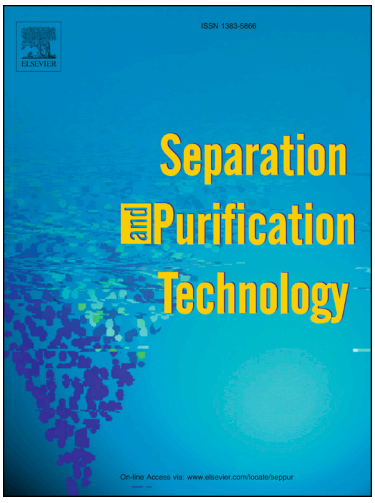

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Sustainable treatment of desulfurization wastewater by ion exchange and bipolar membrane electrodialysis hybrid technology

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Graphical abstract

Highlights
Adsorption of Ca2+ and Mg2+ in desulfurization wastewater were systematically investigated using three chelating resins.
Effluent of ion exchanger is pure enough to meet the demand of BMED stack.
High-purity acid and base were generated by ion exchange and BMED hybrid technology.
Product acid and base were effective in regenerating and transforming the saturated chelating resins.

Abstract

Residual Ca^{2+} and Mg^{2+} in chemically softened desulfurization wastewater may form hydroxides which block the pores of cationic exchange membranes (CEM) during bipolar membrane electrodialysis (BMED) used for acid and base recovery. In this study, ion exchange was investigated as a polishing treatment prior to BMED for sustainable treatment of desulfurization wastewater. Adsorption of Ca^{2+} and Mg^{2+} from desulfurization wastewater was investigated using three chelating resins (Amberlite IRC 747, Lewatit TP 208 and Lewatit TP 260) in batch adsorption studies as a function of contact time (0- 720 min), solution pH (6.0- 11.0), salinity (35- 140 g L^{-1}) and temperature (298- 318 K). Langmuir isotherm fitted the experimental data better than Freundlich isotherm, and the pseudo second-order kinetics describe the adsorption