



Adsorption of Congo red onto mesoporous carbon material: equilibrium and kinetic studies

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ABSTRACT

In the present study, adsorption of Congo red dye on carbon mesoporous surface has been investigated. Mesoporous carbon CMK-3 adsorbent with high surface area and large pore volume was prepared and its textual and structural properties were characterized by X-ray powder diffraction patterns (XRD) and nitrogen physisorption isotherms. Adsorption experiments were carried out as batch studies at different contact time, pH, initial dye concentration and salt concentration. The dye adsorption was rapidly attained after 60 min of contact time. Removal of dye in acidic solutions was better than in basic solutions. The adsorption of dye increased with increasing initial dye concentration and salt concentration. The equilibrium data were analyzed by the Langmuir, Freundlich and Temkin models, which revealed that Langmuir model was more suitable to describe the Congo red adsorption than other models. Experimental data were analyzed using pseudo-first-order, pseudo-second-order, elovich and intra-particle kinetic models. It was found that kinetics followed a pseudo-second-order equation. Thermodynamic study showed that the adsorption was an exothermic process.

Keywords: Congo red; Carbon mesoporous; CMK-3; Adsorption; Equilibrium isotherm; Kinetic

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