WP4.1.2 – Selective-ion separations

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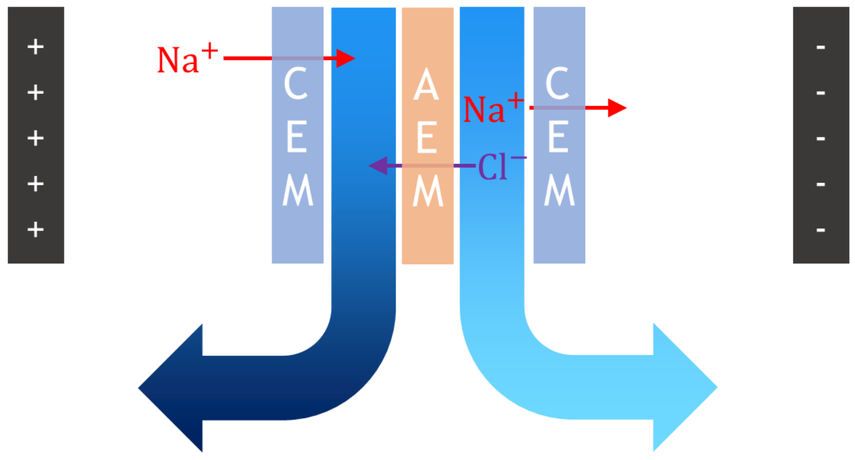
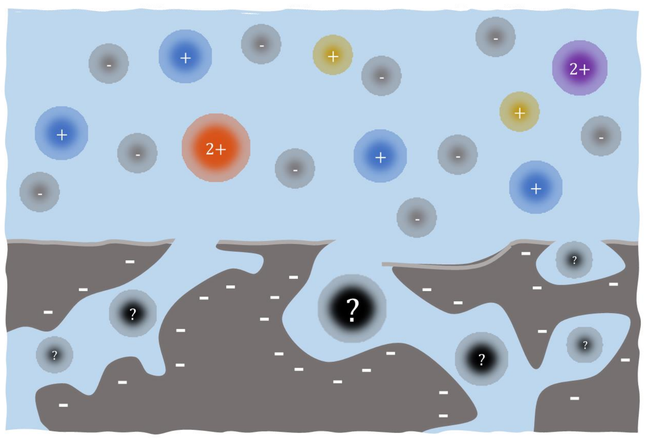
Background

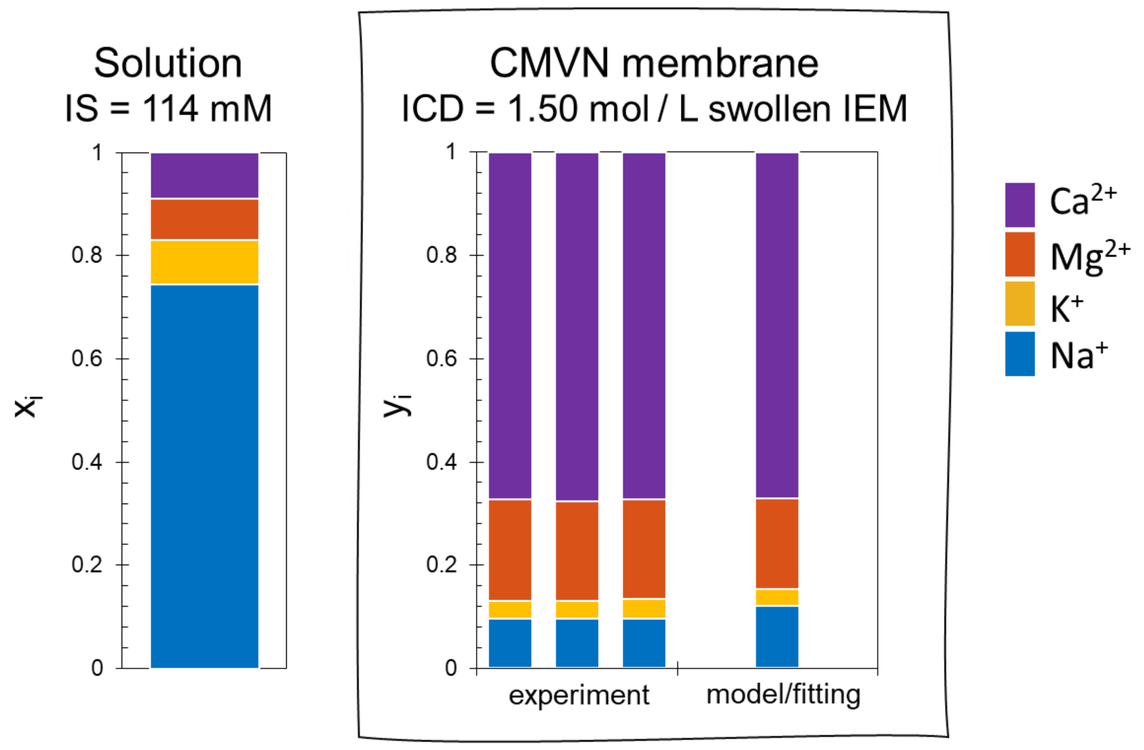
Currently, several technologies are commercially available to reduce water salinity. However, salinity is not the only water quality indicator of interest. For effective water re-use, technologies are required to control the ionic composition of water, i.e., selective removal of a concerned ionic species. In this project, we investigate the electrodialysis technology for selective-ion separations.



Results

- We investigated the ion equilibrium and transport across ion-exchange membranes.
- The transport selectivity for one ion over another is governed by their equilibrium affinities as well as their mobilities inside the membrane.
- General affinity sequence inside cation-exchange membranes: $Ca^{2+} > Mg^{2+} > K^{+} > Na^{+}$



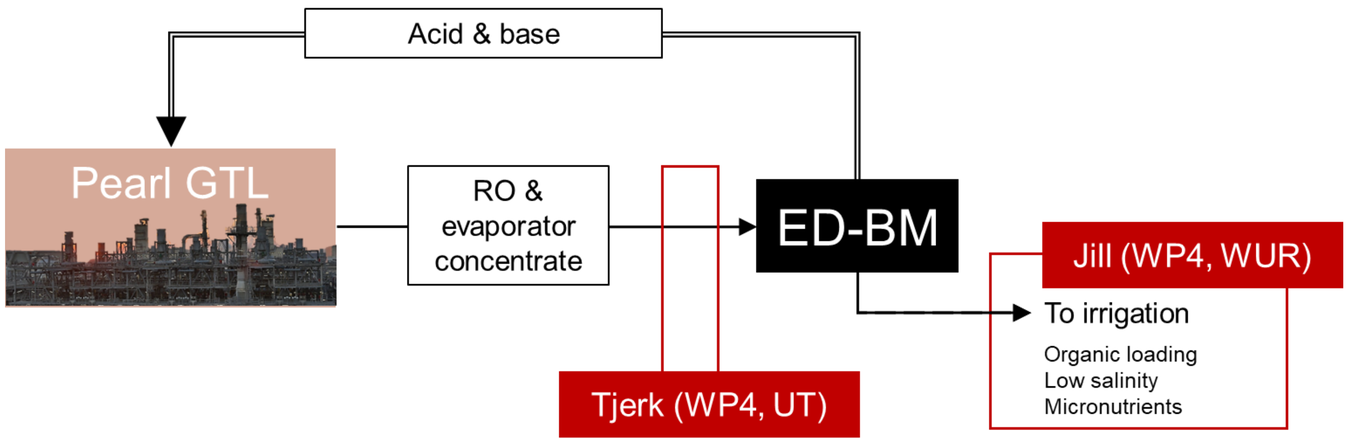


An equilibrium experiment between an ion-exchange membrane and a multi-electrolyte solution compared to the predictions based on fitted activity coefficients.

International outreach: Pearl GTL plant

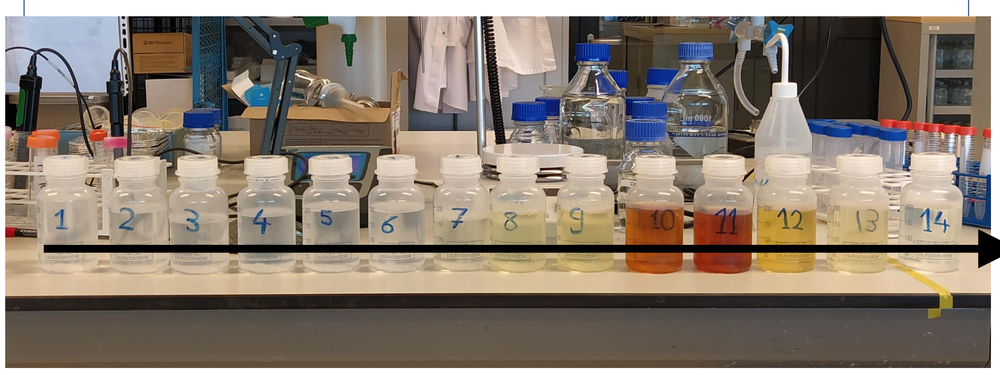
A collaboration within the PhDs of WP4 and Shell NL

Objective: producing acid/base using industrial wastewater streams



IX regeneration wastewater

- Monovalent/divalent ions partially overlap
- Organic loading in the regenerate of the anion-exchange column



Future plans

- Resume the experiments on the monovalent/divalent selectivity
- Investigate the influence of multivalent ions on the performance of electrodialysis bipolar membrane (EDBM) and the needed pre-treatment

AquaConnect