

Electrosorption of cadmium ions from the aqueous solution by a MnO₂/carbon fiber composite electrode

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ABSTRACT

The nanostructured MnO₂/carbon fiber (CF) composite electrode was prepared using the anodic electrodeposition process. The crystal structure and morphology of MnO₂ particles were determined with X-ray diffraction and field-emission scanning electron microscopy. The electrosorptive properties of the prepared electrode were investigated in the removal of cadmium ions from aqueous solution, and the effect of pH, cell voltage, and ionic strength was optimized and modeled using the response surface methodology combined with Box–Behnken design. The results confirm that the optimum conditions to remove Cd(II) ions were: pH of 6.03, a voltage of 2.77 V, and NaCl concentration of 3 g/L. The experimental results showed a good fit for the Freundlich isotherm model and the pseudo-second-order kinetic model.

Keywords: Cadmium ions; Carbon fiber; Electrodeposition; Electrosorption; Nanostructured manganese dioxide

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