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BIOSORPTION OF LEAD(II) FROM AQUEOUS SOLUTIONS USING ADSORBENTS PREPARED FROM PEANUT HULLS, SOYBEAN SHELLS AND GRAPEFRUIT PEELS

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Abstract

Equilibrium and kinetics of biosorption of lead(II) from aqueous solutions by local low-cost agricultural by-products – peanut hulls, soybean shells and grapefruit peels were compared to develop high-efficient and low-cost biosorbents for removal of lead(II) from wastewater. Batch kinetics showed adsorption equilibrium at about 90 min and the adsorption process for the three biosorbents was better represented by the pseudo-second-order model than the pseudo-first-order model. Batch equilibrium data were fitted by using Langmuir, Freundlich, and Dubinin–Radushkevich (D–R) isotherm models, and the Langmuir isotherm equation were fitted better than other models, which yielded Langmuir maximum uptake values of 23.8, 45.5 and 76.9 mg g^{-1} for peanut hulls, soybean shells and grapefruit peels, respectively. Thermodynamic parameters – free energy (ΔG^0), enthalpy (ΔH^0) and entropy changes (ΔS^0) indicated the spontaneous, exothermic and random adsorption for peanut hulls and grapefruit peels while reverse for soybean shells. Therefore peanut hulls, soybean shells and grapefruit peels can be used as low-cost biosorbents for the removal of lead(II) from aqueous solutions.

Key words: biosorbent, equilibrium, isotherms, kinetics, lead(II), removal

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