Study of congo red adsorption onto chitosan coated magnetic iron oxide in batch mode

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ABSTRACT

The adsorption behavior of congo red (CR) on a magnetic composite (chitosan coated magnetic Fe₃O₄ particle) was studied as a function of initial solution pH, salt concentration, contact time, initial concentration of CR in batch mode. Change of solution pH, adsorption isotherms and their thermodynamic parameters \(\Delta G^0, \Delta H^0, \Delta S^0\) were discussed. There was little effect of initial pH and salt concentration. The experimental data were fitted to Langmuir, Freundlich, Temkin, Koble–Corrigan and Toth isotherm models. It was found that the Langmuir, Koble–Corrigan and Toth models provided good correlation. The adsorption capacity of CR was obtained from the Langmuir model and found to be 42.62, 55.68, 56.66 mg/g⁻¹ at 295, 305, 315 K, respectively. The thermodynamic parameters indicated spontaneous and endothermic process. It was concluded that the adsorption process was main chemical adsorption and the dye-loaded adsorbent can be reused by regeneration with dilute NaOH solution.

Keywords: Congo red; Chitosan coated magnetic iron oxide; Isotherm; Thermodynamic parameters; Adsorption; Regeneration

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