Integrated Simulation of Drying Phenomena for Lithium Ion Battery Electrodes with Focus on Mass Transport Mechanisms of Binder Migration

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The processing of electrodes for lithium-ion batteries (LIB) consists of multiple sequential steps that mutually affect each other. The coating and drying steps of the procedure heavily influence the performance of LIB and therefore, must be closely monitored and thoroughly understood [1]. Experimental and simulative studies provide insight on the individual processing steps. However, it is equally important to examine the influence of each step on the subsequent step and to consider the entire integrated process.

Models to describe the individual processing steps will be further developed, improved, and streamlined for the integration into a digitization platform of the LIB production chain. This integration will provide insight on the propagation of parameter variation, the influence of process parameters on LIB performance, and the development of structure properties throughout the process.

As part of this integrative digitization platform, this study simulates the coating, drying, and post drying. The simulation tool probes the complex mass-transport phenomena that occur during drying and post drying and experimental data validate simulative data. A particular focus is on the diffusion process of binder migration during drying which affects the binder distribution in the LIB electrodes and their electro chemical performance in battery cells. Drying conditions and mechanisms control binder migration and will be investigated throughout the simulation.

References

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