



Student thesis

Model-based Validation of Reaction Mechanism in Lithium-ion Batteries during Thermal Stress

Field of Science

- Batteries
- Fuel Cells and Electrolyser
- Electrocatalysis

Focus

- Experimental
- Thermodynamic analysis
- Reaction chemistry
- Development of setups
- Simulation
- Literature research

Studies

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

Starting date

Immediately

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Motivation

The optimization and understanding of lithium-ion batteries' thermal stability is one of the biggest challenges for the technology. The lack of accessibility to kinetic information of degradation reactions limits the progress of knowledge-based hazard prevention. Identifying kinetic and thermodynamic parameters related to the degradation will allow a better understanding of the chemistry and its processes. These parameters can be obtained by reproducing experimental information using mathematical models. However, optimization strategies are a significant challenge due to unknown parameters. For this, an extensive parameter study and sensitivity are needed to extract so far inaccessible data from experiments.

Following work packages are included:

- Literature research for reaction pathways and gas evolution of lithium-ion batteries during thermal degradation.
- Initial familiarization with the existing model.
- Implementation of new features to the model and optimization.
- Determination of kinetic parameters.

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 focused on simulation (Campus East KIT) and experimental (Campus South KIT). Independent work and the motivation to work on current research topics are required. For further information please contact Jorge Valenzuela. If you are interested, please send your curriculum vitae, transcript of records and certificate of matriculation to jorge.valenzuela@kit.edu.