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REMOVAL AND RECOVERY OF Al(III) AND Cr(VI) FROM AQUEOUS SOLUTION BY WASTE BLACK TEA

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Abstract

In this study the immobilized waste black tea (*Camellia synensis*) was used as biosorbent for the removal and recovery of Al(III) and Cr(VI) ions from the synthetic aqueous solutions. Batch experiments were conducted to optimize the various biosorption parameters that affect the biosorption capacity of immobilized waste black tea. Maximum biosorption capacity was found with a biosorbent dose of 0.1g/100 mL for both metal ions. Optimum biosorption capacity for both Al(III) and Cr(VI) ions was observed at pH 2.0. The Langmuir adsorption isotherm and pseudo-second-order model could be better used to fit the biosorption process and kinetics, respectively. Biosorption thermodynamic parameters such as enthalpy (ΔH), free energy (ΔG) and entropy change (ΔS) were determined. The results showed that biosorption of both Al(III) and Cr(VI) ions on immobilized waste black tea was spontaneous and feasible at room temperature and decreased with increase in temperature. Desorption results showed that about 97 % of the adsorbed Al(III) and Cr(VI) ions could be desorbed with 1.0 M NaOH solution as compared to other desorbing agents used in this study. Cyclic study was also conducted to check the reusability of biomass and the results revealed that the biomass could be used up to five cycles. Fourier transform infrared spectroscopy (FTIR) revealed the presence of possible functional groups involved in the biosorption process. The study revealed that waste black tea could be used as efficient biosorbent for separation and recovery of toxic metal ions from wastewater.

Key words: black tea, immobilization, isotherms, regeneration, thermodynamics

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