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Adsorption of Cr(VI) from aqueous solution by prepared high surface area activated carbon from Fox nutshell by chemical activation with H₃PO₄

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Highlights

- Cr(VI) adsorption study onto prepared activated carbon with H₃PO₄ activator.
- The maximum adsorption capacity of Cr(VI) is 74.95 mg/g.
- The adsorption process is endothermic and spontaneous one.
- A maximum removal of 71.86% is achieved in the column study.

Abstract

Adsorption studies of Cr(VI) onto activated carbon, FNAC-700-1.5 (BET surface area of 2636 m²/g and total pore volume of 1.53 cm³/g), prepared from Fox nutshell by chemical activation with H₃PO₄ at an impregnation ratio of 1.5 and activation temperature of 700 °C under N₂ atmosphere were carried out in the present work. In batch adsorption experiments the effect of agitation speed, pH, temperature, adsorbent dosage, initial concentration of Cr(VI), and contact time were studied. Also adsorption kinetics, equilibrium, and thermodynamics of Cr(VI) adsorption were studied. The adsorption was found to follow the pseudo second order model. A maximum adsorption of 74.95 mg/g was obtained at the operating condition of 35 mg/L of initial concentration of Cr(VI) at pH of 2.0, temperature 45 °C and contact time of 3 h. Thermodynamic parameters such as ΔG° , ΔH° and ΔS° were calculated by using Van't Hoff equation. The adsorption process was endothermic and spontaneous one. In column experiments, the effects of the bed height of the packing material and flow rate of Cr(VI)

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