DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY KANPUR

PHYSICS COLLOQUIUM

Printed Random Network of CNT as an Electronic Material: Transport, Trapping & Transients

The emergence of large area flexible and stretchable electronics is all set to bring about a revolution akin to silicon revolution. Ability to print functional materials with suitable electronic properties is central to this effort. One of the key strategies for this has been to embed carbon nanostructures or 2D chalcogenides in polymer matrices to render them printable. Among these material options, printed random network of CNT is currently being viewed as a leading material for its suitability in device applications such as Thin Film Transistors (TFT) and photodetectors.

In this talk, I will consider printed random network of CNT and examine its properties from the point of view of mechanism of carrier transport, and charge trapping (as reported in a recent doctoral thesis from our group). The physics of carrier transport, specifically in the presence of controlled disorder and trapping is not understood well. Since such material is not amenable to conventional techniques such as Hall effect, we use novel analysis based on impedance spectroscopy to extract carrier mobility as a function of temperature. The usual suspect mechanisms of band transport, variable range hopping or percolation do not seem to be valid. Further, the observed features of trapping obtained from tuning of Fermi level (using gate voltage of TFT structures) and varying temperature are also counterintuitive. Using current transient studies, I will examine the nature of trapping which is in contradistinction to what we normally observe in conventional semiconductors. We will offer phenomenological models as heuristics for further development of this class material systems.

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VENUE

Thursday, Jan 22, 2026 at 5:15 PM (refreshments at 5:00 PM) at FB-382 (Prof. Amal Kumar Raychaudhuri Seminar Room)

WEBSITE

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