

MLZ Conference 2024: Neutrons for Energy Storage



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Energy Storage Applications of Neutron Imaging at MLZ

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The fundamentally different interaction of x-rays and neutrons with matter renders neutron imaging a valuable and complementary tool for non-destructive testing applications. Many light elements which are generally hard to detect with x-rays show excellent contrast in neutron imaging. Most prominently, these are hydrogen, lithium and boron. At the same time metals are often significantly more transparent for neutrons than for x-rays. The excellent contrast for hydrogen and lithium makes neutron imaging ideally suited to study energy storage and conversion systems such as fuel cells, electrolyzers or lithium-ion batteries.

In our presentation we will give an overview of recent experiments on energy storage applications performed in collaboration with users and industrial customers. In CO₂ electrolyzers, we have investigated the dynamic distribution of water and salt precipitates at different current densities and identified their influence on the performance of the electrolyzer cells.

An important economic aspect in the manufacturing of lithium-ion batteries is the process of filling the batteries with electrolyte prior to cell formation. Failure to complete the wetting of the cell, leads to the irreversible loss of capacity. Here, neutron imaging provides an ideal tool to follow the wetting process in real time and provide pathways for the optimization. Even large lead acid batteries can be investigated using fission neutrons uniquely available at our beam line NECTAR, thus providing unique insights into full scale battery systems.

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