Lithium recovery and battery-grade materials production from European resources

Laura Herrmann[1], Fabian Jeschull[2]

1) EnBW, Energie Baden Württemberg A.G., Research and Development Department, Geothermal Energy, 76131 Karlsruhe, Germany

2) Karlsruhe Institute of Technology (KIT), Institute for Applied Materials – Energy Storage Systems (IAM-ESS), 76344 Eggenstein-Leopoldshafen, Germany

LiCORNE

Aims

- LiCORNE aims to establish the first ever Li supply chain from European resources.
- The scope is to increase the European Li-processing and refining capacity for producing battery-grade chemicals from hard rocks and brines.
- As part of a recycling strategy the extraction and reuse of valuable Li, Co and Ni from waste cathode material will be investigated.

Potential

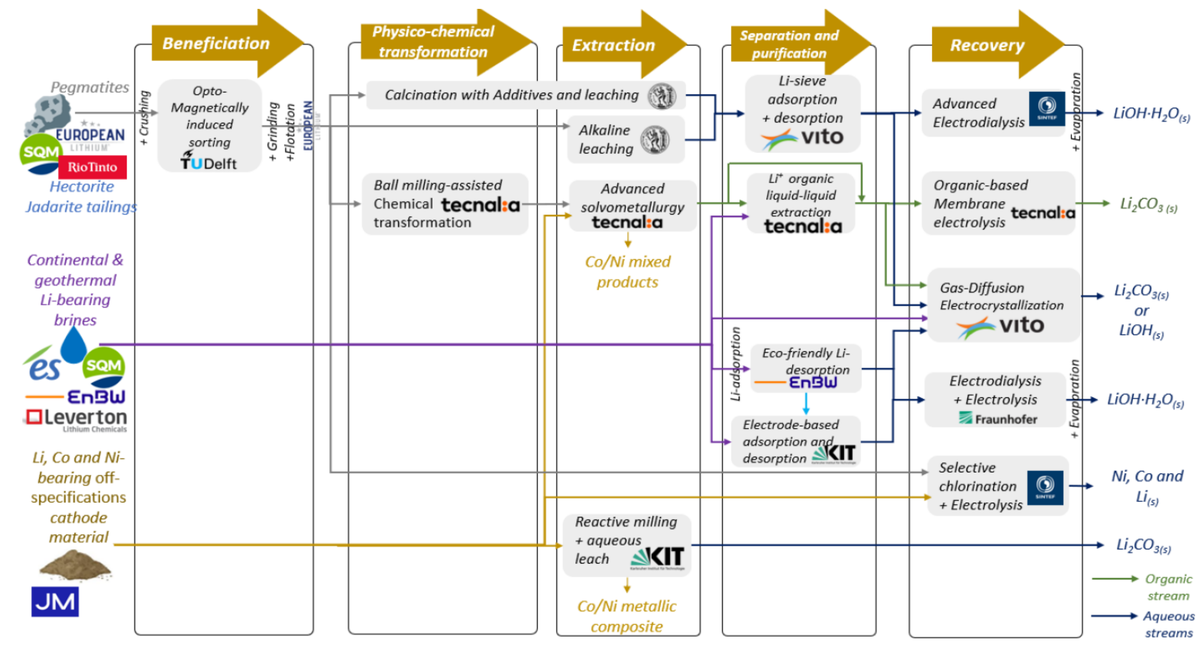
- The European primary resources that are considered in LiCORNE would be enough to supply ~3000 GWh of batteries.
- I.e., ~10 years of supply considering 300 GWh/year production capacity in Europe by 2030.

EU currently depends **100%** on the import of Li

300 GWh/year expected production capacity in Europe by 2030

End-of-life Recycling Input Rate for Li in EU is **0%**

The EU aims to become Climate Neutral by **2050**



Investigations

- A total of 14 consortium partners will focus on different aspects along the Li-processing value chain and explore innovative Li-extraction and purification technologies.
- The most auspicious technologies are to be scaled up to demonstrate the production of battery-grade Li-chemicals from several resources in a cost-competitive and environmentally friendly way compared to conventional processes.
- The upscaled LiCORNE process will be demonstrated and validated with the production of ~1 kg of battery-grade Li-chemicals ($LiOH{\cdot}H_2O$, Li_2CO_3 or Li-metal).

Selective Electrochemical Li-Extraction

Karlsruher Institut für Technologie

Contact:
fabian.jeschull@kit.edu

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Aim is the ***electrochemical sieving of Li-ions from geothermal or continental brines***, using insertion/intercalation materials, typical in the field of batteries. A second application is the purification of Li-enriched solution coming from the Eco-friendly Li+ desorption.

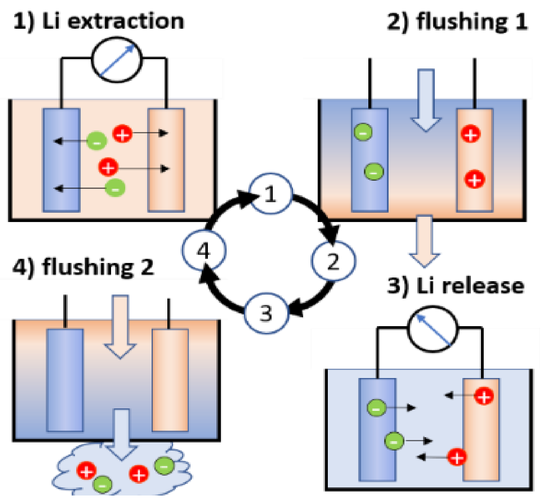

Figure: *Working principle of electrochemical sieving, based on a dual battery type setup*

Major challenges

a) finding suitable counter electrodes for reversible cation/anion insertion ***without the use of sacrificial components.***

b) enable chemically stable electrodes (up to 70 degrees) and energy-efficiency for long operation life times and cost competitiveness.

Eco-friendly Li-Desorption Technology

EnBW

Contact:
l.herrmann@enbw.com

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ENBW will work on **Li-extraction** from geothermal brine using **adsorption/desorption technology**. Main bottleneck in this technology is currently the desorption step as eluents cause **degradation** of the **adsorbent** in side reactions.

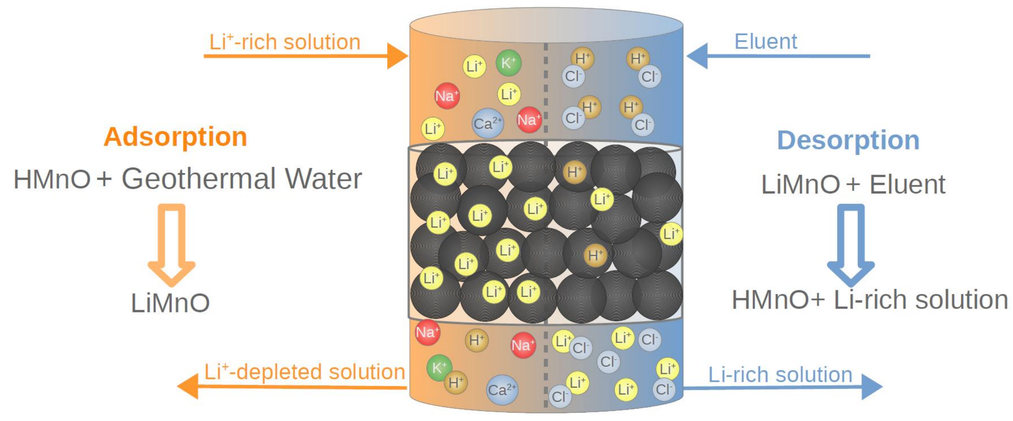

Figure: *Selective Li-Ion-Exchange with Manganese Oxide Adsorbent*

- Identification of **suitable eluents** as well as **optimized operating conditions** (e.g. pH, pressure, concentration, temperature) can improve the efficiency of the extraction process and long-term performance of the adsorbent material.
- Therefore, EnBW will focus on developing an energy-efficient, environmentally-friendly, cost-competitive and chemically-stable Li^+ desorption technology (to TRL4) in order to make a **sustainable Li+ extraction** and separation from geothermal and continental brines based on at min. 90 % yield.