Decolorization of textile wastewater by the hybird process of ultrasound/photo-fenton method

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ABSTRACT

This study discusses the effects of ultrasound (US) irradiation on the decolorization of C.I. Reactive Red 2 (RR2) in UV/Fenton and UV/Fenton-like systems. The used oxidants were H2O2 and Na2S2O8; additionally, the metal ions were Fe2+ and Fe3+. The effects of oxidant concentration, metal ion dosage, wavelength of UV light, US irradiation and the addition of radical scavenger were determined in this work. The experimental data indicated that the concentration of oxidant had a threshold limit for the decolorization of RR2. However, the decolorization rate of RR2 increased with the metal ion dosage increasing. This work found that the decolorization rate fitted with the pseudo-first-order kinetics. The irradiation of UV light promoted the decolorization rate of RR2 in Fenton and Fenton-like systems; moreover, the decolorization rate of 254 nm irradiation was higher than that of 365 nm. Under 0.01 mM metal ion addition, the decolorization rate followed the order US/Fenton (0.0710 min-1) > Fenton (0.0503 min-1) > US/Na2S2O8/Fe2+ (0.0217 min-1) > Na2S2O8/Fe2+ (0.0192 min-1) > US/H2O2/Fe3+ (0.0070 min-1) > US/Na2S2O8/Fe3+ (0.0049 min-1) > H2O2/Fe3+ (0.0020 min-1) > Na2S2O8/Fe3+ (0.0005 min-1). This study showed that the irradiation of US accelerated the decolorization rate of RR2 in Fenton and Fenton-like systems. The addition of C2H5OH inhibited the decolorization rate of RR2 in UV/US/Fenton and UV/US/H2O2/Fe3+ systems; hence, this research suggested that the hydroxyl radicals were the main oxidation reagents. However, the addition of C2H5OH did not terminate the decolorization of RR2 in UV/US/Na2S2O8/Fe2+ and UV/US/Na2S2O8/Fe3+ systems; accordingly, the oxidation of HO2 and sulfate radicals could not be ignored in UV/Fenton-like systems.

Keywords : Fenton、Fenton-like、ultrasound、ultraviolet、H2O2、Na2S2O8

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