

过程与工艺

Photodegradation of Methylene Blue in a Batch Fixed Bed Photoreactor Using Activated Carbon Fibers Supported TiO₂ Photocatalyst

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摘要 A batch fixed bed photoreactor, using felt-form activated carbon fibers (ACF) supported TiO₂ photocatalyst (TiO₂/ACF), was developed to carry out photocatalytic degradation of methylene blue (MB) solution. The effects of TiO₂ particle size, loaded TiO₂ amount, initial MB concentration, airflow rate and successive run on the decomposition rate were investigated. The results showed that photodegradation process followed a pseudo-first-order reaction kinetic law. The apparent first-order reaction constant k_{app} was larger than 0.047 min⁻¹ with half reaction time $t_{1/2}$ shorter than 15 min, which was comparable to reported data using suspended Degussa P-25 TiO₂ particles. The high degradation rate was mainly attributed to adsorption of MB molecules onto the surface of TiO₂/ACF. The photocatalytic efficiency still remained nearly 90% after 12 successive runs, showing that successive usage of the designed photoreactor was possible. The synergic enhancement effect in combination of adsorption with ACF and photodegradation with TiO₂ was proved by comparing MB removal rates in the successive degradation and adsorption runs, respectively.

关键词 [photodegradation, fixed bed photoreactor, activated carbon fibers, titanium dioxide, methylene blue](#)

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