S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES
Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Condensed Matter and Materials Physics

3rd July, 2024 **4.00 PM** **ONLINE / FERMION**

SPEAKER
Dr. Arnab Maity,
Post-Doctoral Fellow,
Department of Chemical Engineering, Technion, Israel

TITLE OF THE TALK

Atomically thin 2D-Field Effect Transistors and Printed Chemi-resistors for Rapid biopsy of Malignant Lesion, Chirality Identification, and Aquatic Hazards Assessment

ABSTRACT

This talk unveils a novel approach to 2D material-based detectors equipped with spatiotemporal control, paving the way for innovative advancements in machine-intelligence-controlled-healthcare, environmental monitoring, quantum device and transistor technology [1-3]. Inspired by the intricate architecture of butterfly wings, we've engineered a hierarchical stacked geometrical configuration (HSGC) utilizing functionalized graphene layers and helical cellulose-based sieves. This innovative design enables time-resolved separation and detection of individual molecules within a mixture, generating detailed mass spectrograms. This unlocks a plethora of possibilities, including real-time volatile organic compounds (VOC) spectrograms during machine learning enabled liquid biopsy, predicting growing cancer organoid's mutation status driven by most advanced generative AI, eliminating the need for complex procedures. Imagine wearable devices capturing molecular profiles emitted from skin during various dietary conditions, offering personalized insights into health and well-being. Moreover, spin-sensitive detectors constructed from chiral and DNA-like helical nano-hybrids of 2D materials offer exciting possibilities for identifying chiral molecules. This advancement could pave the way for a new era of organic quantum spintronics and computing. Furthermore, we'll delve into the exciting potential of various 2D materials, such as graphene and black phosphorus, used in ultrafast field-effect transistors (FETs) for detecting heavy metals and bacteria in aquatic samples. This will include an in-depth discussion on industry-inspired non-destructive testing, minimizing device variation, scalability, and technology readiness level (TRL). [4]. This talk promises a captivating journey into the future of 2D material-based detection, showing its revolutionary potential to transform medical, quantum technology, environmental monitoring, and nanotechnological advancements for the betterment of our world. [details attached].

HOST FACULTY

Prof. Anjan Barman, Senior Professor
Dept. of Condensed Matter & Materials Physics

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