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Notice for the PhD Viva Voce Examination

Ms Neethu Joseph (Registration Number: 1942086), 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 Saturday, 10 August 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	:	**Green Synthesis of Nano Carbon-Infused Polymer for the Detection of Toxic Heavy Metals**
Discipline	:	**Physics**
External Examiner (Outside Karnataka)	:	**Dr R Balaji** Scientist International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) IITM Research Park Tharamani, Chennai Tamil Nadu
External Examiner (Within Karnataka)	:	**Dr Thippe Rudrappa J** Professor Department of Physics Vijayanagara Sri Krihnadevaraya University Ballari - 583015 Karnataka
Supervisor	:	**Dr Manoj B** Professor Department of Physics and Electronics 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: 02 August 2024

ABSTRACT

Green nanotechnology, which uses carbon nanomaterials for environmental remediation, is the pioneer among the existing strategies for the production, characterization, and applications of carbon nanomaterials derived from sustainable and renewable energy resources. For the first time, we report in this thesis work the ultra-low level detection in picomolar (pM), of metal ions using a nanocarbon material via a plant-based synthesis from the medicinal plants, *Indigofera Tinctora (L.)* (IBLH) and *Ruta Graveolens* (ARH) as our carbon source. On analysing the fluorescence performance of developed IBLH and ARH nanocarbon was employed as an effective sensor for various heavy metal ions.

This work reveals the cutting-edge development of a highly biocompatible multifunctional sensor developed through simple, greener at the same time scientifically from an easily accessible natural product, exhibiting multifunctional characteristics as a fluorescent and electrochemical sensor, as well as a biomarker for the intracellular detection, of toxic heavy metal ions which might eventually lead to a breakthrough in biosensors and bioimaging as well as a long-term solution for the disposal of biomass waste. Four patents and multiple publications were achieved as a part of this PhD thesis work.

Keywords; green synthesis; nanocarbon sensor; nanocarbon-polymer nanocomposite; fluorescence sensing; electrochemical sensing; heavy metal ions; biomarker; intercellular detection

Publications:

1. **Joseph, Neethu**, Aleena Ann Mathew, Elcey C. Daniel, and Manoj Balachandran. "Polymer-Carbon nanocomposite: synthesis, optical and biocidal properties." Results in Chemistry (2023): 100826. https://doi.org/10.1016/j.rechem.2023.100826
2. **Joseph, N.**, Manoj, B. (2022). Nanomaterials-Based Chemical Sensing. In: Mubarak, N.M., Gopi, S., Balakrishnan, P. (eds) Nanotechnology for Electronic Applications. Materials Horizons: From Nature to Nanomaterials. Springer, Singapore. https://doi.org/10.1007/978-981-16-6022-1_7
3. **Joseph, N.**, & Manoj, B. (2022). Green Synthesized Fluorescent Nano-Carbon Derived from Indigofera Tinctora (L.) Leaf Extract for Sensing of Pb^{2+} Ions. ECS Transactions, 107(1), 15255 https://doi.org/10.1149/10701.15255ecst
4. **Neethu, Joseph**, Mathew Aleena Ann, and Balachandran Manoj. "Biomass Derived Fluorescent Nanocarbon Sensor for Effective Sensing of Toxic Cadmium Metal Ions." In *International Conference on Nanotechnology: Opportunities and Challenges*, pp. 265-269. Singapore: Springer Nature Singapore, 2022. https://link.springer.com/chapter/10.1007/978-981-99-4685-3_36

Patent:

1. **Neethu Joseph**, Manoj B, George Thomas "Development of Highly Fluorescent Nano-Carbon Sensor from Ruta Graveolens", IN Patent App. 202241007109 A, Publication No: E-101/1892/2022-CHE. 6.
2. **Neethu Joseph**, Manoj B, "Fluorescent Enhancement of Polymer Nanoparticle by its Composite Preparation with Ruta Graveolens Nano-Carbon and Application in Fluorescence Sensing", IN Patent App. 202241039689 A, Publication No: E- 101/12056/2022- CHE. 7.
3. **Neethu Joseph**, Manoj B, "Fluorescent Sensor to Biomarker: Enhancement of Carbon Dot Derived from Ruta Graveolens for Bioimaging Applications", IN Patent App. 202341013422 A Publication No: E- - 101/4137/2023-CHE