Uptake of acid blue 113 dye from aqueous solution by sludge/floc nanoparticles in electrocoagulation process

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ABSTRACT

Electrocoagulation (EC) process has been used for uptake of acid blue 113 (AB113) dye as a hazardous pollutant. The operating parameters of EC process by application of iron (anode)/aluminum (cathode) as the electrodes were optimized by considering the effect of initial dye concentration, initial pH, current density, electrolyte concentration, water reclamation yield, type of current (direct current (DC) and square pulse current (SPC)), electrical energy and specific electrical energy consumption (SEEC). The results indicated that SPC was found distinctive to DC for the AB113 dye removal by EC based on significantly high values of dye uptake (%), water reclamation yield and energy economization. The dried sludge/floc was characterized by scanning electron microscopy (SEM), energy dispersive analysis of X-ray (EDAX), X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR). The dried sludge/floc was in the form of nano pseudo sphere of iron and aluminum hydroxide particles. The dye adsorption results were treated by several adsorption isotherms equations and it was found that the Sips isotherm equation indicated the best fit to the obtained results. Also among the rate equations, it was found that the pseudo-second-order rate equation properly expressed the rate of the dye adsorption.

Keywords: Acid blue113; Electrocoagulation; Sludge/floc nanoparticles; Square pulse current