SYNTHESIS AND CHARACTERIZATION OF THE Z SCHEME Bi2WO6/Ag/AgBr FOR THE PHOTOCATALYTICAL
DEGRADATION OF PHARMACEUTICAL COMPOUNDS IN WATER

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Currently, visible light driven photocatalysis is a promising alternative to cope with the presence of emerging pollutants in wastewater. For that reason, the synthesis of nanostructured semiconductors with low band gap is a work under constant development. In recent years, many studies have focused on the evaluation of the photocatalytic activity of Bi2WO6 for the oxidation and reduction of pollutants in water, as well as in water splitting process. However, the generation of OH• radicals is quite low for this material, which represent an important window of opportunity for improving the photocatalytic activity of such material. The fabrication of type III heterostructures, such as all solid state Z schemes, could be a promising way to significantly increase the performance of such materials. This work proposes the synthesis of the Z scheme Ag/AgBr/Bi2WO6 by a three-step route. Initially, Bi2WO6 was synthesized by the solvothermal method, using bismuth nitrate pentahydrate, sodium tungstate and EG as solvent. Then, the surface of Bi2WO6 was decorated by deposition of metallic silver nanoparticles through photodeposition. Finally, scheme Z was completed upon the reaction with KBr by the precipitation of silver bromide. The samples were characterized by X-ray diffraction, scanning electron microscopy (SEM), transmission electron microscopy (TEM), UV-vis diffuse reflection spectroscopy, nitrogen adsorption-desorption isotherms (BET), X-ray energy dispersion spectroscopy (EDX), inductively coupled plasma atomic emission spectroscopy (ICP-OES) and X-ray photoelectron spectroscopy (XPS). The photocatalytic activity of the samples was evaluated via the degradation and mineralization of the antibiotic ciprofloxacin under visible light irradiation. The results showed that the photocatalytic activity increase as the Z scheme was formed. This is, the activity of the Bi2WO6 support was lower than those observed for the Ag/Bi2WO6 and Bi2WO6/Ag/AgBr materials. Degradation of the antibiotic was 50% higher than that obtained for the Bi2WO6 support, while mineralization increased in a 30%. The enhanced photocatalytic activity could be associated to the increased production of hydroxyl radicals by the modified materials. The semiconducting properties were determined by electrochemical assays, confirming the function of the Z scheme as a type III heterostructure.

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