Photocatalytic Destruction of Dye in Aqueous Solution by TiO2-Based Composite Materials

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ABSTRACT

The objectives of this work are to prepare various TiO2-based composite materials using the photodeposition method, and to decompose different dyestuffs in aqueous solutions under UV irradiation. Several kinds of photocatalysts were synthesized, including TiO2/Al2O3, TiO2/GAC, Fe/TiO2/Al2O3, Ba/TiO2/Al2O3, and Sr/TiO2/Al2O3. Their physico-chemical characteristics were also analyzed by ICP-AES, BET, SEM/EDX, and XRD. Additionally, the optimum experimental conditions (including pH value, TiO2 loading, and initial dye concentration) were studied. The experimental results showed that the BET specific surface areas for the various photocatalysts are about 103~105 m2/g. As for the decay of dye concentration,rate equation of the pseudo-first-order reaction can be used to fit the data. It also revealed that the photocatalysts doped with metals (that is, Fe/TiO2/Al2O3, Ba/TiO2/Al2O3,andSr/TiO2/Al2O3) had greater reaction rates and could remove dyestuffs more effectively. In addition, For both dye solutions (AR27 and RR141), the optimum pH value and photocatalyst loading were found to be 3 and 0.05g, respectively.

Keywords : Photocatalytic reaction ; Photocatalysts ; TiO2 ; Dye ; Rate equation of pseudo-first-order reaction

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