Degradation of Dyeing Wastewater by the UV/TiO2 Process

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ABSTRACT

This study employed the UV/TiO2-based systems to evaluate the treatment efficiency and possibility of textile wastewater. The parent compounds were C.I. Reaction Red 198 (RR198) and C.I. Reaction Black 5 (RBK5). The parameters of this research were pH, dye concentration, TiO2 dosage, light intensity and wavelength and oxidant addition. The oxidants included hydrogen peroxide, sodium persulfate,
sodium periodate, sodium bromate and sodium chlorate.

This study indicated the most appropriate dosage of TiO2 was 1 g/L. The decolorization rate increased with the dye concentration and light wavelength decreasing, conversely, the decolorization rate increased as light intensity increased. The experimental results of pH effect showed the decolorization rate followed the order pH 4 > pH 7 > pH 10; additionally, RBK5 was more easy to decolorize than RR198. The photodegradation efficiency of UV/TiO2 system was promoted by the
addition of NaCl and Na2SO4.

In UV (254 nm)/oxidant systems, the decolorization efficiency increased with the dosage of oxidant increasing; however, sodium chlorate exhibited no photocatalytic ability. For UV/H2O2 system, the most appropriate dosage of H2O2 was 12 mM. In UV/TiO2/oxidant systems, only sodium periodate can accelerate the decolorization rate of UV/TiO2. The inhibition of dye decolorization by adding C2H5OH reveals that the primary decolorization pathway involves hydroxyl radicals, and that direct oxidation by photogenerated holes is probably important in the UV/TiO2-based system. In UV/H2O2 system, the decolorization pathway only involves hydroxyl radicals; however, in UV/Na2S2O8, UV/NaBrO3 andUV/NaIO4 systems, the oxidation of persulfate, bromate and periodate radicals cannot be ignore.

Keywords : TiO2、Photocatalytic、Hydrogen peroxide、Sodium Persulfate、Sodium Periodate、Sodium Bromate、Sodium Chlorate

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