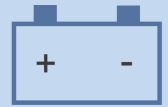


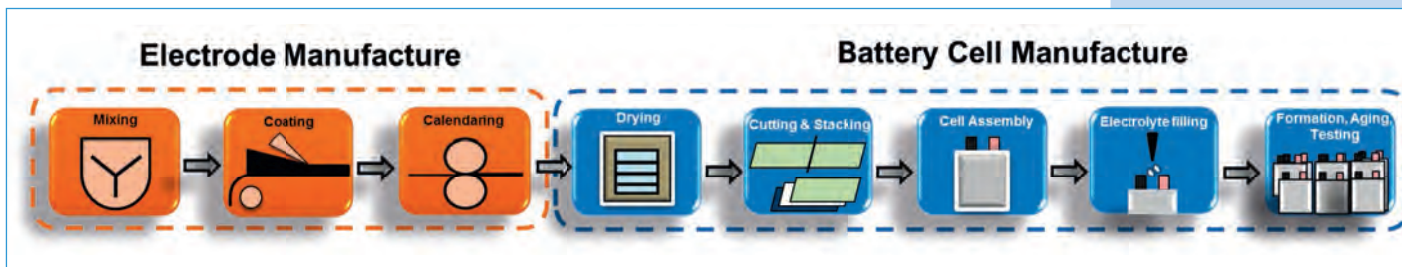
Manufacturing Technologies and Production Methods for Battery Cells



Scope of project

The research group manufacturing technologies for battery production focuses on the development of innovative, sustainable and cost-effective production technologies for high performance battery cells. Our aim is to support Swiss battery industry such as battery production and equipment suppliers from Swiss machine industry as well as suppliers for electro-chemicals. The purpose is to share machine and process knowledge from a holistic approach to support even smaller firms with deeper process knowledge. With this base additional functionality and value for the battery industry can be created. Further we like to connect the Swiss excellence in electro-chemical research with the production line at the shop floor by demonstrating production at our pilot line.

Status of project and main scientific results of workgroups



As a result of the various mobile and stationary applications, there are different production tendencies which are focused mainly on lithium-ion, sodium-ion or redox-flow batteries. Not only different types of batteries, it is also possible to manufacture them in different sizes and designs. The prime focus lies on lithium based cells. According to their package layout they are grouped commonly as cylindrical, prismatic and pouch cells and are available for miscellaneous utilization purposes.

The conventional lithium-ion battery production is based on two main stages, which are electrode and cell manufacturing. Battery cell manufacturing begins with a drying step and targets to remove residual water from the electrodes. Considering the case type there are different processing methods available. For pouch cell type, cell manufacturing

includes cutting, stacking and assembly steps. At this phase there is big improvement potential in terms of process parameters and technologies such as positioning accuracy, cutting tool, cutting speed etc.

It is predicted that, with cooperation of different disciplines such as automation technology, control engineering, data communication and data management, the research studies in this field will pave the way for the smart manufacturing process in an «Industry 4.0» environment. For that reason, at the BFH, a research group is implementing a pilot production line which is based on battery cell manufacturing. Therefore the pouch cell design as a future-oriented case type was decided for this production.

At the first stage of this project it is planned to establish an assembly line that includes cutting, handling and stack-

ing steps for electrodes and separator. It should be mentioned that the production line is aimed for the experimental purposes of research groups, industrial partners and also for demonstrating the battery cell assembly. For the cell chemistry it is foreseen to use first lithium-ion and later sodium-ion technology.

The team cooperates with research groups at BFH Energy Storage Research Center ES-ReC at the InnoCampus Biel. Simultaneously it supports the know-how-transfer between research units – such as ETHZ, PSI, University of Freiburg – for the development of new, suitable as well as cost-efficient manufacturing technologies of battery cells.

Figure 1:

Flow chart for lithium-ion battery manufacturing.

References

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