

Adsorption of copper ions onto the surface of modified cellulose

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ABSTRACT

This study employed the modified cellulose to adsorb copper ions from aqueous solution. The surface modified agents included citric acid, phosphate acid and sulfate acid. The effects of modified agent concentration (0.3, 0.6, 0.9 and 1.2 M), modified temperature (90, 120, 150 and 180 °C), modified time (60, 120, 180 and 180 min) were evaluated for the adsorption of copper ions onto the surface of modified cellulose. Moreover, the influences of pH (3, 4 and 5), modified cellulose dosage (0.5, 1.0 and 2.5 g/L), copper ions concentration (10, 20 and 40 mg/L) and temperature (15, 25 and 35 °C) were also investigated in this work. The surface characteristics of raw and modified cellulose were determined by SEM, BET, FTIR and zeta potential. The specific surface area of modified cellulose was greater than that of raw cellulose; additionally, the zeta potential of modified cellulose was lower than that of raw cellulose. Bangham's equation, pseudo-first-order kinetic model, pseudo-second-order kinetic model and intraparticle diffusion model were used to simulate the kinetic adsorption; moreover, Langmuir, Freundlich, Redlich-Paterson, Dubinin-Radushkevich and Temkin isotherms were employed to simulate the equilibrium adsorption. The experimental results indicated the adsorption percentage of copper ions onto the surface of modified cellulose increased with pH and cellulose dose increasing. Experimental results reveal that the affinity of modified cellulose for copper ions increased as temperature increased, suggesting that adsorption of copper ions onto modified cellulose is endothermic. Based on analyses of thermodynamic parameters, adsorption of copper ions onto modified cellulose was driven by a physisorption process. The H_0 and S_0 were 11.85 kJ/mol and 130 J/mol.K, respectively. Activation energy (E_a), H_0 , and G_0 suggested that adsorption of copper ions onto modified cellulose was via physisorption.

Keywords : Surface of Modified Cellulose、Adsorption、Copper Ions

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