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Wei Zhang, Li Zhou, Jun Shi, Huiping Deng

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Fabrication of novel visible-light-driven AgI/g-C₃N₄ composites with enhanced visible-light photocatalytic activity for diclofenac degradation

Wei Zhang, Li Zhou, Jun Shi, Huiping Deng*

College of Environmental Science and Engineering, Tongji University, Shanghai 200092, China

*Corresponding author. Tel.: +86 02165982688;

Email address: denghuiping@tongji.edu.cn

Graphical abstract

Abstract

A visible-light-driven heterostructured AgI/g-C₃N₄ was prepared by a deposition-precipitation method. The composition, structure, morphology, and optical properties of the photocatalyst were characterized by Brunauer-Emmett-Teller method (BET), X-ray powder diffraction (XRD), Fourier transform-infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS), transmission electron microscope (TEM), scanning electron microscope (SEM), UV-vis diffused reflectance spectroscopy (DRS), photoluminescence spectroscopy (PL), photocurrent, and electrochemical impedance spectroscopy (EIS), respectively. AgI/g-C₃N₄ composite photocatalysts exhibited higher photocatalytic activities than those of AgI nanoparticles and g-C₃N₄ in the degradation of diclofenac (a model anti-inflammatory medicine) under visible light irradiation ($\lambda \geq 400$ nm). When the mass molar ratio of AgI was 45% in AgI/g-C₃N₄, the reaction rate constant of diclofenac degradation reached 0.561 min^{-1} , which was almost 12.5 and 43.2 times higher than that achieved by AgI (0.045 min^{-1}) and g-C₃N₄ (0.013 min^{-1}). The h^+ and $\cdot\text{O}_2^-$ were pinpointed as the main reactive species in the photocatalytic reaction using their obligate radical scavengers. Diclofenac was completely degraded and partly mineralized during the photodegradation. The main intermediates were determined by liquid chromatograph mass spectrometer (LC-MS), and toxicological assessments were carried out to

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