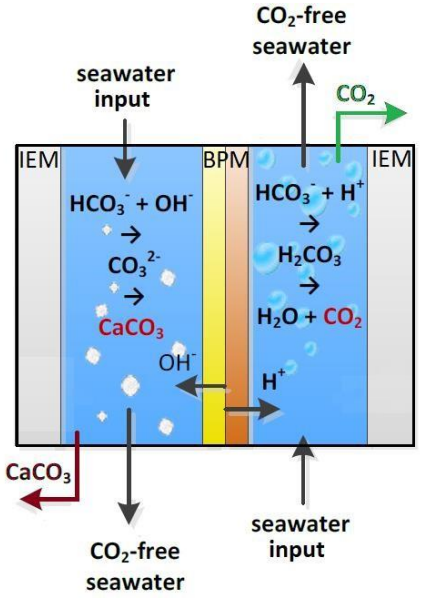
Seawater CO_2 capture:
Effect of carbonic species cross over on the efficiency of BPMED

Motivation

Capturing CO_2 from seawater deacidifies the seawater by shifting its carbonate equilibrium [1]. Besides, it reduces the scaling potential of carbonates in desalination units such as, reverse osmosis. Bipolar membrane electrodialysis (BPMED) can be used as an alternative for using chemicals (i.e., anti-scalants and acids) to address scaling risks. A bipolar membrane can produce acid (H^+) and base (OH^-) from feed water when inserted in an electrical field, Figure1 [2]. Subsequently, the produced H^+/ OH^- react with the HCO_3^- present in the seawater, resulting in $CO_{2\,(aq)}$/CO_3^{2-} on the acidic and basic compartment, respectively. These products can then be extracted from the cell.

Method

When using BPMED for CO_2 capture, there are different losses (ohmic and non-ohmic) involved in the process. One of the losses is the crossover of carbonic species (i.e., H_2CO_3, HCO_3^- & CO_3^{2-}) through the BPM and IEM's (ion exchange membranes). To quantify these losses we will perform diffusivity tests using various membranes. We will look at the effect of the applied current density, flow rate, ion concentrations and pH on the ion crossover. We will predict the cross over using a mathematical model and compare the computed results with measure experimental data.



Your profile

The ideal candidate has a background in environmental/chemical or a similar field, and is looking for an internship or BSc/MSc thesis. Having experience with electrochemistry is an advantage. Fluency in English is a must. EU/Non-EU student enrolled in any university within The Netherlands or EU student enrolled in universities elsewhere in the EU are welcome to apply. Unfortunately, non-EU students enrolled outside the Netherlands cannot apply due to visa and work permit limitations.

Your tasks

- Carrying out experiments, analyzing and reporting the results.
- Experimenting with different scenarios for optimizing results.

Benefits and additional info

- Starting date September 2019, for a duration of min 4 months.
- Location is Wetsus water research center, Leeuwarden, The Netherlands.
- Monthly allowance of 350 €.

How to apply

Contact Rose Sharifian (Rose.Sharifian@wetsus.nl), include your CV and motivation letter.

1. Butler, J. N., 1982. *Carbon dioxide equilibria and their applications.*
2. Eisaman et al, 2017. Indirect ocean capture of atmospheric CO2: Part I. Prototype of a negative emissions technology.