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Notice for the PhD Viva Voce Examination

Mr Kiran Bijapur, Registration Number: 2270119, PhD Scholar at the Department of Chemistry, School of Sciences, CHRIST (Deemed to be University) will defend his PhD thesis at the public viva-voce examination on Wednesday, 03 September 2025 at 9.00 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

Title of the Thesis : **Effect and Comparative Study of Biomass-Derived Carbon Nanospheres on the Viscosity and Thermal Conductivity of the Nanofluid**

Discipline : **Chemistry**

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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 (Academics)

Place: Bengaluru
Date: 29 August 2025

ABSTRACT

The growing demand for nano-coolants in heat dissipation applications necessitates the development of high thermal conductivity (TC) nanofluids. In this research, we have synthesized carbon nanospheres (CNSs) using a sustainable approach by utilizing biomass-derived precursors. CNSs were obtained from eight different biowastes, each exhibiting unique physicochemical characteristics. The prepared CNSs were characterized, and their dispersion stability was optimized for nanofluid formulation. The study focused on optimizing key parameters such as concentration, temperature, sonication time, nanoparticle size, and zeta potential to enhance TC. Notably, groundnut skin-derived nanofluids exhibited a remarkable TC enhancement of 175% at elevated temperatures. Sonication time optimization revealed that maximum TC improvement was achieved at 240 minutes. The impact of CNSs size on TC was also investigated, with smaller-sized CNSs (~28 nm) demonstrating an enhancement of up to 122.64%. Furthermore, the zeta potential of the synthesized CNSs, ranging from -45.6 mV to -17.0 mV, played a crucial role in ensuring stability and heat transfer efficiency, with a maximum TC improvement of 111.8%. pH optimization studies were also conducted to further refine nanofluid performance. Rheological studies revealed that all biomass-derived nanofluids exhibited excellent dynamic viscosity behaviour, with viscosity decreasing as temperature increased. Additionally, theoretical modelling was performed to predict thermophysical properties using comparative models and surface plots. This work has strong industrial relevance in automotive, HVAC, and electronics cooling applications, aligning with SDG 7, SDG 9, and SDG 12 by promoting sustainable, energy-efficient, and eco-friendly thermal management solutions.

Keywords: *Nanofluid, Thermal conductivity, Viscosity, Biomass, Carbon nanosphere, Zetapotential*

Publications:

1. **Kiran Bijapur**, Samir Mandal, Pradeep G. Siddheshwar, Suryasarathi Bose, and Gurumurthy Hegde, "Experimental investigation of a biomass-derived nanofluid with enhanced thermal conductivity as a green, sustainable heat-transfer medium and qualitative comparison mathematical modelling," *Nanoscale Adv*, *vol. 6*, no. 19, pp. 4944–4955, Jul. 2024, https://doi.org/10.1039/D4NA00362D.
2. **Kiran Bijapur**, Samir Mandal, Pradeep G. Siddheshwar, Suryasarathi Bose, and Gurumurthy Hegde, "Unlocking efficiency: experimental and theoretical insights into biomass-derived carbon nanofluids with enhanced thermal conductivity," *Nanoscale*, *vol. 17*, no. 16, pp. 10239–10249, Apr. 2025. https://doi.org/10.1039/D4NR04740K.
3. **Kiran Bijapur**, Pradeep G. Siddheshwar, Suryasarathi Bose, and Gurumurthy Hegde, "Effects of Dispersion on Thermal Conductivity and Viscosity in Biomass-Based Nano Systems," *ChemPlusChem*, p. e202500100, May 2025

Patent:

1. **Kiran Bijapur**, Enhancement of Thermal Conductivity in Nanofluids Using Biomass-Derived Carbon Nanospheres (Patent No. 202441047800). Patent published on July 5, 2024.
2. **Kiran Bijapur**, Enhancement in Thermal Conductivity of Bio-Nanofluids (Patent No. 202441091667). Patent published on November 29, 2024