Lithium selective extraction from old Tunisian sea waters using nanofiltration membranes

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Résumé

We will focalize on the main role play by hydration for selective elimination (partial or total) of Ca2+/Mg2+ vs Li+ in presence of Na+, Cl-, with different nanofiltration membranes under different operating conditions (molecular weight cutoff, ionic strength, transmembrane pressure, membrane material, fouling agents).

The possibility to separate lithium from salt lake brines from Tunisians Chotts, using NF and low pressure reverse osmosis membranes was studied. NF90 membrane compared to the XLE appeared more efficient for Li+ extraction due to its higher hydraulic permeability to pure water and also for a 0.1 M NaCl solution, its lower critical pressure ($P_c = 0$), its higher selectivity between monovalent ions (40%) obtained at low operating transmembrane pressure (below 15 bar). NF90 exhibited 100% rejection of magnesium in a first step separation from brine diluted ten times as only 15% for Li+, with a final separation between Mg2+/Li+ of 85%. The permeability to the diluted brine was 0.7 L.h–1.m–2.bar–1 usable to size full scale experiments in the future in order to extract lithium i.e. battery industry. In a second step we have succeeded to separate totally Li+ and Na+ by a dialysis separation with NF90. We obtained a total separation between Li+ and Na+ with few membranes tested with a 5 times higher diffusion flux ($4.42 \times 10^{-7}$ mol.s–1.m–2 at 20 °C with NaCl 0.1 M) for the NF90 vs XLE, [1].


Mots-Clés: brines, lithium extraction, nanofiltration, reverse osmosis

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