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Operando visualization of mass transfer in sodium-zinc liquid metal batteries

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The Horizon 2020 project SOLSTICE aims to deliver two different working battery prototypes based on the price-competitive Na-Zn chemistry. The first concept benefits from the existing and successful ZEBRA® technology where the Ni-electrode is replaced by cheap and abundant Zn while the second approach aims to remove the need for the solid ion-conductive membrane by using molten salt electrolyte. To support this objective, small-scale experimental cells have been developed for fundamental research. They have been designed to allow for in situ radiographic imaging of the interior. The main objective is to charge and discharge the cells during dynamic neutron radiography, in order to observe the mass transfer of electroactive species and any flow that occurs during cycling. The focus is on how these phenomena depend on the geometry and chemical composition of the different cell components, such as the positive and negative current collectors. Neutron radiography experiments have been successfully conducted at the Paul Scherrer Institut (PSI) in Villigen, Switzerland, using the NEUTRA instrument of the neutron spallation source SINQ. Analysis of the obtained data, in particular the recorded radiographic image sequences fully demonstrating what happens during the cycling of the cells, will be presented at the conference.

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