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Notice for the PhD Viva Voce Examination

Ms Roopa Margaret Rodrigues (Registration Number: 2170243), 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, 30 October 2024 at 10.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Electrochemical Synthesis of Heterocyclic Carbonyls Using Carbon Based Electrocatalysts**
Discipline	:	**Chemistry**
External Examiner (Outside Karnataka)	:	**Dr Puthalapattu Reddy Prasad** Associate Professor Department of Chemistry Institute of Aeronautical Engineering (IARE) Dundigal, Hyderabad - 500043 Telangana
External Examiner (Within Karnataka)	:	**Dr Denthaje Krishna Bhat** Professor Department of Chemistry National Institute of Technology Surathkal, Mangalore - 575025 Karnataka
Supervisor	:	**Dr Anitha Varghese** 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: 23 October 2024

ABSTRACT

Electro-organic synthesis (EOS) is emerging as a powerful and sustainable technique for synthesizing organic compounds. EOS offers a compelling alternative to conventional synthetic methods, driven by the need for cleaner and more efficient processes and a growing focus on environmental impact. This approach minimizes environmental impact by reducing dependence on hazardous chemicals and solvents. Additionally, EOS enables precise control over reaction parameters, leading to selective product formation and potentially novel reaction pathways. This work presents the development of electrocatalysts for the electro-oxidation of selected heterocyclic alcohols, namely piperonyl alcohol (PA), thiophene-2-ylmethanol (TM), furfuryl alcohol (FA) and indole-3-carbinol (IC) to their corresponding aldehydes. A Toray carbon fiber paper (TCFP) substrate modified with 2D materials, conducting polymers, metal oxides, and metal oxide nanoparticles are employed in the fabrication of the electrodes.

The efficiency of the developed electrode was studied employing different electrochemical and physicochemical studies. X-ray Diffraction Spectroscopy (XPS), Field Emission Scanning Electron Microscopy (FESEM), Energy Dispersive X-ray Spectrometry (EDS), X-ray Photoelectron Spectroscopy (XPS), and Optical Profilometry (OP) techniques were utilized for the physicochemical studies of the fabricated electrodes. Cyclic voltammetry (CV), Electrochemical Impedance Spectroscopy (EIS), Chronoamperometry (CA) and Bulk Electrolysis (BE) techniques were employed for the electrochemical studies, including optimization and synthesis of heterocyclic aldehydes. The fabricated electrocatalysts demonstrated remarkable stability, higher electrocatalytic activity, and good conductivity. The electro-oxidation reactions were carried out in a three-electrode system via BE using 4-acetamido-2,2,6,6-tetramethylpiperidine 1-oxyl (4-ACT) mediator. The products obtained were characterized by Proton Nuclear Magnetic Resonance (^{1}H NMR) spectroscopy.

Keywords: *electro-oxidation, electropolymerization, 4-ACT, heterocyclic aldehydes*

Publications:

1. **Roopa Margaret Rodrigues**, Ditto Abraham Thadathil, G. Shanker, Uraiwan Sirimahachai, Anitha Varghese, and Gurumurthy Hegde. "Co-electrodeposited Pi-MnO_2-rGO as an efficient electrode for the selective oxidation of piperonyl alcohol." Journal of the Electrochemical Society 170, no. 3 (2023): 036501. http://dx.doi.org/10.1149/1945-7111/acbdc2.
2. **Roopa Margaret Rodrigues,** Ditto Abraham Thadathil, and Anitha Varghese. "Pi-MnO_2 decorated poly-3-thienylacetic acid on carbon fiber paper for electrochemical synthesis of 2-formyl-thiophene." Molecular Catalysis 545 (2023):113242. https://doi.org/10.1016/j.mcat.2023.113242.
3. **Roopa Margaret Rodrigues,** and Anitha Varghese. "ZnO Nanorods on POPD/GCN/TCFP with Ternary Synergy for Promoting Electro-Oxidation of Furfuryl Alcohol." *Electrochimica Acta* (2024): 144620. https://doi.org/10.1016/j.electacta.2024.144620.
4. **Roopa Margaret Rodrigues,** and Anitha Varghese. "Indole-3-Carbinol Upconversion with Copper Oxide Nanoparticles Supported Graphitic Carbon Nitride: A Sustainable Approach." Journal of the Electrochemical Society 171.9 (2024): 096509. http://dx.doi.org/10.1149/1945-7111/ad7766.
5. **Roopa Margaret Rodrigues,** Ditto Abraham Thadathil, Keerthana Ponmudi, Ashlay George, and Anitha Varghese. "Recent advances in electrochemical synthesis of nitriles: a sustainable approach." Chemistry Select 7, no. 12 (2022): e202200081. https://doi.org/10.1002/slct.202200081