

The Challenge to Stabilize Interfaces and Interphases in Lithium and Sodium Batteries

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A large focus has been on the characterization of electrode/electrolyte interface in Li-ion batteries, which has taught us many important things. Today we know that interfaces could be influenced by a number of different parameters ranging from the choice of binder materials in the electrode [1], the active electrode materials [2], the electrolyte formulation including the salt used as well as special additives [3], to the cross-talk to the cathode material used in the battery cell. A stable interface on the negative electrode, and especially if the negative electrode is metallic, is crucial for the performance, safety and durability of the battery.

In this presentation, many years of characterizing interfaces in Li-ion and Na-ion batteries will be discussed with the goal to describe the challenges we face in stabilizing them for improved battery durability. Examples will be taken from studies of silicon electrodes [1][4][5] and these will be compared to those of pure graphite electrodes and mixtures of graphite and silicon when it comes to Li-ion batteries. The goal is to protect the silicon particles from direct exposure to the electrolyte to prevent cell failure when cycling in full Li-ion cells.

Hard carbons in Na-ion batteries will also be highlighted and the difference/similarity of the interface chemistry compared to carbon materials in Li-ion batteries.

However, most importantly is the discussion on how long-term cycling in full cells of Li-ion or Na-ions will influence interface chemistry and thus the battery performance.

All the discussion is based on careful photoelectron spectroscopy results at different depths of interfaces using synchrotron-based methods at Helmholtz Zentrum Berlin or Diamond in UK.

References:

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