Shorttitle: **Direct characterization of float currents to estimate the aging behavior and path dependence**
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Lithium-ion batteries have become the most important driver especially for mobile, but also for stationary energy storage in many applications. Before integrating an appropriate cell type into a system, manufacturers of battery systems make a benchmark of the available batteries that suit to their application based on the cell's datasheet. Additionally, the cell quality has to be assessed by quality control tests during pack production. With conventional calendar aging tests, this testing effort is costly and time consuming and, therefore, typically only a small part of the test matrix is evaluated. The float current analysis presented in this work is a novel, low-cost and comparably fast method that has the potential to fulfill industries' demands. The float current analysis measures the self-discharge currents after compensating currents due to e.g. the anode overhang effect or the variation of particle size within the electrodes diminished. In a previous work, we already showed a qualitative and quantitative correlation of float currents and capacity loss for LFP/Graphite (10.1016/j.jpowsour.2017.03.136) and NCA/Graphite (10.3390/batteries7020022) cells.

In this presentation, we will discuss the results of a fast characterization for several cell types (LFP/Graphite, NMC/Graphite and NCA/Graphite) with different active materials of the format 18650. At first, for several SOCs, the transient part is evaluated before the steady state of the float currents is finally reached. We compare the results of the transient part to identify the influence of the check-up and the point of reliable float current measurement to improve the strategy to achieve accelerated characterization. As expected performing additional check-ups increases the time to reach the steady-state by additional inhomogeneities during the capacity tests varying the SOC.

In addition to the transient part, the float currents are presented, which are measured during temperature steps between 20 and 60°C. The data is analysed for the identification of a path dependence, hysteresis and the influence of the temperature step size. A classical hysteresis behavior is thereby not observed. Finally, the float current results are compared to state-of-the-art check-up based methods and tools of the differential voltage analysis assessing the electrode aging to increase the understanding of float currents. We found a correlation of the float current to formation of SEI.