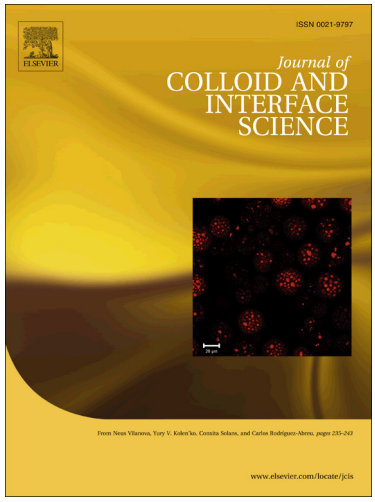

Regular Article

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Fabrication of novel visible-light-driven AgI/g-C_3N_4 composites with enhanced visible-light photocatalytic activity for diclofenac degradation

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Graphical abstract

Abstract

A visible-light-driven heterostructured AgI/g-C_3N_4 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-C_3N_4 composite photocatalysts exhibited higher photocatalytic activities than those of AgI nanoparticles and g-C_3N_4 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-C_3N_4, 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-C_3N_4 (0.013 min^{-1}). The h^+ and $\bullet O_2^-$ 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