

## Contact

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*Operando-XRD © Daniel  
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# Battery Materials

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Development of sustainable  
battery technologies with a  
focus on aluminum-ion batteries

We develop and investigate sustainable battery technologies, in particular rechargeable aluminum-ion batteries (AIB) as cost-effective and non-combustible electrical energy storage solutions. In order to be able to characterize novel battery technologies under conditions as close as possible to the application, we prepare pouch cell prototypes that are tailored to the individual requirements of the cell chemistry. Our materials research is accompanied by comprehensive (structural) analysis, where the materials are examined in their initial state, under operando conditions and post-mortem. This enables the understanding of energy storage processes as well as ageing and failure mechanisms.

## Aluminum-ion-based cell chemistry

### Services

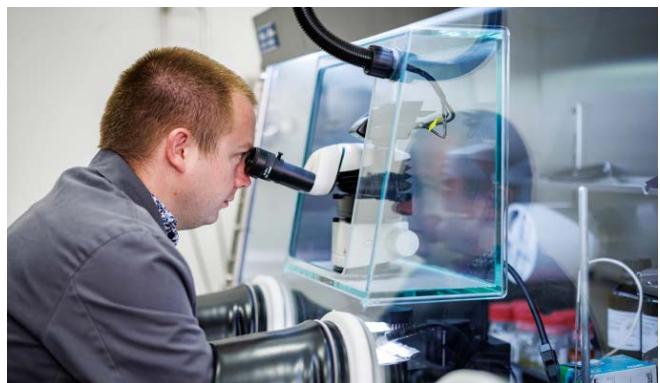
- Synthesis and development of sustainable active and passive materials for Li-free battery technologies
- Packaging technology for Al-ion pouch cells

### Key Topics

- Cost-effective and non-flammable energy storage technology: rechargeable Aluminum-Ion Battery (AIB)
- Active materials based on aluminum and graphite
- High-power storage device operating at high charge & discharge rates
- Multi-layered pouch cells with capacities >200 mAh employing a corrosion-resistant casing
- Potential applications: for stationary and hybrid mobile applications, dynamic grid stabilization, and uninterruptible power supply (UPS) systems



*Pouch cell components © Daniel Karmann / Fraunhofer IISB*



*Post-mortem analysis battery cells under inert conditions to investigate ageing mechanism © Daniel Karmann / Fraunhofer IISB*

# Electrochemical characterization

## Services

- Battery test cells and potentiostats for tailored examination conditions
- Temperature-dependent ionic conductivity of electrolytes via EIS
- Post-mortem analysis under inert conditions

## Key Topics

- Development of pouch cell prototypes for battery technologies
- Half-cell studies in pouch cells
- Assessment of potential applications



*Electrochemical characterization of laboratory test cells in the climate chamber © Daniel Karmann / Fraunhofer IISB*

# Material characterization

## Services

- Operando XRD, Raman spectroscopy & microscopy
- Water content of solid battery components
- Particle size distribution
- Determination of BET surface area

## Key Topics

- Microstructural material analysis in initial state, operando & post-mortem conditions
- Development of operando measuring cells for specific requirements



*IR spectroscopy of electrolytes at inert conditions © Kurt Fuchs / Fraunhofer IISB*