



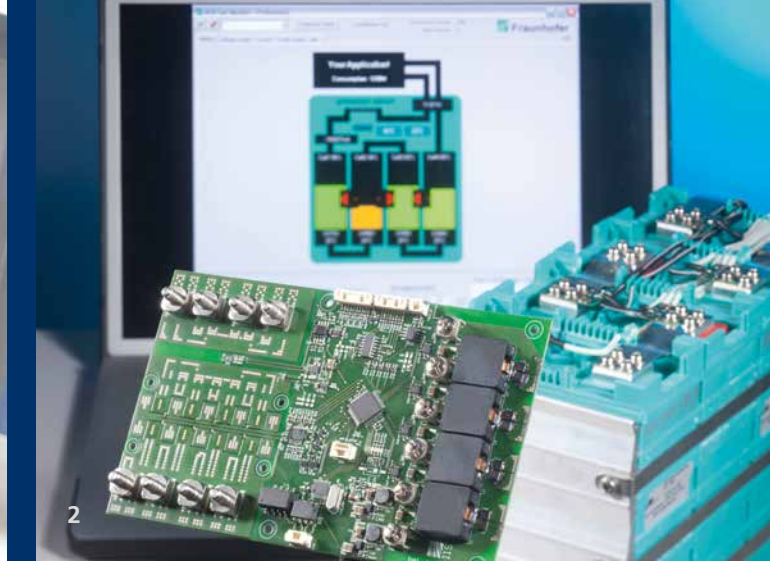
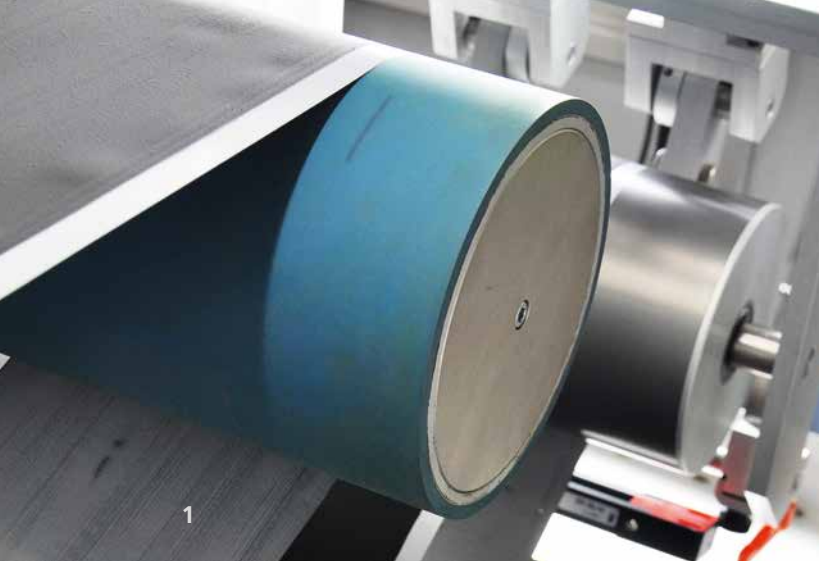
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BATTERIEN

FRAUNHOFER BATTERY ALLIANCE

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High-performance batteries are key components in mobile and stationary electrically-powered applications, and are also the most complex elements in these systems. Particularly in high energy and output ranges, the durability and reliability of a system must be high, placing significant technical demands on the batteries. Electrical energy storage devices in vehicles must meet a particularly wide range of (sometimes contradictory) requirements, regarding for example their cost, energy and power density, cycle stability, temperature range and safety.

Through research in the field of electrochemical energy storage, the Fraunhofer Battery Alliance develops suitable technologies and conceptual solutions to application level, paying particular attention to their social, economic and ecological impacts. Here optimization is needed across a series of disciplines. The 19 members of the Fraunhofer Battery Alliance have competences in virtually all of these areas.

Materials and cells

In the area of materials and cells, the members of the Battery Alliance develop, optimize and characterize customer-specific materials and manufacturing processes for batteries. Emphasis is placed on lithium-ion systems and double-layer capacitors. Redox-flow and high-temperature storage (NaS, Na nickel chloride) are also developed. Research and development work aims to increase tolerance to external influences and improve the storage properties and intrinsic safety.

Systems

Within the Fraunhofer Battery Alliance, individual cells based on different technologies are developed for use in tailored battery modules and complete battery systems in a range of applications. Work covers the simulation-based design of the mechanical construction and the cooling system, joining technologies, safety concepts, the development of battery management systems and the accompanying algorithms for measuring charge and aging, and optimized charging and operation management strategies. The interfaces of the modular battery systems are configured to facilitate system integration in terms of both performance and communication.

Simulation

The properties of batteries from the atomic scale up to behavior in a power chain are investigated by the Battery Alliance using cutting-edge simulation tools. Research topics in both fundamental and contract research include the simulation of material properties, cell optimization from a thermal and aging perspective, the optimization of battery management systems, network simulations and the crash behavior of cells and batteries.

Testing and evaluation

The testing and evaluation of energy storage devices is an important stage in the development chain for automotive applications. Due to the range of challenges involved, a significant number of attributes must be investigated. Beside standard tests, the facilities available within the Fraunhofer Battery Alliance enable specialized and highly scientific tests on specific topics, on a cell, module and system level.



COVER PHOTOGRAPH:

12-cell battery stack as an active component of a battery module.

Photograph: Fraunhofer ICT.

1 Electrode production.

Photograph: Fraunhofer IKTS.

2 Battery management system.

Photograph: Fraunhofer IIS.

3 Test equipment for the nail penetration test.

Photograph: Fraunhofer ICT.

Research and development experts from 19 Fraunhofer institutes have combined their competences in the Fraunhofer Battery Alliance. Feel free to contact us!

- Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut EMI
- Fraunhofer Institute for Electron Beam and Plasma Technology FEP
- Fraunhofer Institute for Chemical Technology ICT
- Fraunhofer Institute for Manufacturing Technology and Applied Materials Research IFAM
- Fraunhofer Institute for Integrated Circuits IIS
- Fraunhofer Institute for Integrated Systems and Device Technology IISB
- Fraunhofer Institute for Ceramic Technologies and Systems IKTS
- Fraunhofer Institute for Laser Technology ILT
- Fraunhofer Institute for Manufacturing Engineering and Automation IPA
- Fraunhofer Institute for Silicate Research ISC
- Fraunhofer Institute for Solar Energy Systems ISE
- Fraunhofer Institute for Systems and Innovation Research ISI
- Fraunhofer Institute for Silicon Technology ISIT
- Fraunhofer Institute for Industrial Mathematics ITWM
- Fraunhofer Institute for Transportation and Infrastructure Systems IVI
- Fraunhofer Institute for Wind Energy and Energy System Technology IWES
- Fraunhofer Institute for Mechanics of Materials IWM
- Fraunhofer Institute for Material and Beam Technology IWS
- Fraunhofer Institute for Durability and System Reliability LBF



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Contact persons in the Fraunhofer Battery Alliance

Dr. Jens Tübke
Spokesperson for the Alliance
Phone +49 721 4640-343
Fax +49 721 4640-800343
jens.tuebke@ict.fraunhofer.de

Dr. Sophie Weixler
Head of Coordination Office
Phone +49 721 4640-731
Fax +49 721 4640-111
sophie.weixler@ict.fraunhofer.de

www.fraunhofer.de
www.batterien.fraunhofer.de