

Efficient Photocatalytic Degradation of Tetracycline Hydrochloride Using Modified Carbon Nitride CCN/Bi₂WO₆ Heterojunction

Authors : Syed Najeeb-Uz-Zaman Haider, Yang Juan

Abstract : Antibiotic overuse raises environmental concerns, boosting the demand for efficient removal from pharmaceutical wastewater. Photocatalysis, particularly using semiconductor photocatalysts, offers a promising solution and garners significant scientific interest. In this study, a Z-scheme 0.15BWO/CCN heterojunction was developed, analyzed, and employed for the photocatalytic degradation of tetracycline hydrochloride (TC) under visible light. The study revealed that the dosage of 0.15BWO@CCN and the presence of coexisting ions significantly influenced the degradation efficiency, achieving up to 87% within 20 minutes under optimal conditions (at pH 9-11/strongly basic conditions) while maintaining 84% efficiency under standard conditions (unaltered pH). Photoinduced electrons gathered on the conduction band of BWO while holes accumulated on the valence band of CCN, creating more favorable conditions to produce superoxide and hydroxyl radicals. Additionally, through comprehensive experimental analysis, the degradation pathway and mechanism were thoroughly explored. The superior photocatalytic performance of 0.15BWO@CCN was attributed to its Z-scheme heterojunction structure, which significantly reduced the recombination of photoinduced electrons and holes. The radicals produced were identified using ESR, and their involvement in tetracycline degradation was further analyzed through active species trapping experiments.

Keywords : CCN, Bi₂WO₆, TC, photocatalytic degradation, heterojunction

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