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Notice for the PhD Viva Voce Examination

Ms Keerthana P (Registration Number: 2071405), 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 Monday, 30 October 2023 at 10.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Development of Optical and Electrochemical Sensor for Environmental Pollutants**
Discipline	:	**Chemistry**
External Examiner (Outside Karnataka)	:	**Dr T Selvaraju** Associate Professor Department of Chemistry Bharathiar University Tamil Nadu
External Examiner (Within Karnataka)	:	**Dr Arun Isloor M** Professor Department of Chemistry NITK Surathkal Mangaluru Karnataka - 575025
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: 20 October 2023

ABSTRACT

Carbon nanocomposites have garnered much attention among various nanomaterials owing to their well-defined characteristics, such as large surface area, biocompatibility, and concise synthetic routes. They are also a viable contender for fluorescence and electrochemical applications, notably sensing, due to their intriguing photoluminescence and electrochemical features. Fluorescence and Electrochemical sensors for environmental pollutants are constructed using carbon quantum dots with different surface functionalization (functionalized with boric acid, organic dyes, polymer composite, and 2-aminothiazole). The developed sensor was considered as potential material for detecting heavy metal ions and organic pollutants.

Surface morphology was analyzed using Transmission electron microscopy (TEM), an X-ray diffraction pattern (XRD), Raman spectra, X-Ray Photoelectron spectroscopy (XPS), Optical Profilometry, and Fourier Transform Infrared Spectroscopy (FTIR) studies. UV-Visible and photoluminescence spectroscopy reveals the absorption, emission, and excitation spectra for the synthesized sensor with and without the addition of analytes. In electrochemical investigations, Nyquist plots showed that the modified working electrodes had the lowest charge transfer resistance when compared to other working electrodes. The effect of pH, ionic strength, long-term storage ability, and quantum yield were optimized for the fabricated fluorescence sensor. For the electrochemical sensor, the influence of the scan rate and the appropriate thickness of the electrodeposited film was carefully examined to achieve the highest current responsiveness and potential window. Quantification of the analytes was performed using Forster resonance energy transfer (FRET), Differential Pulse Voltammetry (DPV), and the square wave voltammetry technique (SWV). The designed sensor was used to carry out analytical corroboration for the real samples. Simple and facile methods were successfully developed for the electrochemical and fluorescence determination of various environmental pollutants.

Keywords: *Carbon quantum dots, Organic pollutants, Heavy metal ion, Fluorescence sensor, Electrochemical sensor*

Publications:

1. **P Keerthana**, Anila Rose Cherian, Uraiwan Sirimahachai, Ditto Abraham Thadathil, Anitha Varghese, Gurumurthy Hegde. "Detection of picric acid in industrial effluents using multifunctional green fluorescent B/N-carbon quantumdots." *Journal of Environmental Chemical Engineering* (2022): 107209. https://doi.org/10.1016/j.jece.2022.107209.
2. **Keerthana, P.**, Avijit Kumar Das, M. Bharath, Munmun Ghosh, and Anitha Varghese. "A ratiometric fluorescent sensor based on dual-emissive carbon dot for the selective detection of Cd2+." *Journal of Environmental Chemical Engineering* (2023): 109325. https://doi.org/10.1016/j.jece.2023.109325.
3. **Ponmudi, Keerthana**, Anila Rose Cherian, and Anitha Varghese. "Carbon dots as an effective material in enzyme immobilization for sensing applications." In *Carbon Dots in Analytical Chemistry*, pp. 241-253. Elsevier, 2023. https://doi.org/10.1016/B978-0-323-98350-1.00006-2.
4. **Keerthana Ponmudi**, Hanna Abbo, Anila Rose Cherian, Salam Titinchi, Anitha Varghese. "An efficient inclusion complex based fluorescent sensor for mercury (II) and its application in live-cell imaging." *Journal of Fluorescence* 32, no. 3 (2022): 1109-1124. https://doi.org/10.1007/s10895-022-02931-4.
5. **Keerthana, P.**, Ashlay George, Libina Benny, and Anitha Varghese. "Biomass Derived Carbon Quantum Dots embedded PEDOT/CFP Electrode for The Electrochemical detection of Phloroglucinol." *Electrochimica Acta* (2023): 142184. https://doi.org/10.1016/j.electacta.2023.142184