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Acid Blue 74 removal from aqueous solutions by EC/GAC coupling: a multi-objective optimization approach based on a hybrid NN-GA

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ABSTRACT

A hybrid approach based on neural networks and genetic algorithms was employed to develop a novel multi-objective procedure. Acid Blue 74 (AB74) removal by granular activated carbon/electrocoagulation (GAC/EC) coupling operated in alternating pulse current mode was investigated. Five independent variables, namely current density, GAC dose, initial pH value, initial AB74 concentration and GAC/EC time, were investigated. The dependent variables, that is, total organic carbon (TOC) removal efficiency, unit energy demand, and unit electrode material demands (Fe or Al), were considered. Six optimization cases are discussed by assuming different constraints. The optimal conditions for three imposed values of removal efficiency (80%, 90% and 97%) within the experimental region and at the highest level of GAC dose were analyzed. Under optimal conditions, 97% TOC removal efficiency was obtained for 0.2 g/L of dye solution by applying a current density of 86.9 A/m^2 for only 18.83 min and adding a GAC dose of 0.88 g/L.

Keywords: Electrocoagulation (EC); Coupling process; Multi-objective optimization; Acid Blue 74; Alternating pulse current; Neural networks-genetic algorithms (NN-GA)

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