National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: A Comparative Study of Graphene, hexagonal boron nitride, and their combined structures: exploring their properties and diverse applications
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Venue	: M.Tech class room (MM 202E), MM Annex building
Date and Time	: 03 Apr 2024 (4:30 pm)
Abstract	: In the domains of materials science and condensed-matter physics, graphene emerges as an incredibly promising material, showcasing exceptional crystal and electronic characteristics. Its profound importance in physics is indisputable, paving the way for fresh physics realms and potential applications outlined here. Graphene's distinctive electronic attributes facilitate 'relativistic' condensed-matter physics, allowing for simulations of quantum relativistic phenomena previously inaccessible in high-energy physics, thereby advancing experiments on a laboratory scale. As a material merely one atom thick, graphene signifies a novel class, delving into unexplored territories in low-dimensional physics, continually surprising researchers with diverse practical application possibilities. Likewise, hexagonal boron nitride (h-BN), with a layered structure akin to graphite, mirrors similar unique traits. This review offers an overview of hexagonal h-BN and graphene. Additionally, the synthesis of h-BN, akin to graphene, is explored, outlining its potential applications in coatings, dielectrics, and assorted devices, echoing the structural resemblance shared with graphene. The recent fascination of the scientific community with two-dimensional materials like graphene, h-BN, silicene, germanium, black phosphorus (BP), and transition metal sulfides stems from their atomic-level thinness, showcasing impressive Young's modulus and expansive specific surface areas. This comprehensive review navigates through the synthesis, structure, properties, and amalgamated structures of graphene and h-BN, spotlighting their mechanical, optical, thermal, and electrical properties. Finally, it outlines future potentials, highlighting their possible applications and offering insights into their promising paths for development and utilization across photonics, catalysis, semiconductor technology, and beyond. Keywords: graphene, hBN, mechanical, optical, thermal, and electrical