Notice for the PhD Viva Voce Examination

Ms Riya Thomas (Registration Number: 1881302), PhD scholar at the School Sciences, CHRIST (Deemed to be University), Bangalore will defend her PhD thesis at the public viva-voce examination on Monday, 22 May 2023 at 3.00 pm in the Council Room, Ground Floor, Central Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	**:**	**Facile Fabrication of Nanocarbon Derivatives for Optical and Electrochemical Application**
Discipline	**:**	**Physics**
External Examiner (Outside Karnataka)	**:**	**Dr Balaji** Senior Scientist International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) IITM Research Park, Tharamani Chennai, Tamil Nadu
External Examiner (Within Karnataka)	**:**	**Dr Basavaraj Angadi** Associate Professor Department of Physics Bangalore University Bengaluru - 560056 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: 17 May 2023

ABSTRACT

From synthesis of novel materials to their end-use applications, the prime objective of the material science community is to address the burgeoning social issues across the world. Noxious emissions from fossil fuel combustion, increased incidence of skin cancer, drug misuse, and ever-increasing demand for energy are some of the global concerns that require urgent consideration. In light of this, the current doctoral research emphasizes the development of trailblazing graphene-based materials with manifold usages derived from a naturally abundant carbonaceous fossil fuel coke to discover scientific solutions to the aforesaid trials and tribulations. Fossil fuel coke with 99% carbon content was used for the production of high-quality oxidized graphene derivatives by employing an environmentally-benign synthesis technique. The obtained graphene structure exhibited a multi-emissive fluorescence property having emissions ranging from blue to green-yellow. In addition, it also possessed remarkable electrochemical performance, good rate capability, and durability, signifying its expediency in energy storage devices. In an attempt to further enhance the scope of as-synthesized coke-based graphene derivatives, heteroatoms such as nitrogen and phosphorus were introduced into the graphene lattice via substitutional doping. By utilizing the as-synthesized heteroatom doped graphene derivative, oxytocin, a high-risk abused drug, was electrochemically detected in an nM range and also obtained fluorescent bioimaging of melanoma skin cancer cells with appreciable biocompatibility. The coke-based graphene derivatives were further refashioned to obtain optimum textural and surface chemistry characteristics beneficial for energy storage characteristics. Accordingly, simultaneous heteroatom-doping and activation of graphene derivative were carried out to attain enhanced supercapacitive performance, facilitating the cradle-to-gate transformation of fossil fuel, i.e., the conversion of sluggish black coal to green energy.

Keywords: Fossil fuel coke, oxidized graphene derivatives, eco-friendly preparation approach, heteroatom doping, fluorescence biomarker, electrochemical sensor, supercapacitor

Publications:

1. **Riya Thomas** & Manoj B. Doable production of highly fluorescent, heteroatom-doped graphene material from fuel coke for cellular bioimaging: An eco-sustainable cradle-to-gate approach. *Journal of cleaner production*. 2023, 383, p.135541
2. **Riya Thomas** & Manoj B. Heteroatom Engineered Graphene-Based Electrochemical Assay for the Quantification of High-Risk Abused Drug Oxytocin in Edibles and Biological Samples. *Food Chemistry*. 2022, 400: 134106.
3. **Riya Thomas** & Manoj B. Luminescence and energy storage characteristics of coke-based graphite oxide. *Materials Chemistry and Physics.* 2021, 257:123854.
4. **Riya Thomas** & Manoj B. Antibacterial performance of GO–Ag nanocomposite prepared via ecologically safe protocols. *Applied Nanoscience*. 2020, 10(11):4207-19.
5. Ramya, A. V., **Riya, Thomas**, & Manoj, B. Mesoporous onion-like carbon nanostructures from natural oil for high-performance supercapacitor and electrochemical sensing applications: Insights into the post-synthesis sonochemical treatment on the electrochemical performance. *Ultrasonics Sonochemistry.* 2021, 79 p.105767.
6. **Riya Thomas** & Manoj B. Electrochemical efficacies of coal derived nanocarbons. *International Journal of Coal Science & Technology*. 2020,1-4.
7. **Riya Thomas** & Manoj B. Dielectric performance of graphene nanostructures prepared from naturally sourced material. *Materials Today: Proceedings*. 2020,1;43:3424-7
8. Annpriya Johnson, Devika Santhosh, **Riya Thomas**, Elcey C & Manoj B. Non-antibacterial carbon particles and their fluorescence properties. *ECS Transactions* 2022, 107(1), p.9015.
9. Shivanand Chougle, Anna Mary, **Riya Thomas** & Manoj B. Quantifying the role of nanocarbon fillers on dielectric properties of PVDF matrix. *Polymer and polymer composites*,2022,3-4.
10. Aleena Ann Mathew, Meera Antony, **Riya Thomas** & Manoj B. Fluorescent PVDF dots: from synthesis to biocidal activity *Polymer Bulletin*, 2021, 1-18.
11. Jicksy Joy, Mithun sanady, **Riya Thomas** & Manoj B. Biosynthesized Ag Nanoparticles: a Promising Pathway for Bandgap Tailoring, *Biointerface Research in Applied Chemistry*, 2020, 11: 8875–8883.

Patents published:

1. **Riya Thomas** & Manoj B. Heteroatom doped coke-based nanocarbon for the detection of oxytocin. IN Patent E-101/9805/2021- CHE.
2. **Riya Thomas** & Manoj B. Development of nitrogen-doped multilayer graphene derivative from coke for imaging biomarker applications IN Patent E-101/9283/2022- CHE
3. **Riya Thomas** & Manoj B. Fabrication of heteroatom doped, activated graphene-based architecture derived from coke as supercapacitor electrode material. IN Patent E-101/15935/2022-CHE