

Lithium-Ion Batteries

Analysis of composition and structure

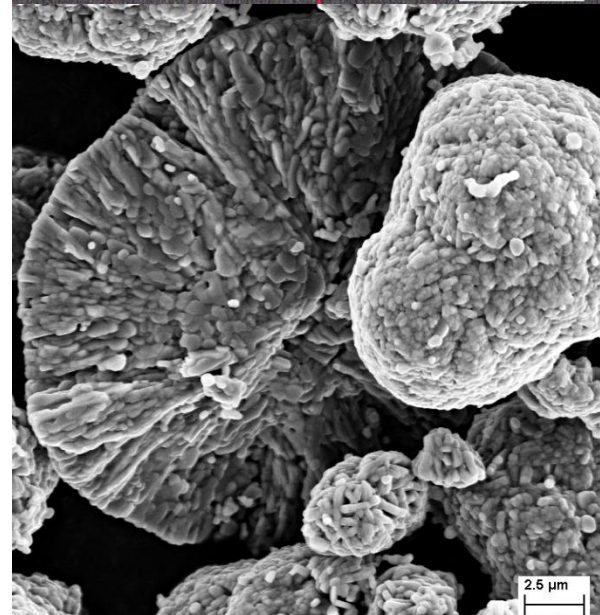
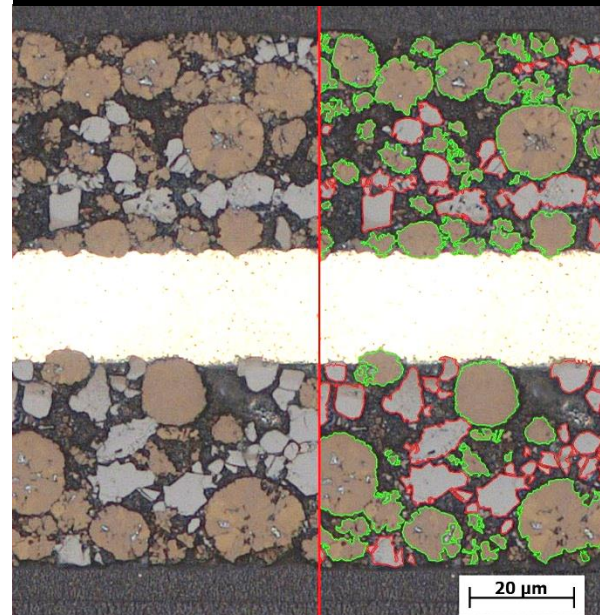
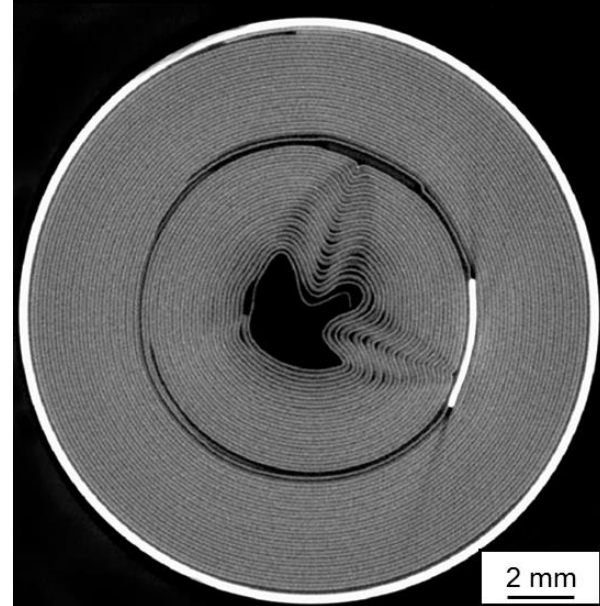
- **Nondestructive x-ray computed tomography, e.g. macroscopic structure, battery connectors, winding deformation, impurities**
- **Opening, preparation and microscopy for microstructure evaluation of Li-Ion cells**
- **X-ray and chemical analysis for determination of composition and crystalline structures**
- **Qualitative and quantitative assessment of manufacturing quality**
- **Post-mortem analysis for analyzing e.g. aging processes and failure modes**

Evaluation of electrical properties

- **Measuring of electrical specification, e.g. capacity, rate capability**
- **Application of specific charge and discharge profiles including long-term testing in safety temperature chambers**
- **Analysis and evaluation of key factors of battery aging and safety**

Development projects and new methods

- **Quality assurance: Development of analytical methods for evaluation of production quality**
- **Electrode design: Development of high energy and power electrodes on laboratory scale**
- **Combined load spectrums: Measuring the evolution of mechanical loads during charge/discharge**
- **Thermal management: Evaluation of thermal behaviour of materials, cells and battery systems**



Technical Equipment

Battery laboratory

- Equipment for electrode manufacturing on lab scale including slurry mixing, coating, calendaring and cutting
- Glove-boxes for battery assembly and disassembly

Materialography / Microscopy

Materialographic laboratory

- Preparation and polishing with local exhaust ventilation
- Ion polishing system
- Sputtering chamber for contrasting of active materials

Microscopy

- High-end light optical microscopy
- Scanning electron microscopy with energy and wavelength dispersive x-ray spectroscopy
- High-resolution FIB-SEM for nanoanalytics with EDS, EBSD and multichannel GIS
- Quantifying of layer thickness and phase distribution via digital image algorithms

X-ray analysis

- 3D computed tomography with micro- and nanofocus x-ray tube
- X-ray diffraction analysis with Rietveld refinement

Electrical tests / battery aging

- Multi-channel battery tests including temperature measurement (0 - 6 V, 5 A up to 50 A max.)
- Safety temperature test chambers (Hazard Level 5) for battery testing in a temperature range from -40 up to +180°C
- Built in clamping frame to combine mechanical loads with electrical tests

In collaboration with Aalen University, Materials Research Institute

