Chemistry**
- External Examiner - I** : **Dr Suryasarathi Bose**  
Professor  
Department of Materials Engineering  
Indian Institute of Science  
Bengaluru - 560012  
Karnataka
- External Examiner - II** : **Dr Santanu Kumar Pal**  
Professor  
Department of Chemical Sciences  
Indian Institute of Science Education and Research (IISER), Singh Nagar  
Mohali - 140306  
Punjab
- Supervisor** : **Dr Gurumurthy Hegde**  
Professor (Former)  
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.

Place: Bengaluru  
Date: 23 March 2026

  
Registrar (Academics)

## ABSTRACT

Catalysis is central to sustainable chemistry, with heterogeneous catalysis dominating industrial processes due to its efficiency and recyclability. This thesis reports the synthesis of porous carbon nanomaterials from biowaste sources—Caesalpinia pods, oil palm leaves, Samanea saman pods, and Terminalia catappa leaves—used as eco-friendly supports for metal nanoparticles at ultra-low loadings (Pd and Cu). The resulting catalysts exhibited excellent performance in key organic transformations, including the synthesis of biaryls and aromatic amines, and were thoroughly characterized by XRD, FTIR, FESEM, TEM, and XPS. Their strong heterogeneity, recyclability, and structural stability highlight the potential of biowaste-derived carbons as sustainable supports for efficient heterogeneous catalysis.

**Keywords:** *Biowaste-derived carbon nanomaterials; Heterogeneous catalysis; Suzuki Miyaura coupling; Nitroarene reduction; Sustainable catalysts*

### Publications:

1. **Apoorva Shetty**, Vandana Molahalli, Aman Sharma and Gurumurthy Hegde, “Biomass-derived carbon materials in heterogeneous catalysis: A step towards sustainable future,” *Catalysts*, vol. 13, no. 1, p. 20, Dec. 2022, doi: 10.3390/catal13010020.
2. **Apoorva Shetty**, Braja Gopal Bag, Uraivan Sirimahachai, and Gurumurthy Hegde, “Copper-boosted thiol-functionalized carbon nanospheres from biomass: a novel non-noble metal based recoverable catalyst for efficient nitro-to-amine reduction,” *Catal. Sci. Technol.*, vol. 15, no. 5, pp. 1535-1537, Jan. 2025, doi: 10.1039/d4cy01368a.
3. **Apoorva Shetty** and Gurumurthy Hegde,, “Synthesis and characterization of biowaste-derived porous carbon supported palladium: a systematic study as a heterogeneous catalyst for the reduction of nitroarenes,” *React. Kinet. Mech. Catal.*, vol. 137, pp. 2989-3004, Aug. 2024, doi: 10.1007/s11144-024-02690-2.
4. **Apoorva Shetty**, Dhanya Sunil, Thitima Rujiralai, Sanjeev P Maradur, Abdullah N Alodhayb, and Gurumurthy Hegde, “Sustainable carbonaceous nanomaterial supported palladium as an efficient ligand-free heterogeneous catalyst for Suzuki-Miyaura coupling,” *Nanoscale Adv.*, vol. 6, no. 9, pp. 2516–2526, Apr. 2024, doi: 10.1039/D4NA00116H.