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Adsorption behavior of chromium(VI) on activated carbon from eucalyptus sawdust prepared by microwave-assisted activation with $ZnCl_2$

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ABSTRACT

Activated carbon (AC) was prepared from eucalyptus sawdust by microwave-assisted activation with $ZnCl_2$ and utilized for removing chromium(VI) from an aqueous solution with a concentration of 10–80 mg L^{-1} and a temperature of 30–60°C. The effects of pH, contact time, initial concentration of Cr(VI) and temperature on adsorption, as well as the thermodynamics and kinetics were investigated. The results were as follows: (1) The adsorption capacity of Cr(VI) was dependent on pH and initial concentration as the equilibrium time increased, but the Cr(VI) removal percentage decreased with an increase in the initial Cr(VI) concentration; (2) The adsorption process was in good agreement with the Langmuir adsorption isotherm model at 30°C and the Freundlich adsorption isotherm model at 45 and 60°C; (3) Adsorption thermodynamic parameters ΔH°, ΔS°, and ΔG° indicated that Cr(VI) adsorption on AC was a spontaneous and endothermic process with increased randomness at the solid–solution interface; (4) Cr(VI) adsorption on AC followed a pseudo-second-order equation at 30, 45, and 60°C fitted into an intraparticle diffusion model at 30 and 45°C, and it followed a pseudo-first-order equation only at 60°C and at Cr(VI) concentrations of 10 and 20 mg L^{-1}.

Keywords: Activated carbon; Cr(VI) adsorption; Isotherms model; Adsorption thermodynamics parameters; Adsorption kinetics model

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