

Modeling of Nanofiltration of low concentration Pb(II) aqueous solutions Using a Coupled Concentration Polarization and Pore Flow Model

sufyan Fadhil

Abstract

In this paper, the performance of nanofiltration membrane process in removing Pb(II) from aqueous solution was modeled by the pore flow-concentration polarization model. The model was fabricated based on the simultaneous resolving of Extended Nernst–Planck equation (ENP), film theory, and osmotic pressure model. The effects of various operational parameters such as the applied pressure, feed concentration, and cross-velocity on lead Pb(II) ion rejection and solvent flux were investigated. The applied pressure, feed concentration, and cross-velocity varied between 10-50 bar, 5-15 ppm, and 0.2-1.2 m/s, respectively. It was found that lead rejection increased initially and reached the maximum value; then, it decreased with a further increase in pressure, while solvent flux increased linearly within the whole pressure range. This phenomenon is attributed mainly to the developed concentration polarization layer. This effect was significantly decreased with increasing cross-velocity to 1.2 m/s. Ultimately, the proposed model successfully predicted the filtration process in terms of real and observed rejections as well as solvent flux