CHRIST
(DEEMED TO BE UNIVERSITY)
BANGALORE · INDIA

Notice for the PhD Viva Voce Examination

Ms Akshatha A Rao, Registration Number: 2090231, 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 Friday, 16 May 2025 at 10.00 am in Room No. 044, Ground Floor, Research and Development Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Development of Coal Based Low-Dimensional Nanocarbon for Enhancing the Performance of DSSC**
Discipline	:	**Physics**
External Examiner - I	:	**Dr Koteswar Rao** Associate Professor Department of Electronic Science University of Delhi, South Campus New Delhi - 110021
External Examiner - II	:	**Dr Biju V** Professor and Head Department of Physics University of Kerala Kariavattom Campus Thiruvananthapuram - 695581 Kerala
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: 08 May 2025

ABSTRACT

Solar energy is an abundant energy source, and harnessing the sun's radiation with an efficient solar cell can be a promising technology for a limitless supply of sustainable energy. The amount of solar radiation that reaches the Earth is beyond the world's energy consumption. However, the cause for minimal usage of the sun's energy is the sophisticated manufacturing of photovoltaics and its high cost of production. Likewise, the usage of space and infrastructure required for installing solar cells is yet another reason for limited usage. Upon comparing the emerging photovoltaics, Dye-sensitized solar cells (DSSC) have a greater future scope as an energy harvester. Rapid technological growth over the years, usage of affordable materials, and capability of working efficiently in low lighting conditions make them potent solar energy harvesters. To harness the incident solar energy, the bottlenecks faced by a dye-sensitized solar cell are interfacial recombination and narrow absorption region. These problems can be appreciably solved using low-dimensional nanocarbons with exceptional optoelectronic properties. Thus, this study emphasizes developing a cutting-edge approach for the high-quality use of fossil fuel-derived low-dimensional nanocarbons in energy conversion systems by encouraging the green conversion of fossil fuels and broadening the potential of coal's utilization in energy conversion applications.

Keywords: Dye-sensitized solar cells, J-V characteristics, Coal, low-dimensional nanocarbon, co-sensitizer, silver plasmonics

Publications:

1. **Rao, Akshatha A.**, Alex P. Joseph, and Manoj Balachandran. "An outlook on zero-dimensional nanocarbons as components of DSSC." *Biomass Conversion and Biorefinery* 14, no. 8 (2024): 9023-9045. https://doi.org/10.1007/s13399-022-03208-3

2. **Rao, Akshatha A.**, Shanyukta Upadhyay, Santhosh Narendhiran, Imran Jafri Razack, and Manoj Balachandran. "Lignite-derived nanocarbon as surface passivator and co-sensitizer in dye-sensitized solar cell." *Materials Today Energy* 41(2024):101539. https://doi.org/10.1016/j.mtener.2024.101539

3. **Rao, Akshatha A.**, Santhosh Narendhiran, and Manoj Balachandran. "Fossil fuel derived GQD as a photosensitizer in dye-sensitized solar cells." *Materials Letters* 357 (2024):135692. https://doi.org/10.1016/j.matlet.2023.135692

4. **Rao, Akshatha A.**, Santhosh Narendhiran and Manoj Balachandran. "Enhanced visible light harvesting in dye-sensitized solar cells through incorporation of solution-processable silver plasmons and anthracite-derived graphene quantum dots." Materials Today Physics 46 (2024): 101512. https://doi.org/10.1016/j.mtphys.2024.101512

5. Upadhyay, Shanyukta, **Akshatha A Rao**, Santhosh Narendhiran, Imran Jafri, and Manoj Balachandran. "Phosphorus-doped molybdenum disulfide as counter electrode catalyst for efficient bifacial dye-sensitized solar cells." Materials Today Energy 37 (2023): 101412. https://doi.org/10.1016/j.mtener.2023.101412