

## Bipolar membrane electro dialysis technique (BPMED), to capture CO<sub>2</sub> from the ocean

### Motivation

To mitigate global warming, a zero net CO<sub>2</sub> emission is required. For that, CO<sub>2</sub> can be captured from various sources: flue gas, air, soil and also ocean. Ocean (i.e., seawater) is a massive sink for CO<sub>2</sub>. When CO<sub>2(g)</sub> dissolves in the ocean, it mainly produce bicarbonate ion (HCO<sub>3</sub><sup>-</sup>). An electrochemical method using bipolar membrane (BPM) can be used to remove the excess HCO<sub>3</sub><sup>-</sup> (1) in gaseous form on the acidic side (Acid route) of the BPM or (2) as solid CaCO<sub>3</sub> precipitate on the alkaline side (Base route), Figure 1 [1]. The result in both case will be a CO<sub>2</sub> free seawater.

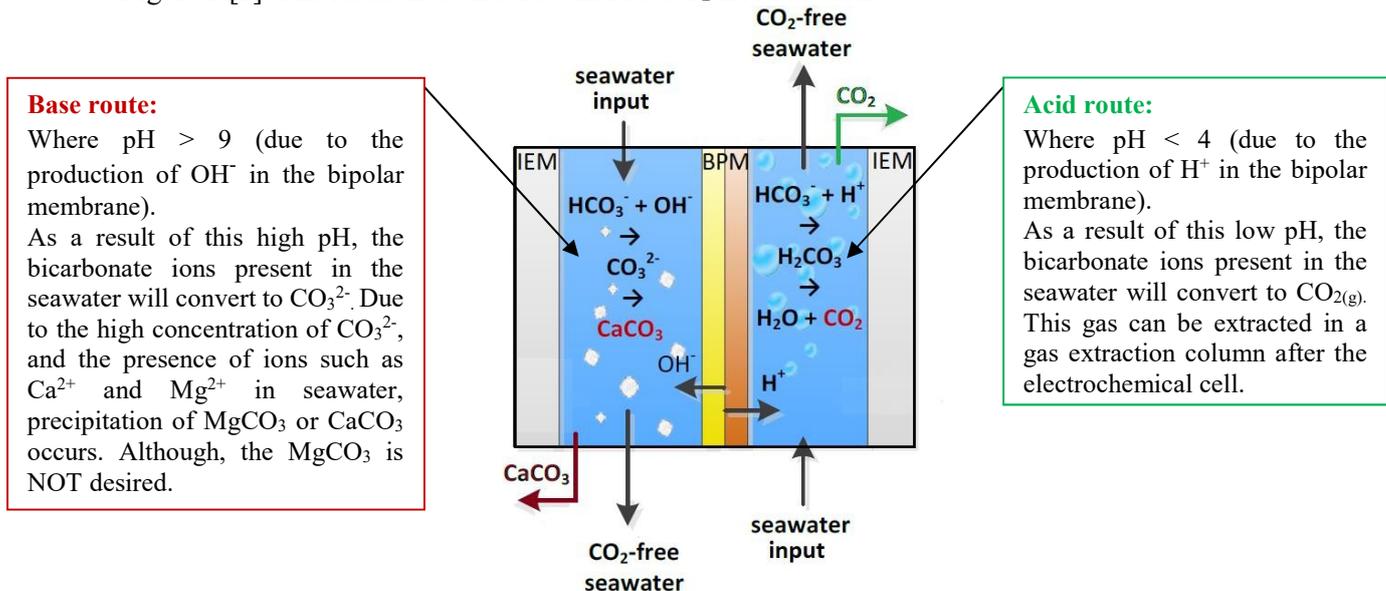


Figure 1. Decarbonization in BPMED. IEM stands for ion exchange membrane that can be anion or cation exchange membrane.

### The project

The bipolar membrane can produce acid (H<sup>+</sup>) and base (OH<sup>-</sup>) from dissociation of a water (H<sub>2</sub>O). The energy for the reaction comes from the current (or voltage) that is applied to the electrochemical cell. More current (i.e., less resistance) means more H<sup>+</sup> and OH<sup>-</sup>. There are also resistances (i.e., losses) involved in this process such as the membrane & electrode resistances, or the ion leakages through the membrane. The aim of this research is to find the optimum condition (flow rate, flow direction, feed concentration, current, cell design etc.) to minimize the involved losses and improve the total energy efficiency of the system.

### Your profile

- Background in chemical/environmental engineering or other related fields.
- Familiar with terms such as electrochemistry, flow and mass equations and carbonate equilibrium.
- Experimental and analytical skills; this work requires working in the laboratory.
- Fluent in English (with good English writing skills).

### Benefits and additional info

- Starting date September 2020, for a duration of 6-8 months.
- Location is Wetsus, European Centre of Excellence for Sustainable Water Technology, Leeuwarden (The Netherlands), with a monthly allowance of 175 €.

### How to apply

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

1. Eisaman et al, 2017. Indirect ocean capture of atmospheric CO<sub>2</sub>: Part I. Prototype of a negative emissions technology.