National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Development of MoS2 Composites for Wastewater Remediation Using Advanced Oxidation Processes
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Venue	: Old Seminar Hall
Date and Time	: 13 May 2025 (10:00)
Abstract	: Molybdenum disulfide (MoS_2) composites have gained significant attention as photocatalysts for wastewater remediation due to their unique structural, optical, and electronic properties. MoS_2 has a two-dimensional layered structure, similar to graphene, which provides a high specific surface area. MoS_2 is chemically stable and exhibits strong resistance to photocorrosion, making it more durable in harsh wastewater environments compared to some other semiconductor photocatalysts. MoS_2 is relatively non-toxic and composed of elements that are more abundant and less costly than some noble-metal-based catalysts. Pristine MoS_2 suffers from a high rate of electron&ndashhole recombination, which significantly reduces photocatalytic efficiency. This limitation is often addressed through compositing, but it remains a challenge in single-component systems. MoS_2 is often combined with other materials (e.g., TiO_2, ZnO, g-C_3N_4, graphene) to form heterostructures that improve charge separation and reduce recombination rates of photogenerated electron&ndashhole pairs, thereby enhancing photocatalytic efficiency.MoS_2 nanoparticles can agglomerate in water, reducing their surface area and catalytic activity. Proper dispersion techniques or support materials are often required.The fabrication of high-performance MoS_2-based composites often involves complex and costly synthesis methods (e.g., hydrothermal, solvothermal, or CVD processes), which may hinder scalability for real-world wastewater treatment plants.Like many nanoparticulate catalysts, MoS_2-based materials can be difficult to separate from treated water, raising concerns about recovery, reusability, and potential secondary pollution. MoS_2 composites present a promising class of visible-light-driven photocatalysts for wastewater remediation, especially when combined with other materials to overcome intrinsic limitations. However, challenges related to material stability, synthesis, and practical deployment must be addressed to realize their full potential in environmental applications.