Institute for Applied Materials
Electrochemical Technologies
Adenauerring 20 b
76131 Karlsruhe

Bachelor thesis

Degradation Mechanisms of Impurities in Lithium-ion Batteries during thermal runaway

Field fo Science

- ☒ Batteries
- ☐ Fuel Cells and Electrolyser
- ☐ Electrocatalysis

Focus

- ☐ Experimental
- ☒ Advanced data analysis
- ☒ Reaction chemistry
- ☐ Development of setups
- ☒ Gas analysis
- ☐ Simulation
- ☒ Literature research

Studies

- ☒ Chemistry
- ☒ Chemical engineering
- ☒ Electrical engineering
- ☒ Mechanical engineering
- ☒ Material science

Starting date

Immediately

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https://www.iam.kit.edu/et/english/index.php

Motivation

Impurities like water are one of the main drivers of reduced life time of a lithium-ion battery. Parasitic reactions of the conductive salt and the resulting stability decrease of several battery components affect the performance and safety. These processes are often accompanied by gas evolution as byproducts. The evolving gases can be analyzed qualitatively and quantitatively by online electrochemical mass spectrometry. This method allows insights in the degradation processes during thermal runaway of a lithium-ion battery. Interpretation is however a big challenge in online mass spectrometry due to various effects during the data acquisition. The efficiency of the way the measurement data is handled defines the precision of the interpretation and insights gained.

Following work packages are included:

- Literature research for reactions pathways and gas evolution caused by impurities in lithium-ion batteries.
- Initial familiarization with the existing data handling script in python. Implementation of new features as well as the improvement of current steps for the data handling.
- Analysis of an existing dataset of measurements and combination with the reaction pathways from literature.

About us:

We offer excellent supervision and the opportunity to work in an interdisciplinary team on a cutting-edge topic. The IAM-ET offers a constantly growing team with expertise in battery, fuel cell and electrocatalysis research at the South Campus of KIT. Independent work and the motivation to work on current research topics are required. For further information please contact Leon Schmidt. If you are interested, please send your curriculum vitae, transcript of records and certificate of matriculation to leon.schmidt@kit.edu.