

Kinetics study and neural network modeling of degradation of Naphtol Blue Black by electro-Fenton process: effects of anions, metal ions, and organic compound

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Abstract: In the present work, the degradation of azo dye Naphtol Blue Black (NBB) in aqueous solution by electro-Fenton process was investigated. The results indicated that the degradation of NBB by electro-Fenton process followed the second-order reaction kinetics. The experimental results were also modeled by artificial neural network (ANN) with mean squared error of 10⁻⁵. This model was developed in Matlab using a feed forward back propagation network; multilayered perceptron. The input variables to the feed-forward neural network were as follows: initial Fe³⁺ concentration, initial pH, concentration of Na₂SO₄, temperature, applied current, and initial dye concentration. The degradation efficiency and rate constant were chosen as the experimental responses or output variables. The findings indicated that ANN provided reasonable predictive performance ($R^2 > 0.99$). Effects of additives such as anions, metal ions, and organic compound on the efficiency and on the rate constant of NBB degradation were also studied under optimum conditions.

Keywords : degradation, Electro-Fenton, Naphtol Blue Black, Artificial neural network