

A Numerical Study on Concentration Polarization of Spiral Wound RO Membrane Modules

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An unsteady-state model was formulated and checked for numerical stability and convergence. In addition, the model was simplified to apply the analysis of RO membrane fouling. In this study, synthetic NaCl solution was used to investigate the effect of operating pressure, number of elements, feed concentration, operating temperature and recovery ratio, on the loss of initial permeate flow, using a 2.5 inch pilot-scale spiral wound RO unit, with a processing capacity of 1.47 m³/d. Initial permeate flow significantly decreased with the increase in operating pressure from 4 to 10 kg_f/cm², at constant feed concentration (1,600 μs/cm), temperature and in the absence of recirculation. Excellent fitness was found between the numerical simulations and experimental observations of the average permeate fluxes.