

Seminar

The Goodness of Imperfections: Defect- and interface-engineering in low- dimensional materials

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Recent advances in materials science and engineering posit “low-dimensional Materials” as the panacea for overcoming many fundamental challenges in energy security and information technology. While many straightforward applications of carbon nanotubes, graphene, and other emerging two-dimensional materials (e.g., MoS₂, h-BN) have been realized, the underlying fundamental science of controlling and manipulating defects in nanomaterials remains far from being well understood. Although high quality and defect-free materials may be a pre-requisite to electronic devices, defects/interfaces provide a simple and yet principal way to break crystal symmetry and thereby realize distinctive electrical, magnetic, thermal, and optical properties. In this regard, this talk will provide a brief overview of synthesis and spectroscopic tools for generating and characterizing defects/interfaces in nanomaterials. More importantly, this talk will discuss some of our lab’s results, which affirm that defects and interfaces could indeed result in novel properties and applications such as: i) improved quantum capacitance of carbon nanostructure-based supercapacitor electrodes, ii) electrically conducting interfaces in Li-ion batteries iii) non-reciprocal transmission of light and optical diode action in graphene/C₆₀ or MXene/C₆₀ interfacial architectures, and iv) biosensing and multi-photon imaging. Finally, I will present a succinct outlook, opportunities, and persisting challenges in nanomaterials - based energy research.

Friday, Jan 5th 2018

11:30 AM (Tea/Coffee at 11:00 AM)

Seminar Hall, TIFR-H