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REMOVAL OF HEXAVALENT CHROMIUM USING TWO INNOVATIVE ADSORBENTS

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Abstract

Hexavalent chromium Cr(VI), a constituent of wastewater from many industries, is regulated by the Environmental Protection Agency (EPA) as one of the priority pollutants. Adsorption is an important technique that can be used for Cr(VI) removal from wastewater. The challenge in adsorption techniques is to find a cheap, widely available adsorbent that has a high adsorption capacity to Cr(VI). Dates stones (DS) and palm fiber (PF) are two agricultural wastes that are produced from palm trees. These adsorbent materials were tested in batch systems to investigate the different factors that may affect the adsorption process, e.g. adsorbent dose, initial adsorbate concentration, pH of aqueous solution and agitation time. Equilibrium models tested include Langmuir, Freundlich, Temkin and Dubinin-Radushkevich. Freundlich adsorption isotherm was found to best fit the experimental data. The maximum adsorption capacities obtained for DS and PF were 16 and 6 mg/g, respectively. Kinetic studies indicated that the adsorption of Cr(VI) on both DS and PF was fast in the first stage of the adsorption process. The equilibrium was reached in less than 2 h for both adsorption systems. The adsorption process was found to be second order with both adsorbent and adsorbate concentration to affect the adsorption process. Film diffusion and intraparticle diffusion models were found to simultaneously influence the adsorption. The adsorption process was found to be favorable and of physical nature.

Key words: adsorption, chromium (VI), dates stones, kinetics, palm fiber, thermodynamic

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