Centre for microbial ecology and technology; Ghent University

# Membrane electrolysis for resource-efficient lithium and sodium recovery from brines

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## Background

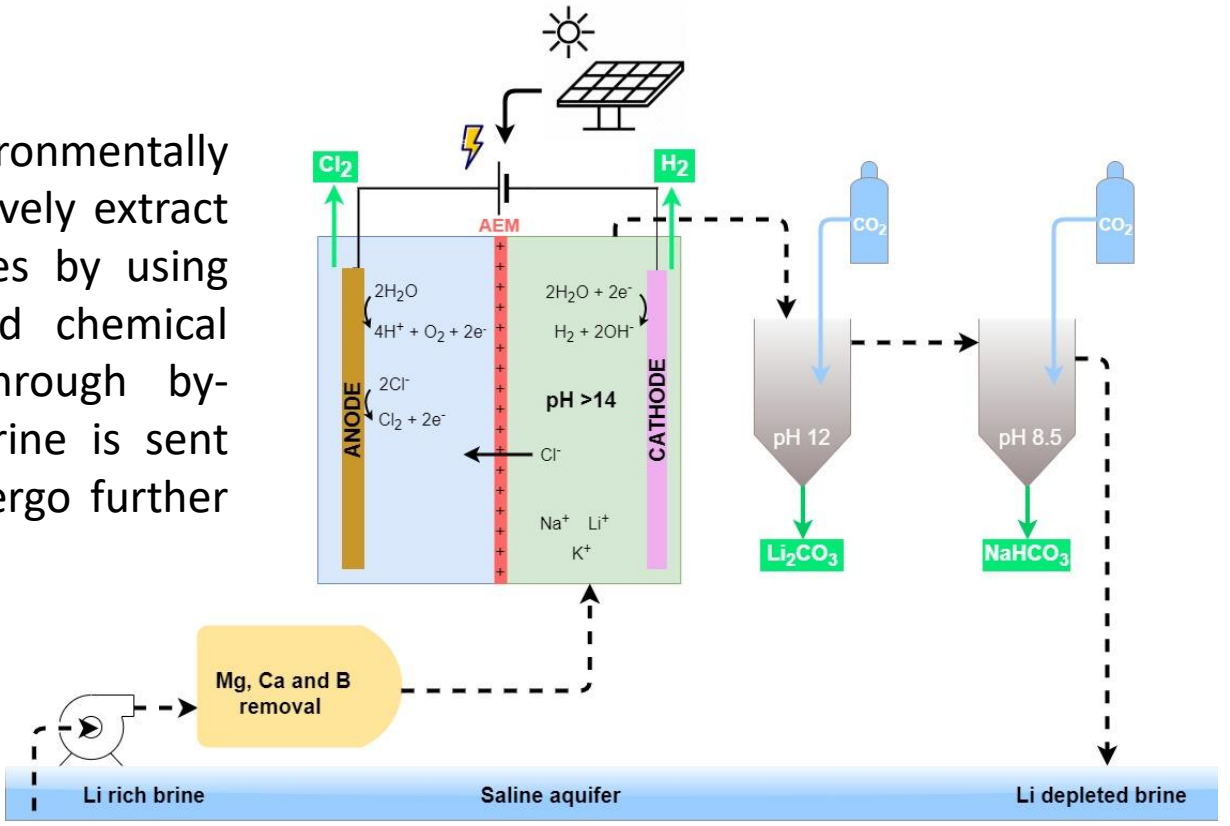
Lithium is, due to its light weight and high energy density, the perfect charge carrier for batteries and plays a key role in the transition towards a carbon neutral society. 56% of the total lithium reserve is located in the *"lithium triangle"* in South-America. However, four main drawbacks urge the need for novel extraction processes to improve the speed and sustainability of the extraction of Li to meet future lithium demands.


**Current Li extraction method:**

- Long process cycle (1,5 – 2 yr)
- Lithium loss (30-50%)
- Cheap
- Destruction of ecosystem
- Landfilling of waste (115 ton/ton LiOH)

## Aim and objective

To develop a fast and environmentally friendly method that can selectively extract lithium from the natural brines by using green energy and with limited chemical addition. Waste is limited through by-product valorization and the brine is sent back to the aquifer or can undergo further treatment.




## Method

The pre-treated brine, free of Mg, Ca and B is treated with a membrane electrolysis cell. $Cl^-$ is separated from the cations and $OH^-$ is generated in the cathodic compartment (pH > 14). Next, $CO_2$ is absorbed and $Li_2CO_3$ is crystallized from the brine at pH 12 and 88°C. In the final step, more $CO_2$ is added to crystallize $NaHCO_3$ at pH 8.5 and 20°C.

## Results

| Current Density ($A/m^2$) | Li extracted (%) | Purity (%) | $E_{cons}$ (kWh/ kg $Li_2CO_3$) | Cost (€/kg $Li_2CO_3$) | Na extracted (%) |
|---|---|---|---|---|---|
| 100 | 73.9 | 98.5 | 79.62 | 3.58 | 28.5 |
| 250 | 69.7 | 98.3 | 86.12 | 3.87 | 22.5 |

*Cost includes only the electricity cost of the electrolyser

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