Optimization of the electrodeionization process: comparison of different resin bed configurations

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ABSTRACT

Optimization of the EDI resin bed poses a serious challenge for the design. This research work deals with this optimization problem. It is based on the comparison of five different configurations (homogenous/mixed, cationic, anionic, inert and two layers ordered bipolar beds). The performance of the EDI systems was evaluated in terms of removal efficiency (RE), current efficiency (CE), power consumption (P) and was evaluated by the comparison of I–V curves. The ionic mobility was also calculated using Nernst–Planck equation. Our results are summarized by this efficiency order: two layers ordered bipolar bed > homogenous mixed bed > cationic bed > anionic bed > inert bed. This is particularly due to the bipolar effect between resin layers and the polarization decrease at the cation-exchange membrane and anion-exchange membrane surfaces.

Keywords: Electrodeionization; Efficiency; Ion exchange; Electrodialysis

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