

Sorption of cadmium and lead from aqueous solutions by spent grain

ABSTRACT

The sorption of cadmium and lead from aqueous solutions by spent grain, a by-product of the brewing process, was investigated. The effects of solution pH, ionic strength, initial concentration, ligands and temperature were studied in batch experiments. The equilibrium process was described well by the Langmuir isotherm model with maximum sorption capacities of 17.3 and 35.5 mg/g of cadmium and lead on spent grain, respectively. The enthalpy of sorption was endothermic and the increase in Pb uptake was larger than that of Cd over the same rise in temperature. The initial uptake was rapid and equilibrium was established in less than 120 min. Good correlation coefficients were obtained for the pseudo second-order kinetic model. Equimolar concentrations of Cd and Pb to ethylenediamine tetraacetic acid and nitrilotriacetic acid almost completely suppressed the uptake of metals. Sorption capacities of spent grain for cadmium and lead were compared with some low-cost biological materials.

Keyword: Sorption; Cadmium; Lead; Spent grain