

Neutron and X-ray imaging to assess battery operation, degradation and failure



Abstract:

A great variety of cell chemistries and formats are being investigated for development of lithium-ion battery technology. Here, some application of imaging techniques using neutrons and X rays to the non-destructive investigation of lithium ion cells are presented and discussed. The non-destructive nature of these probes enables in situ and operando imaging of working devices, and under externally applied conditions. Radiography allows the visualisation of the internal structure in projection images. Tomographic techniques provide cross-sectional and three-dimensional imaging of such devices using a multitude of viewing angles.

After introduction of the principles of the methods applied, the lecture focusses on examples from the instrument NeXT at the Institut Laue Langevin (ILL) and of various imaging beamlines at the European synchrotron ESRF in Grenoble.

Biography

Lukas Helfen received his physics diploma at the Saarland University (Saarbrücken, Germany) in 1998. Until 2004 he worked for the Fraunhofer Institute for Non-Destructive Testing (Saarbrücken and Dresden, Germany), submitting at the Saarland University in 2003 his Ph.D. thesis on investigation of porous materials by synchrotron radiation imaging. After working for the Karlsruhe Institute of Technology (Germany) to develop and apply advanced X-ray imaging methods (such as synchrotron laminography at the microtomography beamline ID19 of the European Synchrotron ESRF), he joined the Institut Laue-Langevin (ILL) in June 2019 to co-develop an upgraded imaging instrument. As scientist in ILL's Large Scale Structure group, he is currently the instrument responsible of NeXT, an imaging station dedicated to correlative neutron and x-ray imaging.