Desalination and Water Treatment, 2015, pages 12

Removal of Ni(II), Zn(II) and Pb(II) from aqueous solutions using cation-exchange resin in fixed-bed column

Abstract

Breakthrough curves for the removal of Ni(II), Zn(II), and Pb(II) from aqueous solutions using cation exchange resin (Dowex 50W) were determined at dynamic conditions in a fixed-bed column under ambient temperature. The experiments and data obtained were designed and analyzed using response surface methodology, respectively. Three operating parameters: flow rate (15–25 mL min^{-1}), pH (3–9), and bed height (3–5 cm) were investigated. Fixed-bed adsorption models namely Thomas model and Bohart–Adam model were adopted to describe the dynamics of metal adsorption in the column. The obtained experimental data were fitted to these models based on the kinetic constant k_{BA}(mg min cm^{-3}), k_{TH} (cm^3 mg^{-1} min), the maximum amount of metal exchange N_0 (mg cm^{-3}), and the maximum adsorption capacities q_tm (mg), accordingly. The Thomas model was found to best fit all the experimental conditions studied with correlation coefficients of 0.91, 0.97, and 0.92 for Ni(II), Zn(II), and Pb(II), respectively.

Keywords

Bohart–Adam model; Cation exchange resins; Heavy metal; Thomas model