

Optimization of the treatment of a real textile wastewater by coagulation–flocculation processes using central composite design

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ABSTRACT

The treatment of real textile wastewater by coagulation–flocculation (CF) using ferric chloride as coagulant and polymer as flocculant was optimized with the central composite design (CCD) based on response surfaces methodology. The independent variables considered were pH, coagulant, and flocculant dose. Their effects on the treatment were evaluated by the analysis of variance. The models are validated by the comparison between the predicted and experimental values, with a coefficient of determination reached a value above 93%, for all responses; removal efficiency of chemical oxygen demand (COD), biological oxygen demand (BOD₅), turbidity, and color. The graphical representations of the models in the space of the variables enable us to determine the optimal conditions, which are pH = 8.1, a dose of FeCl₃ = 0.8 g/L and a dose of flocculant = 2.6 mL/L. Under these conditions, the removal efficiency of COD, turbidity, color, and BOD₅ achieved 95%, 92%, 96%, and 60% respectively.

Keywords: Real textile wastewater; Coagulation–flocculation; optimization; Central composite design; Surface response methodology; Turbidity; COD; BOD₅; Color

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