Facile Synthesis of Hollow Ag/AgBr Hybrid Nanostructures and Their Visible-Light Driven Photocatalytic Properties

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This paper describes a simple and fast aqueous-phase route to the synthesis of Ag/AgBr hybrid nanostructures. The synthesized AgBr nanoparticle shows spherical and cubic morphologies with sizes from ~124.7 to ~ 228.4 nm by varying the reaction temperature. In this system, polyethyleneimine (PEI) was used as a stabilizer for the formation of Ag/AgBr hybrid nanostructures through interaction with Ag^+ ions. We could easily control the morphology and composition of the nanostructures by varying the amount of reducing agent. The as-synthesized Ag/AgBr hybrid nanostructures exhibited enhanced photocatalytic activity and stability during the degradation of methylene blue under visible light irradiation because of their strong surface plasmon resonance (SPR) effect. The catalytic results indicated the rate constant (k) was 1.63×10^{-1} min^{-1}, for Ag/AgBr. The enhanced photocatalytic performance of Ag/AgBr hybrid nanostructures was attributed to smaller bandgap (2.5 eV) and increased light absorption due to surface plasmon resonance (SPR) effect.