

Plasmon-induced ZnO-Ag/AgCl photocatalyst for degradation of tetracycline hydrochloride

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ABSTRACT

The release of a large number of antibiotics to the environment has created a shade of sorrow in the scientific community. This work reports the preparation of efficient plasmon-induced ZnO-Ag/AgCl photocatalysts by in-situ coprecipitation and hydrothermal methods, and applied for the degradation of tetracycline hydrochloride antibiotic under visible light irradiation. The ZnO-Ag/AgCl composites were characterized by XRD, TEM-EDS, DRS, XPS and PL. The photocatalytic efficiency of ZnO was significantly improved by introducing proper amount of Ag/AgCl. The improved photocatalytic activity is due to the surface plasmon resonance effect of Ag metal and charge separation in the nanocomposite material. The obtained results showed that ZnO-Ag/AgCl photocatalyst had higher photocatalytic activity compare to pure ZnO. The amount optimized sample containing 30% Ag/AgCl decomposed 80.7% tetracycline hydrochloride in 2 h. From trapping experiments, it was concluded that super oxide anions were the main degrading species involved in the degradation of tetracycline hydrochloride. Finally, charge transfer mechanism was proposed based on the obtained results and active species involved in the degradation process. In conclusion, the synthesized ZnO-Ag/AgCl composite photocatalyst has a good potential for environmental remediation.

Keywords: ZnO-Ag/AgCl; Tetracycline hydrochloride; Photocatalytic activity; Visible light

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