

Fraunhofer Battery Alliance

Material research

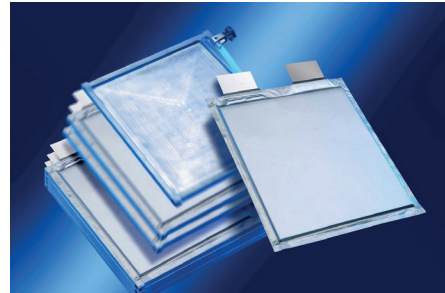
The 26 member institutes of the Fraunhofer Battery Alliance develop technical and conceptual solutions along the entire value chain of electrochemical energy storage systems up to the application level on behalf of customers or in publicly funded projects together with industry. Our expertise and many years of experience range from materials development to system integration of mobile and stationary storage systems.

Competences and field of work

The Fraunhofer Battery Alliance develops, optimizes, and characterizes customer-specific materials and manufacturing processes for battery cells. Research and development work aims to improve the storage properties such as both energy and power density, cycle and calendar life as well as intrinsic safety, with particular attention to aspects of material synthesis and cell production. The Battery Alliance focuses on both material and technology development and offers necessary characterization methods. Knowledge relevant to production and application can be obtained on both a laboratory and pilot scale, facilitating industrial implementation. The focus is placed on lithium-based systems such as lithium-ion batteries including solid-state batteries and lithium-sulfur cells. Furthermore, redox-flow batteries, high-temperature storage systems, sodium batteries, metal-air batteries and double-layer capacitors are considered.



Vacuum intensive mixer
(© Fraunhofer IFAM)



*LiPo-cells for
automotive applications*
(© Fraunhofer ISIT)

Materials

Based on long-standing experience, the Fraunhofer Battery Alliance develops innovative electrode materials, electrolytes and separator components. Activities include chemical material synthesis and the sol-gel or solvothermal synthesis of numerous oxidic and non-oxidic materials. A specific field of work within the Battery Alliance is the development of electrolytes and separators, with an emphasis on stability and safety aspects.

Furthermore, special carbon materials for electrode and C/Si composites, processes for the functional coating of particles (core-shell structures) and the modification of surfaces using electrode and protective coatings are developed. The improvement of wetting behavior and comprehensive know-how on the targeted adjustment of particle morphologies are additional possibilities to ensure the stability, the functionality and packing density of electrodes. These developments are supported by advanced analytics and characterization.

Electrode manufacturing and cell development

In addition to the use of highly efficient active materials, a key factor in the performance and reliability of battery cells is the processing of these materials. The Battery Alliance consequently develops and optimizes the processes and manufacturing technologies which are required for the production of battery cells. In addition, the cells manufactured in the laboratory or pilot plant can provide important information concerning material stability and processability in near-application conditions. Particular emphasis is placed on electrode production, with a focus on efficient and high-output coating and drying of the foils. Work is also carried out on laser processes, both for electrode separation and for the welding of electrode stacks, which is of high interest.

As a basis for cell and process optimization the Fraunhofer Battery Alliance performs comprehensive electrical and mechanical cell tests to investigate the operational and failure behavior of battery cells. A targeted analysis of the failure and aging mechanisms is carried out in a subsequent post-mortem analysis on macroscopic and microanalytical levels.

Our offer

- Material synthesis, development and processing
- Particle modification of battery materials
- Development and optimization of electrolytes and separators
- Development of electrode foils and tailored formulations
- Material analysis and electrochemical testing of materials and components
- Process development for innovative, cost-efficient electrodes and cell production processes
- Prototype production for lithium batteries
- Post-mortem analysis and failure investigations
- Product benchmarking
- Recycling concepts for batteries/ design for recycling
- Modeling of the behavior and failure of cells
- Studies, roadmaps und techno-economic evaluation



Please feel free to contact us – with many years of experience and expertise, we will collaborate with you to develop customized solutions tailored to your needs.

Contact

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