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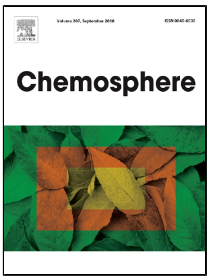

Modeling and optimizing Acid Orange 142 degradation in aqueous solution by non-thermal plasma

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Abstract

The effects of the high voltage electrode material, initial pH of the solution, initial concentration of Fe^{2+}, and time of plasma treatment on the efficiency of Acid Orange 142 (AO142) degradation were studied and evaluated. Furthermore, based on the Box–Behnken response surface methodology (BBD-RSM), a model between response (decolorization efficiency %) and influencing factors was proposed to estimate the interactive effects and optimize the process conditions. The proposed model was adequate with an R^2 of 0.8005 which is in reasonable agreement with the R^2_{adj} of 0.9307. According to the model, the optimum conditions were steel as a high voltage electrode, an initial pH 3.0, an initial Fe^{2+} concentration 0.9 mM, and 20 min time of treatment to obtain a decolorization efficiency of 95.05%. In addition, the analytical results of UV-Vis, FT-IR, TOC and GC-MS indicated the degradation of the dye molecule.

Keywords: water treatment; advanced oxidation process; plasma discharge; optimization; hydrogen peroxide.