

Physical and machine learning modeling of battery manufacturing processes

Date and time: 10 November 2021 – 14:00 - 16:00pm

The manufacturing process of lithium-ion batteries is highly complex: it encompasses multiple steps (mixing, coating, drying, calendaring, etc.) and numerous parameters that need to be adjusted in order to optimize the process, and ultimately the electrodes within the battery cells. Trial and error approaches are currently used for this purpose, but they are time-consuming and costly. The use of predictive physics-based and machine learning models is therefore crucial in order to ease the optimization of such processes.

This virtual training discusses different physics-based models (e.g., coarse grained molecular dynamics, discrete element method, CFD) and machine-learning-based modeling strategies that allow predicting the influence of manufacturing parameters on the electrodes properties, giving the promise to accelerate battery manufacturing optimization. It introduces the basic concepts on how to implement in practice such kind of models and share application examples with the participants. Furthermore, online exercises will be provided, including one using Virtual Reality from an Internet browser. This training is beneficial to participants with knowledge of battery science, preferably with experimental or modeling background.

In short, this training covers the following areas:

- lithium-ion battery manufacturing
- manufacturing process modeling based on physics-based and machine learning computational approaches

Learning outcomes

This virtual training empowers you to:

- familiarize yourself with digital tools to analyze battery manufacturing data
- learn the working principles of digital tools to model battery manufacturing processes
- learn about how to implement in practice some of these tools (software, programs)

Who are the experts?



Dr. Alejandro A. Franco is Full Professor at Université de Picardie Jules Verne (Amiens, France) and Junior Member of the Institut Universitaire de France. He is the leader of the Theory Open Platform at the ALISTORE European Research Institute, and Chairman of the group “Digitalization, Measurement Methods and Quality” in the European Li-Planet Network on battery manufacturing. He holds an ERC (European Research Council) grant for his project “ARTISTIC” dealing with the development of a digital twin of battery manufacturing encompassing multiscale physical modeling and artificial intelligence. He also develops Virtual and Augmented Reality tools for battery education and research.

