

Pressure retarded osmosis from hypersaline solutions: Investigating commercial FO membranes at high pressures

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Abstract

The hypersaline PRO process was investigated in laboratory scale at pressures up to 70 bar and draw solution salinities up to 5 M NaCl to evaluate the power potential and the practical application of the process. Five commercial FO membranes were tested to evaluate the potential of different types of FO membranes, but also the potential of applying already existing membranes in the hypersaline PRO process. The results showed that with commercially available FO membranes, the PRO process could be operated at pressures up to 70 bar with power densities significantly above the 5 W/m², which is the estimated cost efficiency level. Of the tested membrane materials, the cellulose membranes showed highest performance at pressures above 20 bar. Below this pressure, the highest performance was found with the thin film membranes. This study also showed that high pressures negatively influenced the membrane resistance and salt permeability, which therefore should be focus points in future development of high pressure PRO membranes.