National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Design and development of perovskite – 2D Materials nanocomposites for environmental applications
Speaker	: Priyanka Gupta (Rollno : 522ch1003)
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Venue	: New Seminar Room, Department of Chemical Engineering
Date and Time	: 24 Sep 2025 (4:30 PM)
Abstract	: The increasing release of pharmaceutical residues and industrial dyes in aquatic systems has created pressing environmental and health challenges, demanding efficient remediation technologies. In this study, perovskite nanostructures $BiFeO_3$ and $CaSnO_3$ were synthesized via optimized hydrothermal and sol&ndashgel methods, while 2D nanomaterials were developed through eco-friendly reduction. Various material characterizations confirmed the successful synthesis of high-purity nanostructures: XRD analysis confirmed phase-pure crystalline lattices of BiFeO3 and $CaSnO_3$ through the presence of (110), (113), (214) planes for $BiFeO_3$ and (110), (112), (222) planes for CaSnO3, FTIR indicated characteristic metal&ndashoxygen vibrations, FESEM&ndashEDS analysis confirmed the elemental composition of BiFeO3 and CaSnO3, showing Bi (39.36%), Fe (23.3%), O (37.1%) in $BiFeO_3$ and Ca (15.76%), Sn (30.52%), O (36.30%) in $CaSnO_3$.UV&ndashVis spectroscopy confirmed optical absorption and band gap suitability and BET analysis indicated mesoporous structures with a specific surface area of 0.93 m2/g, pore volume of 2.18×10&minus3 cc/g, and an average pore size of 5.8 nm. To advance real-world applicability, floating photocatalysts were designed for efficient light harvesting and recovery, alongside pelletization of catalysts for stable wastewater treatment. These systems will be investigated for the photocatalytic degradation of ciprofloxacin and some emerging industrial dyes as contaminants. The results highlight the potential of Sn-doped perovskite&ndash2D hybrid composites to enhance charge separation, structural stability, and photocatalytic efficiency, offering a sustainable pathway for large-scale water purification.