Mineralization

Photocatalytic degradation of antibiotics using a novel Ag/Ag2S/Bi2MoO6 plasmonic p-n heterojunction photocatalyst: Mineralization activity, degradation pathways and boosted charge separation mechanism

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Abstract

A novel Ag/Ag2S/Bi(2)MoO(6)plasmonic p-n heterojunction has been constructed via the in-situ growth of p-type Ag2S nanoparticles on n-type Bi2MoO6 microspheres, followed by the photo-reduction treatment. Simultaneously, the Ag-0 loading percentage in the heterojunction could be finely controlled by tuning the photo-reduction time. The optimized Ag/Ag2S/Bi2MoO6 (AAS/BMO-4) manifests the highest photocatalytic performance towards degrading levofloxacin (LEV) and tetracycline hydrochloride (TC), which degradation efficiencies are 87.3% and 92.8%, respectively. Such improvement mechanism could be due to the improved light absorption in the visible-light region induced by localized surface plasmon resonance (LSPR) and the efficient interfacial separation and transport of charge carriers in Ag/Ag2S/Bi2MoO6. The impacts of some key parameters (e.g., various inorganic anions, representative organic substances and various water resources) are systematically investigated. Ag/Ag2S/Bi2MoO6 also exhibits excellent mineralization capability and recycling performance in degrading LEV. Moreover, photo-generated h(+), (OH)-O-center dot, and O-center dot(2)- are identified as the dominant reactive species

accounting for the degradation of antibiotics. The photodegradation pathway of LEV has also been elucidated based on the intermediate identification. Therefore, this study not only reports an innovative plasmonic p-n heterojunction but also the new design of photocatalysts capable of efficiently degrading pharmaceutical antibiotics under visible-light irradiation.

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