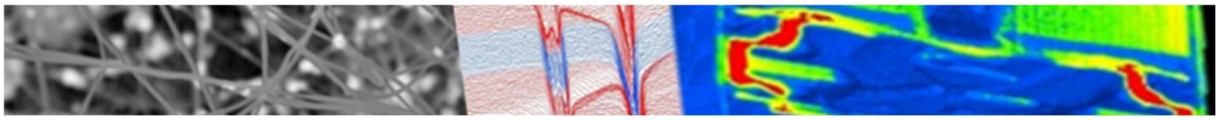
Karlsruher Institut für Technologie Institut für Angewandte Materialien



Master Thesis

"Transition metal dichalcogenides for lithium/sodium-ion batteries"

Publishing date: February 2022

Starting date: as soon as possible

Reversible electrochemical intercalation of lithium and sodium ions in solids has laid the foundation for rechargeable batteries which are recognized as the key to utilization of 'clean' energy. Due to their layered structures with strong covalent bonds within a layer and weak van der Waals interactions between layers, transition-metal dichalcogenides (TMDCs) with the general formula of MoX_2 (M = transition metal; X = S, Se or Te) are one of the possible alternatives of graphite anodes. The combination of large interlayer distances, high theoretical capacity, chemical robustness, and compositional variety makes this class of materials attractive for their study as anodes for lithium- and sodium-ion batteries (LIBs and SIBs). However, further investigations are required to have the TMDC as a suitable anode material for high-performance LIBs or SIBs, where novel fabrication methods and material with improved rate capability and cycling stability will be discovered.

In the current project, we will focus on developing new TMDCs for their usage as the anodes of LIBs and SIBs. Synthesis of novel materials with various compositions will be performed using a multistep solid-state synthesis. The obtained compounds will be used to prepare coin cells for their electrochemical characterization using galvanostatic cycling and cyclic voltammetry.

The tasks of the selected person will include:

- Ball milling of materials
- Thermal treatment of obtained samples.
- Phase analysis and characterization of materials using XRD, DSC, TGA or other methods.
- Building coin cells
- Electrochemical characterization

Ideally, you have a background in chemistry, chemical engineering, material science or similar. Most important, you are enthusiastic person, who are interested in the topic of energy storage materials.
Please take notice that majority of experiments will be done at Campus North.

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