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Thermodynamic and Dynamic of Chromium Biosorption by Pectic and Lignocellulocic Biowastes

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ABSTRACT

Orange peel (OP) and rice husk (RH) were tested as low-cost biosorbents for Cr(III) removal from aqueous solutions. Dynamics of the biosorption process indicated that intraparticle mass transfer represents the rate-limiting step in the system that attained equilibrium at 120 min. While the OP sorbent material was capable of taking up 39.11 mg Cr(III)/g at the optimum pH 4.4, RH immobilized 3.20 mg Cr(III)/g at the optimum pH 3.0. The fitting of different sorption isotherms models resulted in the best fit with the Langmuir isotherm model. The mean free energy of the metal sorption process was in the range of 8-16 kJ/M. Abiotic Cr(VI) reduction was observed at various contact times and Cr-laden biomass was characterized by XPS, XAFS and EPR spectroscopy. These instrumental analyses confirmed that Cr(VI) removed from the solution was reduced and bound to the biomass as Cr(III). Results indicated that OP and RH materials are efficient biosorbents for eliminating Chromium from aqueous solutions.

KEYWORDS

Chromium, Adsorption, Orange Peel, Rice Husk

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