



Decolorization and mineralization efficiency of the hetero-functional reactive dyes using advanced oxidation processes

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ABSTRACT

The current study was aimed at the decolorization and mineralization of six newly synthesized hetero-functional (vinyl sulfone and cyanuric chloride) azo reactive dyes (D-1 to D-6) using two advanced oxidation processes (Fenton and photo-Fenton). Results showed that both oxidation mechanisms effectively mineralized the synthesized hetero-functional azo reactive dyes. However, decolorization and mineralization of dyes through photo-Fenton oxidation were more effective than Fenton oxidation. The data revealed that process parameters (pH, Fe²⁺ dosage, concentration of H₂O₂, and reaction time) greatly affect the mineralization of the selected dyes. Decolorization efficiency (98%) and chemical oxygen demand (COD) removal (78%) was obtained for the six degraded azo reactive dyes under optimum conditions; pH (3), Fe²⁺ concentration (20 mg/L), H₂O₂ (500 mg/L), and contact time (80 min) using Fenton oxidation. On the other hand, 99% decolorization and 82% COD removal was achieved for the photo-Fenton oxidation process under optimum conditions of pH (3), Fe²⁺ (15 mg/L), H₂O₂ (300 mg/L), and irradiation time (60 min) for the six hetero-functional azo reactive dyes. From the above results, it was concluded, that both oxidation processes can be effectively employed for the degradation of the six hetero-functional azo reactive dyes.

Keywords: Decolorization; Mineralization; Reactive dyes; Fenton; Photo-Fenton

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