Simultaneous removal of natural organic matter and turbidity from Oued El Harrach River by electrocoagulation using an experimental design approach

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\textbf{ABSTRACT}

In this study, the application of full factorial design and a surface response methodology was used to model the two-factor influence. Time and current intensity on bacterial biomass, color, turbidity, and natural organic matter (NOM) removal from Oued El Harrach River were discussed. A factorial experimental design was used to investigate the bacterial biomass and color removal from Oued El Harrach River situated in northern Algeria which is treated by electrocoagulation using iron plate electrodes. However, a response surface methodology (RSM) was used to reduce the turbidity and NOM. The bacteria removal efficiency was determined after 30 min of treatment. The combined effects of operating parameters on removal turbidity and NOM were also analyzed. A regression model was found to fit the experimental data very well. Besides, the results were statistically analyzed using the student’s $t$-test, analysis of variance, $F$-test, and lack of fit in order to define the most important process variables affecting the removal of bacteria biomass, color turbidity, and NOM from Oued El Harrach River. The predicted results using factorial regression model showed high regression coefficient values (i.e. $R^2_{\text{bact}} = 0.9687$ and $R^2_{\text{col}} = 0.9983$) which are in substantial agreement with experimental data. On the other hand, predicted values of turbidity and NOM obtained from central composite model were in close agreement with the experimental values (i.e. $R^2_{\text{turb}} = 0.9442$ and $R^2_{\text{NOM}} = 0.9432$). This study proved that factorial design and RSM could efficiently be applied for the wastewater treatment modeling by electrocoagulation process.

\textit{Keywords:} Bacteria; Electrocoagulation; Factorial design; Response surface; Water treatment