Chitosan-mediated tailoring of cadmium sulphide nanoparticle: Synthesis, properties, and interactive mechanisms

Abstract - This study explores the synergistic effects of chitosan-coated cadmium sulphide (CdS) nanoparticles (NPs) at varying concentrations on their structural, optical, and photocatalytic properties. CdS NPs are known for their promising photocatalytic potential, but their practical application often requires stability enhancement and reduced toxicity. Chitosan, a natural biopolymer, offers unique advantages such as biocompatibility and heavy metal adsorption capabilities, making it an attractive candidate for surface modification of CdS NPs. Our investigation reveals that chitosan-coated CdS NPs exhibit concentration-dependent changes in their crystalline structure, bandgap energy, particle size, and vibrational characteristics. Notably, CdS NPs synthesized with 1.5 g chitosan concentration display the smallest bandgap and particle size, suggesting optimal photocatalytic activity. This research provides valuable insights into tailoring CdS NPs for efficient visible light photocatalysis, with implications in environmental remediation and energy conversion.

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