



Degradation of Acid Blue 113 by US/H₂O₂/Fe²⁺ and US/S₂O₈²⁻/Fe²⁺ processes from aqueous solutions

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ABSTRACT

Azo dyes can lead to a number of problems in the environment due to the presence of benzene rings in their structure. Therefore, the removal of these pollutants is necessary before being discharged directly into the environment. This experimental study aimed to evaluate the degradation capability of Acid Blue 113 (AB113) by the ultrasound (US)/H₂O₂/Fe²⁺ and US/S₂O₈²⁻/Fe²⁺ processes. The effects of variables like initial pH, Fe²⁺, H₂O₂ and S₂O₈²⁻ and initial AB113 concentrations on the removal efficiency were investigated using a 20-kHz batch ultrasound generator. The impact of aeration was also examined under optimum conditions; in addition, analysis of wavelength scan of AB113 dye was done. The results showed that the maximum rate of decolorization occurred at pH 3 for both processes. In US/H₂O₂/Fe²⁺ process, H₂O₂ (2.5 mM), Fe²⁺ (0.05 mM), and reaction time (45 min) were selected as the optimum conditions with a removal efficiency of 93.5%. Under the same conditions, 94.3% of the dye was removed via the US/S₂O₈²⁻/Fe²⁺ process. Moreover, aeration decreased the efficiency for both processes. Further, aeration improved the efficiency of US waves used solely. The highest change in the UV-Vis spectrum of AB113 was observed for US/H₂O₂/Fe²⁺, US/S₂O₈²⁻/Fe²⁺, S₂O₈²⁻/Fe²⁺, and H₂O₂/Fe²⁺.

Keywords: Ultrasound; Hydrogen peroxide; Persulfate; Acid Blue 113 degradation

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