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Degradation of Acid Blue 113 in aqueous solutions by the electrochemical advanced oxidation in the presence of persulfate

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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 structures. Therefore, the removal of these pollutants is necessary before being discharged directly into the environment. The aim of the present study was to investigate the efficiency of Persulfate ($S_2O_8^{2-}$) in the degradation of Acid Blue 113 (AB113) by electrically generated iron from the iron anode electrode. In the study, an electrolytic batch reactor equipped with four electrodes and a direct current power supply was used to degrade AB113. pH changes throughout the reaction, synergic effects of related parameters in the system and analysis of UV-Vis spectrum of AB113 were investigated under optimum conditions. The results showed that initial pH of the solution, initial concentration of $S_2O_8^{2-}$ and current density had a significant influence on the decolorization efficiency. The dye degradation was higher under acidic conditions and decreased by pH increase. After 2 min of reaction time at pH 3, 5, 7, 9 and 11, decolorization, efficiencies of 99, 66, 0, 0 and 13.5% were achieved, respectively. An increase in current density (0.625–15.625 A m^{-2}) increased dye removal. $S_2O_8^{2-}$ individually removed 17% of the dye after 2 min. In addition, under the same conditions, the electrochemical process individually showed 31% efficiency. However, electro/persulfate achieved decolorization efficiency by 99.8%. Thus, the use of this process can be a promising method for the operators of industrial wastewater treatment plants.

Keywords: Sulfate radical; Electro/persulfate; Activation; Iron electrode; Acid Blue 113

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