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DEMINERALIZATION OF WATER WITH MIXED-LAYER ION-EXCHANGERS

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Abstract

This paper develops a procedure whereby breakthrough curves obtained experimentally for ion exchange process in fixed bed ion mixed exchangers during water demineralization, can be used to characterize quantitatively and optimize the ion exchange process. In this regard, based on breakthrough curves there were developed statistical models that correlate three important factors which influence the process (superficial fluid velocity through the layer, changing layer height, operating temperature), the volume of water processed until breakthrough point appears, and the effectiveness of using resin. An experimental plant was designed and built to laboratory-pilot scales for water demineralization with online monitoring of temperature, flow and dynamics concentration of calcium ions in effluent. The experimental setup contains ion exchange alternative layers: Purolite A400 + Purolite C100. The experimental data were acquired based an experimental program. The process factors selected were: the flow rate of solution through the exchanger layer, the total volume of ion exchangers and working temperature and the responses of the process during the saturation and efficiency ion exchange process, as evidenced by the volume of demineralized water obtained in each of the cases considered. The system responses during the ion exchange process were determined from the breakthrough curves, and then processed according to the specific algorithm of the experimental program. A mathematical model was proposed, based on the piston flow model with axial dispersion in the liquid phase, having the parameters estimated based on experiments.

Key words: anionite, cationite, demineralization, ion exchange, resin penetration

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