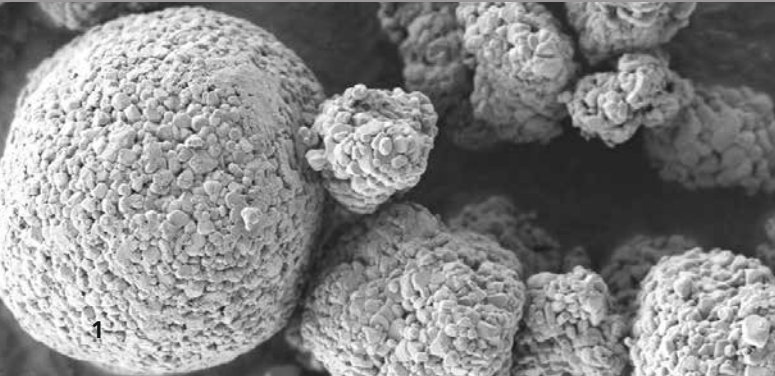




Fraunhofer

BATTERIEN

FRAUNHOFER BATTERY ALLIANCE



1 FESEM image of NCM powder.

Photo: Fraunhofer IKTS.

2 Vacuum intensive mixer.

Photo: Fraunhofer IFAM.

FRAUNHOFER BATTERY ALLIANCE FROM THE MATERIAL TO THE CELL

Fraunhofer Battery Alliance

Contact

Prof. Dr. Jens Tübke
Phone +49 721 4640-343
jens.tuebke@ict.fraunhofer.de

Dr.-Ing. Mareike Wolter
Phone +49 351 2553-7971
mareike.wolter@ikts.fraunhofer.de

www.batterien.fraunhofer.de/en

The Fraunhofer Battery Alliance, consisting of 19 Fraunhofer institutes, carries out research in the field of electrochemical energy storage devices (batteries and super-capacitors) in order to develop technical and conceptual solutions for commercial applications. Particular consideration is given to the social, economic and ecological implications of the technology.

Beside cell production, systems, simulation and testing, a further competence of the Alliance is material and cell development.

Competences and fields of work

The Fraunhofer Battery Alliance develops, optimizes and characterizes customer-specific materials and manufacturing processes for batteries. Emphasis is placed on lithium-ion systems and double-layer capacitors, and also on high-temperature storage devices (NaS, Na nickel chloride), redox-flow and zinc-air systems.

Research and development work aims to increase tolerance to external influences and improve the storage properties and intrinsic safety, with particular attention to aspects of the cell manufacture. The Battery Alliance focuses on both material and technology development, and can offer all the necessary characterization methods. Information relevant to production and application can be obtained on both a laboratory and pilot scale, facilitating industrial implementation.



Materials

On the basis of long-standing experience the Fraunhofer Battery Alliance develops innovative electrode materials, electrolytes and separator components. "Beyond-lithium technologies" such as LiS, zinc-air etc. are also investigated.

Activities include chemical material synthesis, such as the synthesis of inorganic-organic hybrid polymers (ORMOCER®s) and the sol-gel or solvothermal synthesis of numerous oxidic and non-oxidic materials, as well as the development of special carbon compounds for electrode materials.

Processes for the functional coating of particles (core-shell structures) and the modification of surfaces using electrode and protective coatings (modification of the wetting behavior), and comprehensive know-how on the targeted adjustment of particle morphologies are additional possibilities to ensure the stability and packing density of the electrodes.

A specific field of work within the Battery Alliance is the development of electrolytes and separators, with an emphasis on stability and safety aspects. Developments are supported by comprehensive analytical and characterization facilities and equipment.

Cell development and production

Beside the use of efficient storage materials, a key factor in the performance and reliability of battery cells is the processing of these storage materials. The Battery Alliance consequently develops and optimizes the processes and manufacturing technologies necessary for the production of the cells. In addition, the cells produced 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 the efficient and high-output laser-based 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.

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 development and processing
- Product benchmarking
- Particle modification of materials for batteries and super-capacitors
- Development and optimization of electrolytes and separators
- Material analysis and electrochemical tests

- Development of electrode foils and tailored formulations
- Testing of electrodes
- Process development for innovative, cost-efficient electrodes and cell production processes
- Prototype production for lithium batteries

- Post-mortem analysis and failure investigations
- Recycling concepts for batteries / design for recycling
- Modeling of the behavior and failure of cells

- Consultancy, studies

3 Post-mortem analyses of battery cells. Photo: Fraunhofer ICT.

4 Stacking unit for small-series production. Photo: Fraunhofer IWS.