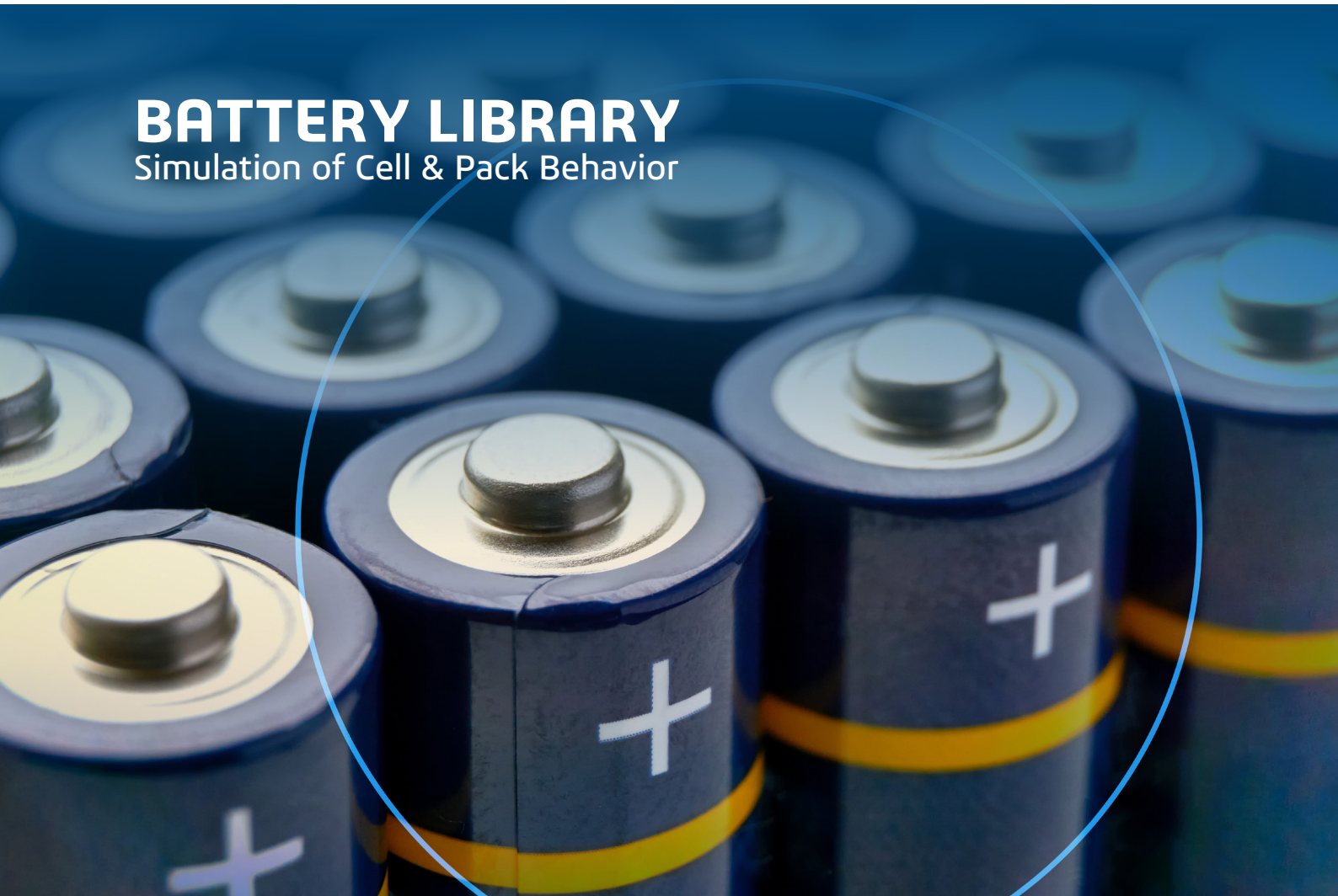


BATTERY LIBRARY

Simulation of Cell & Pack Behavior



BRING BATTERY SIMULATION TO SYSTEM LEVEL

The Battery Library is a Modelica-based simulation library to support the design of electrical storage systems and their integration into complex systems. It predicts the coupled electrical, thermal and aging behavior calculating the true performance of your battery system.

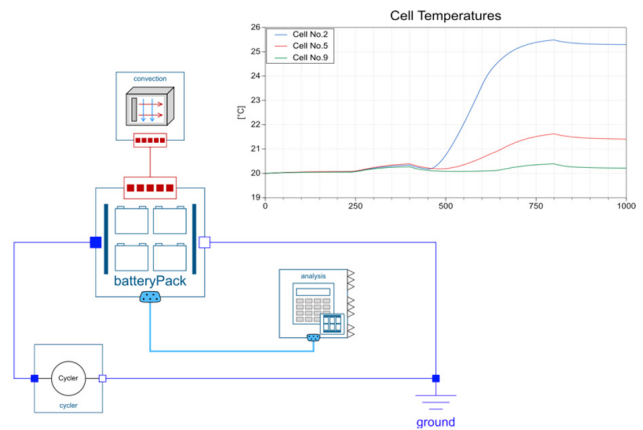
The library covers a wide range of industrial applications and accelerates the design for electrical vehicles, mobile devices, tooling equipment, autonomous robots and many others.

CELL MODELS

The library provides fast-computing equivalent circuit models (ECM) and detailed electrochemical cell (P2D) models.

The cell models consist of electrical, thermal and aging sub-models. Preconfigured sub-models with various levels of complexity and modeling depth are part of the library.

The electrochemical models predict the spatially distributed behavior of the essential states of the battery, such as concentrations and potentials in the electrolyte and the electrodes.



PACK MODELS

The battery pack models are available as both high-performant scaled models and precise discretized models.

The scaled models are suited for long-time aging simulations and integration into complex systems.

The discretized models simulate the individual cells and the interaction between them. This allows the analysis of several phenomena:

1. Cell parameter variations (e.g. capacity, inner resistance, state of health ...).
2. Temperature spread throughout the pack.
3. Self-balancing effects due to state of charge differences.
4. Detailed electric connection design.

FRAMEWORK

The library offers a streamlined modelling and parameterization workflow from cells to pack. Its structure allows easy customization of the electric, thermal and aging behavior on all levels. The model framework enables a seamless integration of user-generated models.

The library gives the user access to the implemented equations, which is critical for an efficient analysis of simulation results and facilitates model customizations.

BENEFITS

1. **Explore your battery** - Create a digital twin of your battery, setup test-benches and design experiments to explore the performance of your battery system.
2. **Virtual design** - Resize your cell, change your pack configuration or perform parameter sweeps to investigate different designs and their effect on your system.
3. **Wide range of model detail** - Simulation often requests a trade-off between detail and computation speed. Create battery models tailored to your problem.
4. **Compatible with other Modelica libraries** - Explore the performance of your battery integrated in drivetrains, vehicles, drones and other multi-physical systems.

Keywords: Battery Simulation, System Simulation, Energy Storage, Battery Cell, Battery Pack, Equivalent Circuit Models, Electrochemical Models, Dymola, Modelica, MBSE

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