Enhancing the degradation efficiency of OPs under visible light by an integrated cascade photo-biocatalyst

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Abstract

Photo-enzymatic integrated nanocatalyst which combined biocompatible photocatalytic carrier and OPH is designed to remove OPs. H-TiO2 microsphere is prepared using wrinkled SiO2 as template. Then, Au nanoparticles are loaded on the H-TiO2 to obtain Au-H-TiO2 heterojunction microsphere, which achieved effective use of visible light based on the SPR. The characterization results of Au-H-TiO2 prove that the Au-H-TiO2 has large specific surface area (226.19 m2/g) and narrow band gap (2.68 eV). Adsorption methods are used to prepare OPH@Au-H-TiO2 by immobilizing OPH molecules. The obtained OPH@Au-H-TiO2 can degrade methyl parathion to p-NP by OPH. Then the p-NP is degraded to hydroquinone with low toxicity using Au-H-TiO2. After 2.5 h, methyl parathion is completely degraded, and about 82.64% of the generated p-NP is further degraded into hydroquinone. The fabricated OPH@Au-H-TiO2 has excellent catalytic activity and cycle stability, which is ascribed to the photo-enzyme synergic catalytic effect.

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