Direct Blue 71 removal by electrocoagulation sludge recycling in photo-Fenton process: response surface modeling and optimization

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\textbf{ABSTRACT}

Feasibility of RSM-optimized electrocoagulation (EC) sludge recycling was studied in photo-Fenton (PF) process for the removal of Direct Blue 71. By EC process, relatively complete decolorization was obtained in pH 8, 20 min, and 150 mA. The produced sludge, in EC process, was evaluated to be used and recycled in PF process experimental runs for two major targets: (1) Degradation of EC sludge as an environmental, concerning by-product; (2) Application of iron species resulted from anodic dissolution during EC process to play the role of catalyst in PF process. PF process was investigated based on the effects of EC sludge volume (total iron) and hydrogen peroxide concentration on decolorization. Besides, the effect of EC sludge recycling on decolorization and mineralization (TOC decrement) was studied. In optimum conditions of PF process (pH 3, 200 mg/L H\textsubscript{2}O\textsubscript{2}, 20 mL EC sludge and 30 min reaction time in the first run), 96.27% decolorization was achieved. In the same conditions, but in 10 min, 67.5% TOC removal was obtained.

\textit{Keywords:} Electrocoagulation; Sludge recycling; Direct Blue 71; Photo-Fenton