



## Biosorption of hexavalent chromium onto wood apple shell: equilibrium, kinetic and thermodynamic studies

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### ABSTRACT

The biosorption of Cr(VI) onto wood apple shell, batch adsorption experiments have been studied. Equilibrium adsorption isotherms, adsorption kinetics and thermodynamic parameters have been analyzed. The Langmuir monolayer adsorption capacity of wood apple shell for Cr(VI) was determined and was found to be 28.81, 29.58 and 31.45 mg g<sup>-1</sup> at 299, 309 and 319 K, respectively. The analyzed kinetic data were following the pseudo-second order model. The thermodynamic parameters, such as Gibbs free energy change ( $\Delta G^\circ$ ), enthalpy change ( $\Delta H^\circ$ ) and entropy change ( $\Delta S^\circ$ ) were calculated and interpreted. The negative value of Gibbs free energy change and positive value of enthalpy change indicate that biosorption is spontaneous and endothermic in nature, respectively. The standard zero free energy temperature ( $T^\circ$ ) of biosorption process is 274.6 K. Infrared spectroscopy study revealed the mechanism of Cr(VI) biosorption on powdered wood apple shell. Wood apple shell powder was shown to be a promising biosorbent for Cr(VI) removal from aqueous solutions.

*Keywords:* Wood apple shell; Biosorption; Chromium; Isotherms; Kinetics; Thermodynamics

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