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Notice for the PhD Viva Voce Examination

Ms Sariga, Registration Number: 2270121, 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 Monday, 04 May 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	:	**A Sustainable Approach towards the Utilization of CO_2 for Electrocarboxylation Reaction**
Discipline	:	**Chemistry**
External Examiner - I	:	**Dr Arun Mohan Isloor** Professor Department of Chemistry National Institute of Technology, Karnataka (NITK) Surathkal, Mangaluru - 575025 Karnataka
External Examiner - II	:	**Dr Surender Kumar** Senior Scientist Innovative Materials and Processes Division (IMPD) CSIR - Advanced Materials and Processes Research Institute (CSIR-AMPRI) Hoshangabad Road, Near Habibganj Naka Bhopal – 462026 Madhya Pradesh
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.

Place: Bengaluru

Registrar (Academics)

ABSTRACT

The alarming escalation of atmospheric CO2 has necessitated the scientific community to adopt emerging technologies that prioritize CO2 valorization. The electrocarboxylation strategy, harnessing renewable electricity and utilizing safe materials/chemicals, presents a highly sustainable method for the direct fixation of CO2 into organic moieties, producing industrially important carboxylic acids and their derivatives. Employing tailor-made modified electrodes enables reformed surface chemistry and electronic traits at the electrode-electrolyte interface that improve the electrocatalytic reaction kinetics and productivity of the desired carboxylate moieties. Herein, first, the performances of Ti3C2TX and Ta2CTX MXene-loaded carbon fiber paper (Ti3C2TX/CFP and Ta2CTX/CFP) electrodes were evaluated for CO2 fixation with benzophenone to produce benzilic acid, with Ti3C2TX/CFP providing a higher yield. Subsequently, the feasibility of silver acetate-electrodeposited Ti3C2Tx MXene-modified electrode (Ag-ac/Ti3C2Tx/CFP) for electrocarboxylation of styrene with CO2 to yield phenylsuccinic acid (PSA) was investigated. Coupling MXene with potential metallic catalysts provides multi-metal centers for enhanced electrocatalytic performance. Following this, a flowerlike cobalt-inorganic phosphate-decorated Ti3C2Tx MXene-modified electrode (Co-Pi/Ti3C2Tx/CFP) was fabricated for electrocarboxylation of benzyl chloride to form phenylacetic acid (PAA). To further boost the electrocatalytic efficiency, a multi-metallic AgCoAc@Ti3C2Tx-based catalyst was developed for CO2 fixation via electrocarboxylation of benzyl bromide to PAA, yielding higher amounts of acid compared to its individual counterparts. Bulk electrocarboxylation experiments were conducted under constant applied current or potential, and the products obtained were isolated and characterized. Hence, the developed protocol provides a facile catalyst preparation strategy for MXene-metal composites and their application for CO2 recycling and conversion into high-value chemical products.

Keywords: *CO2 Utilization, Electrocatalyst, Ti3C2Tx MXene, MXene-metal composite, Carboxylic*

Publications:

1. **Sariga**; Vijayaprabhakaran, A.; Kathiresan, M.; Suryanarayanan, V.; Varghese, Utilization of CO2 for Electrocarboxylation of Benzophenone Using MXene-Based Electrodes: A Sustainable Approach, ACS Sustainable Chemistry & Engineering, 12 (2024) 12328–12340.
2. **Sariga**; Vijayaprabhakaran, A.; Kathiresan, M.; Suryanarayanan, V.; Varghese, A, Sustainable CO2 upcycling: Harnessing Ag-ac-decorated Ti3C2Tx MXene for electrocarboxylation of styrene, ACS Sustainable Resource Management, 2 (2025) 1879–1888.
3. **Sariga**; Varghese, A, Investigating the Electrochemical Behavior of Flowerlike-Co-Pi Decorated Ti3C2Tx MXene for Cathodic CO2 Utilization: A Sustainable Approach, The Journal of Physical Chemistry C, 2025.