 

**Master Thesis**

„Lithium recovery from brine through adsorption methods“

Geothermal brines around Karlsruhe are rich in lithium and an attractive source for the rising demand of lithium. Contrary to the traditional open-air evaporation ponds used in the lithium triangle of South America, Direct Lithium Extraction (DLE) technologies offer solutions to greener and more water- and energy-efficient lithium production. Among DLE technologies, ion exchange and specific adsorption methods stand out as energy-efficient ways to separate lithium from brines. Lithium-ion sieves (LIS) based on transition metal oxides offer advantages such as minimal pretreatment, low environmental impact and high lithium recovery yields. However, some of the state-of the-art materials lose capacity during cycling, due to dissolution or leaching of the powders.

In this master thesis, you would explore and develop next-generation ion-sieves to improve current DLE processes. This includes solid-state and sol-gel material synthesis methods and their characterization by ICP, XRD, FTIR and SEM. In preliminary steps, LiCl solutions will be used to understand the ion exchange process, elucidate the sites involved and mechanism of sorption. The sorption/desorption parameters (time, pH, temperature) will be optimized. In a second step, synthetic and real brines will be evaluated.

We offer a supportive and welcoming working environment in a dynamic and international team. You will have access to state-of-the-art devices on a very current and trendy topic, and good connections to applied and industrial research.

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| **Your Tasks:*** Synthesis of ion-sieves
* Characterization of the materials
* Lithium sorption/desorption experiments

**Your Profile:*** Student in the field of Chemistry or of Materials Science
* Strong taste for an autonomous lab work
* Good knowledge in inorganic chemistry, materials synthesis and characterization
* English language is a condition
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**Start: As soon as possible Working place: KIT Campus Nord**

If you are interested and have further questions or would like to apply for the project, please contact Dr. Martina Gamba (*martina.gamba@kit.edu*). To apply for the master project, we would appreciate if you could present yourself briefly and provide us also with your CV and transcript of records.