

TRENDS IN MEDICINAL AND ENVIRONMENTAL SCIENCE: AN INTRODUCTION

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CHAPTER - 3

STUDIES OF ZnBi_2O_4 NANOPARTICLES FOR THE REMOVAL OF AMIDO BLACK DYE

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Abstract

The study investigates the effectiveness of ZnBi_2O_4 nanoparticles in removing Amido black, a prevalent and persistent pollutant in industrial wastewater. ZnBi_2O_4 nanoparticles were synthesized and characterized for their structural and optical properties, revealing a narrow band gap suitable for visible light photocatalysis. The photocatalytic performance of ZnBi_2O_4 was evaluated under various conditions, including catalyst dosage, initial dye concentration, pH, and irradiation time. Results demonstrated a high degradation efficiency of Amido black dye, with nearly complete removal achieved under optimal conditions. Mechanistic studies indicated that the generation of reactive oxygen species (ROS) was crucial to the degradation process. The nanoparticles exhibited excellent stability and reusability, maintaining significant photocatalytic activity over multiple cycles. These findings underscore the potential of ZnBi_2O_4 nanoparticles as an effective and sustainable solution for wastewater treatment, capable of addressing the challenges posed by organic dye pollutants in industrial effluents. Future research directions include scaling up nanoparticle synthesis and exploring composite materials to further enhance photocatalytic performance.

Keywords: Wastewater; ZnBi_2O_4 ; Nanoparticles; Synthesis; Dye

nanoparticles an effective, sustainable solution for wastewater treatment, with potential for larger-scale applications.

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