



Contribution ID: 27

Type: **Poster**

Project CAESAR: Cell Chemistry Based on Silicon Anode and Nickel-Rich Cathode

Tuesday, December 7, 2021 10:30 AM (1h 30m)

The new project CAESAR funded by the Bundesministerium für Wirtschaft und Energie (BMWi) is a cooperation of the Technical University Munich (TUM) including the FRM II and several industrial partners under the leadership of the company Wacker. The aim of this project is the development of Li ion batteries (LIB) with increased specific energy (Wh/kg) and energy density (Wh/l) accompanied by a decrease of the specific cost (€/Wh). To this end, an appropriate combination of high-capacity materials is substantial, in this case Si anodes and Ni-rich layered oxide cathodes. The project encompasses the whole value chain of LIBs from the material development to the validation of prototypes for applications. Thereby, neutron studies at the FRM II will help to analyze failure mechanisms of LIBs and reveal inherent processes to improve their performance. Neutrons are well suited for LIB research since measuring concentrations and distributions of light elements such as Li is feasible. Furthermore, the discriminability of neighboring elements in the periodic system with neutrons is essential here since the cathode materials contain Co, Mn as well as Ni. In this poster, the just-started CAESAR project and the associated neutron experiments will be introduced. Moreover, first neutron depth profiling (NDP) results of differently lithiated Si anodes will be presented. They reveal the distribution of Li throughout the anodes which has a major impact on their cycling stability.

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Session Classification: Poster Session

Track Classification: Material Science