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# Notice for the PhD Viva Voce Examination

Ms Akshaya S, Registration Number: 1942081, PhD Scholar at the Department of Physics and Electronics, School of Sciences, CHRIST (Deemed to be University), Bangalore will defend her PhD thesis at the public viva-voce examination on Saturday, 11 October 2025 at 9.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru – 560029, Karnataka, India.

**Title of the Thesis** : **Doped Carbon Nanostructures for Fuel Cell Applications**

**Discipline** : **Physics**

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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:** 19 September 2025

# ABSTRACT

Global energy demands have historically been met predominantly by fossil fuels wherein these high energy density materials account for a large fraction of worldwide energy consumption. However, the dependence on fossil fuels has resulted in environmental problems, notably greenhouse gas emissions and climate change. To address these challenges, PEM (Proton Exchange Membrane) fuel cells could be a sustainable option. By harnessing renewable hydrogen sources, PEM fuel cells can significantly reduce carbon emissions and provide a sustainable energy solution and have a potential be used in stationary and vehicular applications. However, Platinum as a catalyst is indispensable at cathode to overcome the slow oxygen reduction reaction (ORR) but using which increases the overall cost of fuel cells. Thus, Platinum dispersed on carbon nanostructures minimizes the usage of platinum and augments the catalytic activity of Pt nanoparticles. In view of this, we have synthesized and investigated different shapes of carbon-based supports (Planar, tubular and spherical) for Pt and further modified its surface chemistry to enhance its stability, durability and fuel cell performance.

**Keywords:** *Carbon support, Electrocatalyst, Polymer electrolyte membrane fuel cell, Stability, Graphene, Multilayered carbon nano-onion, Carbon nanotubes.*

**Publications:**

1. **Nair, A.S.** and Jafri, R.I., 2023. A facile one-step microwave synthesis of Pt deposited on N & P co-doped graphene intercalated carbon black-An efficient cathode electrocatalyst for PEM fuel cell. *International Journal of Hydrogen Energy*, *48*(9), pp.3653-3664. (*IF: 8.1*)
2. **Nair, A.S**. and Imran Jafri, R., 2024. Melamine derived N-doped Carbon nanotubes: A durable catalyst support for Pt nanoparticles in proton exchange membrane fuel cell. *Journal of Applied Electrochemistry*, pp.1-11. (*IF:2.9*)
3. **Nair, A.S.,** Mane, R.S., Jha, N. and Jafri, R.I., 2024. Application of Corn Oil Derived Carbon Nano-onions Using Flame Pyrolysis as Durable Catalyst Support for Polymer Electrolyte Membrane Fuel Cells. *Electrocatalysis*, pp.1-11. *(IF:2.7)*

**Patent:**

1. **Akshaya S Nair**, R Imran Jafri, Flame synthesized multilayered graphitic carbon shell as catalyst support and PEM fuel cell comprising the same (Published: Application no. 202341071413).