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Hydrothermal Synthesis, Characterization and Photocatalytic Activity of Nanosized TiO₂ Based Catalysts for Rhodamine B Degradation

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Abstract: Nanosize crystalline TiO₂ and SiO₂/TiO₂ mixed oxide particles as a photocatalyst for rhodamine B dye (RB) degradation in aqueous media were synthesized by a hydrothermal process at 200 °C. They were characterized using XRD, SEM, FT-IR, UV/VIS and BET analysis. The effects of silica content on the crystallinity and photocatalytic activity of TiO₂ were investigated. Photocatalytic activity of the nano-TiO₂ was compared with that of SiO₂/TiO₂ mixed oxides at the same conditions for degradation of RB, and mixed oxide catalysts showed more effective catalytic activity than the TiO₂. The results revealed that photodegradation of RB proceeds by pseudo-first-order reaction kinetics where the rate constant, k, for degradation of 30 mg/L RB using the catalyst with 0.05 SiO₂/TiO₂ mole ratio is 0.133 min⁻¹.

Key Words: SiO₂/TiO₂ mixed oxides, hydrothermal process, photocatalyst, rhodamine B, photodegradation

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