

Simulation Technology

Multi-scale and multi-physics modeling

The research group has over ten years of expertise in the development and application of numerical simulation methods. A particular focus is being put on multi-scale methods that allow a coupled description of processes taking place on different spatial and temporal scales. We use both our in-house software DENIS (Detailed Electrochemistry and Numerical Impedance Simulation) as well as the simulation codes MATLAB, SIMULINK, COMSOL and CANTERA for treating the various aspects of computational battery and fuel cell technology.

Electrochemical impedance simulation

Electrochemical impedance spectroscopy (EIS) is an established technique for experimental investigation of electrochemical cells. We develop numerical methods that allow the model-based impedance simulation and, thus, a physically-based interpretation of the observed spectra. A recent development is the electrochemical pressure impedance spectroscopy (EPIS) which allows to significantly enhance sensitivity of impedance spectroscopy with respect to transport parameters.