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Preparation, characterization, and catalytic activity of a magnetic photocatalyst (Fe_3O_4@TiO_2)

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ABSTRACT

Magnetic core-shell photocatalytic microparticles were synthesized by a simple precipitation (α-Fe_2O_3), heterocoagulation (α-Fe_2O_3@TiO_2), and magnetization (Fe_3O_4@TiO_2) methodology. Their specific surface area, average size, and average pore size were 202 ± 5.0 m^2 g^{-1}, 1.5 µm, and 7.0 nm, respectively. The microparticles photocatalytic activity was assessed using Acid Blue 9 (AB9) as a model-pollutant. By using 1.0 g photocatayst L^{-1}, 60% of the initial color of a 25 mg AB9 L^{-1} was removed in 120 min (whereas only a 14% color removal was observed by direct photolysis with a medium pressure mercury vapor lamp). The particles were magnetically separated from the dye solution (50 mL) in 2 min using an ordinary magnet. After ten reuse cycles, no perceivable photocatalytic activity losses occurred. Therefore, the synthesized microparticles behaved as a feasible magnetically-recyclable photocatalyst, at least regarding AB9 degradation.

Keywords: AOP; TiO_2; Magnetic photocatalyst; Core-shell; Acid blue 9

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