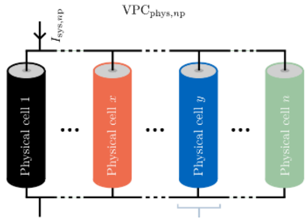
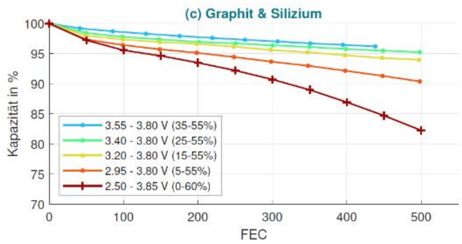
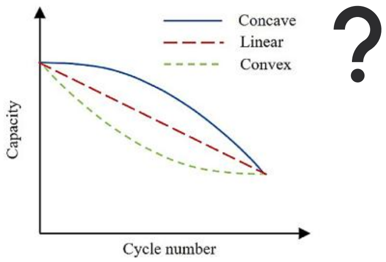
Chair of Electrical Energy Storage Technology
Department of Energy and Process Engineering
Technical University of Munich

– Research Internship / Master Thesis –

Experimental Study of Aging in Parallel-Connected Battery Cell Configurations







Background

High-performance applications often connect large numbers of battery cells both in series and in parallel. Parallel connection is particularly challenging, because non-uniform boundary conditions can cause an uneven current distribution among the cells. Over time this may lead to different aging rates for individual cells, which in turn alters the current distribution within the parallel cell configuration.

For cells with silicon-graphite anodes, cycling down to low states of charge is especially detrimental. Accordingly, this thesis will experimentally investigate the aging behavior of silicon-graphite cells arranged in parallel that are subjected to partial cycling under inhomogeneous boundary conditions.

Tasks

Within the scope of this master's thesis, an experimental study on aging in parallel-connected cell configurations is to be designed, executed, and evaluated. The study will investigate the conditions under which inhomogeneous aging arises. A key part of the analysis is to track the evolution of current distribution, aging states, and degradation modes over continued cycling:

AP1. Literature Review
AP2. Current-Distribution Analysis at BOL (simulation/experimental)
AP3. Planning and Execution of the Aging Campaign
AP4. Data processing and development of suitable analysis methods
AP5. Written thesis

Requirements

- Genuine enthusiasm for laboratory work and long-term measurement campaigns.
- Prior knowledge in lithium-ion batteries
- Prior knowledge in aging phenomena in silicon-based lithium-ion batteries is a plus
- Good skills in MATLAB for data analysis and visualization

Focus

☒ Cell Characterization
☒ Experimental Test Series
☐ Hardware Development
☐ Software Design
☐ Modelling
☐ Simulation
☒ Literature Review

Degree Program

☒ Electrical-/Information Engineering
☐ Computer Science
☒ Mechanical Engineering
☒ Physics
☐ Mathematics
☐ Chemical Engineering
☐ Industrial Engineering

Start Date

From 01.09.2025

Contact

Franz Röhrer
franz.roehrer@tum.de
Phone: +49 (0) 89 / 289 - 26969
Room: 3017
http://www.ees.ei.tum.de