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Synergistic Nanocomposite Photocatalysts for Photodegradation of Organic Pollutants in Water

Plenary Talk

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Abstract

The discharge of industrial effluents containing dyes and toxic chemicals into aquatic ecosystems poses a potential threat to environmental quality and community health. Addressing this challenge, the present work focuses on the development of novel nanocomposite materials with enhanced photocatalytic properties for the effective removal of organic contaminants from aquatic systems. The nanocomposites are synthesized by combining semiconductor materials with metal or non-metal, or metal oxide compounds. This strategy maximizes visible-light absorption, improves charge separation, and enhances surface interactions. The photocatalytic performance of the synthesised nanocomposites was systematically evaluated, demonstrating their ability to degrade a range of organic contaminants found in aquatic environments. Upon light irradiation, the nanocomposites generate reactive oxygen species that efficiently diffuse into the aqueous solution, creating an oxidative environment capable of breaking down complex organic pollutants. Furthermore, the photocatalysts exhibit good structural integrity and reusability over multiple cycles, indicating their potential as a viable, sustainable, and cost-effective solution for wastewater treatment and environmental remediation applications.

Keywords: Nanocomposites, photocatalysis, wastewater treatment, organic pollutant degradation, water purification, sustainable remediation