National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Fabrication of Indium Sulphide based Hydrogels as a Multifunctional Photocatalyst for Environmental remediation and Energy Application
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Venue	: New Seminar Hall, Department of Chemical Engineering
Date and Time	: 05 Feb 2025 (4:00 PM)

Abstract : Photocatalysis has emerged as a sustainable and efficient approach for addressing environmental challenges, particularly in wastewater treatment and energy applications. By harnessing solar energy, photocatalysts enable the degradation of harmful pollutants and the generation of renewable energy, offering a dual advantage for environmental remediation. Among various photocatalysts, indium sulfide (In_2S_3) stands out due to its visible-light responsiveness, narrow band gap, and superior photocatalytic properties. In this study, In_2S_3 microspheres were synthesized via a hydrothermal method and incorporated into a sodium alginate (SA) hydrogel matrix through calcium chloride cross-linking to form a multifunctional In_2S_3-alginate hydrogel. The hydrogel was evaluated for the degradation of sulfamethoxazole (SMX), a commonly used antibiotic and persistent water pollutant, under visible light. Characterization using XRD, FTIR, PL, UV-DRS, FESEM and EDX confirmed the successful integration of In_2S_3 into the hydrogel, highlighting enhanced charge separation, broader visible light absorption, and a significant reduction in the band gap from 2.4 eV to 1.4 eV. Experimental results demonstrated 81% SMX degradation under optimal conditions, with efficiency influenced by factors such as pollutant concentration (10 mg/L: 81%, 50 mg/L: 57%), catalyst loading (1 g/L: 58%, 5 g/L: 81%), pH (acidic/alkaline favored), and temperature (20°C: 60%, 60°C: 79%). The hydrogel retained 63% efficiency after eight cycles and remained effective across various water sources (distilled: 99%, tap: 87%, pond: 80%). This study highlights the potential of In_2S_3-based hydrogels as multifunctional photocatalysts, capable of addressing wastewater pollution and contributing to energy applications through visible light-driven processes.

Keywords: *Photocatalysis, In_2S_3, Hydrogel, Wastewater treatment, Sulfamethoxazole, Energy applications.*