

Batteries

The battery is today the most important technology for electrical energy storage in various portable, mobile, and stationary applications. We investigate and optimize energy density, lifetime, and safety of batteries using computer simulations and complementary validation experiments.

Design and optimization of lithium-ion batteries

For stationary applications (e.g., solar home systems), lithium-ion batteries require particularly long lifetimes. We use multi-scale thermo-electrical models to optimize cell design and operation strategy with regard to thermal behavior and long lifetime. Part of the investigations are carried out in collaboration with the battery manufacturer *Leclanché*.

Understanding of metal-air batteries

So-called "post-lithium-ion batteries" such as lithium-air or sodium-air cells are governed by complex precipitation and dissolution reactions of the active materials. These reactions dominate performance and cyclability of the cells. We use spatially resolved simulations to understand and optimize performance limitation and cycling behavior.