NETWORK OF RESEARCH PILOT LINES
FOR LITHIUM BATTERY CELLS

Modeling and simulation of cells

Date and time:

Part 1: 27 October 2021 – 14:00 - 16:00pm

Part 2: 28 October 2021 – 14:00 - 16:00pm

Electrochemical modeling plays a key role in optimizing the processing conditions to achieve the desired cell performance. For such optimization, the physics-based electrochemical model accurately simulates the cell performance by solving coupled differential equations and is thus the industry standard method. This virtual training starts by introducing basic concepts of designing an electrochemical model and the insights they provide on the processing-performance mapping using case studies. After a general introduction to the different model scales, this training will focus on the continuum scale models as well as in ML models. The main aspects and purposes of such models will be discussed. Continuum model equations will be described as well as state of the art in numerical algorithms and optimization algorithms will be briefly mentioned. Model parametrization aspects will be described as well as the required parameters for each of the models will be enumerated. Similarly, the general overview of the current ML models for battery predictions will be described showing the advantages of these models in computation costs. Finally, some examples of the usage cases will be shared for both models. This training is suitable for theoretical and experimental researchers alike as well as managers to have a basic understanding of model development and design principles. Participants are only expected to have a basic understanding of the working of an electrochemical cell.

Learning outcomes

This virtual training empowers you to:

- understand the elements in electrochemical modeling for lithium-ion batteries
- identify the relation of processing conditions to electrode microstructure and cell performance
- learn how to tune the model for more realistic simulations
- understand the scope and approach of continuum models
- understand how model-based design can be applied to real usage
- understand how models can accelerate the battery parametrization activities

This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 875479

Who are the experts?

Ms. Elixabete Ayerbe is a Team Leader in Modeling and Post-mortem in the Materials for Energy Unit of CIDETEC Energy Storage, coordinating the activities related to multiphysics and data-driven models, as well as the parameterization and post-mortem analysis for Li-ion and advanced Li-ion batteries. She is currently coordinating H2020 DEFACTO project and coordinated in the past the FP7 SHEL project. In addition, she represents the multiphysics modeling activity of CIDETEC in several H2020 EU projects, such as SPICY, HIFI ELEMENTS, SPIDER, CoFBAT, BIG-MAP and Battery2030PLUS, and leads the area of Manufacturability in Battery 2030+ initiative.

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