



Kinetic and thermodynamic study of cobalt adsorption by spent coffee

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ABSTRACT

The biosorption of cobalt from aqueous solution onto a spent coffee (SC) was carried out to assess the effectiveness of the adsorbent used in the removal of Co(II) from aqueous solution by batch tests. Adsorption of Co(II) as a function of contact time, pH, and temperature was investigated. The kinetic study revealed that adsorption followed better a second-order type reaction with high correlation coefficient ($R^2 = 0.999$). Adsorption data were described using Freundlich and Langmuir models. The thermodynamic study for the Co(II) adsorption onto SC showed that the process was spontaneous with a raised affinity for Co(II) ($\Delta G^\circ < 0$ and $\Delta S^\circ > 0$), exothermic ($\Delta H^\circ < 0$), and occurred with physical adsorption mechanism ($E_a = 10.922 \text{ kJ mol}^{-1}$).

Keywords: Cobalt; Adsorption; Kinetics; Thermodynamics

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