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OPTIMIZATION OF THE COMBINED UV/ELECTROCOAGULATION PROCESS FOR DYE REMOVAL FROM TEXTILE WASTEWATER USING RESPONSE SURFACE METHODOLOGY

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Abstract

In this study, response surface methodology (RSM) method was applied based on a five-level and four-variable central composite design. The optimization of the C.I. Direct Red 81 (DR81) removal by the combination of electrocoagulation (EC) and UV processes was also performed. The effect of initial pH, reaction time, current density and initial dye concentration on the dye removal was investigated to obtain the optimal experimental conditions. The optimal conditions with the dye removal of 95% were found to be at initial pH of 3.78, reaction time of 6.44 min, current density of 62 A/m² and initial dye concentration of 111.5 mg/L. The experimental value for dye removal (94.36%) was in a satisfactory agreement with the predicted value. The kinetic of dye removal was investigated at various initial pH and high correlation coefficients ($R^2 > 0.95$) indicated that the DR81 removal has followed second order kinetic model. The results showed that UV irradiation has enhanced the EC performance and COD removal efficiency. The results also indicate that the proposed combined method has a high efficiency and RSM experimental design is a proper method for modeling the removal processing of DR81.

Key words: C.I. Direct Red 81, electrocoagulation, optimization, response surface methodology (RSM), UV

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