

PRESS RELEASE

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Fraunhofer ITWM Presents Innovations for Electromobility

Getting More Out of the Battery with Simulations

Researchers at the Fraunhofer Institute for Industrial Mathematics ITWM are using innovative technologies to focus on battery behavior during charging and discharging, the optimization of battery production and the aging of batteries. They use modern simulation tools and innovative measurement techniques to drive forward the further development of battery cells for electric cars. They will be presenting their research results at the Battery Show Europe 2025 from June 3 to 5.

The electrodes are a central component of battery cells. The microscopic structure of the electrodes has a decisive influence on the behavior of the entire battery cell. The Fraunhofer ITWM's [BEST simulation software](#) makes it possible to simulate the three-dimensional microstructure of electrodes in detail. Through these simulations, our researchers gain important insights into the behaviour of the battery cell: »We can use these insights to predict how the cell will behave during charging and discharging and then make targeted optimizations to improve the performance and efficiency of the battery« explains Dr. Jochen Zausch, team leader of »Electrochemistry and Batteries«.

Predicting Battery Aging by Simulation

Battery cells age both during active use and during storage. There are many factors that influence the ageing behavior. For example, mechanical stress during operation can cause parts of the cell to become inactive such that they no longer contribute to charge exchange. In addition, chemical side reactions take place, which result in a loss of capacity and increased internal resistance, which impedes performance. »We are working on gaining a better understanding of the cells and are researching how these special ageing processes can be slowed down in order to save resources and energy in battery production in the long term « explains Dr. Falco Schneider, expert in [battery cell ageing](#). Several ageing models and analysis methods are integrated into the latest version of the BEST software.

Simulation-Based Optimization of Battery Production

The researchers at Fraunhofer ITWM are also focusing on battery production, which is being driven forward in the state government-funded project »Digitalization of Battery Cell Production to Create a Battery Twin for the Entire Product Life Cycle«, or [DiBaZ](#) for

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short. A key aspect is the simulation and optimization of the central steps in the production of batteries, such as calendaring the electrodes, electrolyte wetting and battery cell formation or foam encapsulation of cells within modules for insulation, using proven tools such as [FeelMath](#), [FLUID](#) and [FOAM](#).

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DiBaZ brings together various areas of expertise at the Fraunhofer ITWM to develop a digital twin for all process steps in battery production. »Through the work in this project, we can offer our industrial partners methods and models that not only simulate processes from battery production, but also enable non-destructive quality control and include energy management with predictive control« explains Dr. Konrad Steiner, coordinator of the project.

Quality Assurance in Battery Production

The Fraunhofer ITWM has also further developed its terahertz measurement technology and offers new possibilities for inspecting the electrode coating for battery cells. Inspection systems based on terahertz radiation are non-contact and non-destructive optical methods. Most importantly, they are also completely harmless to health. »The results of tests on terahertz measurement technology are promising and show the great potential of this technology for the production of battery cells« says Dr. Joachim Jonuscheit, deputy Head of the Department »Material Characterization and Testing« at the Fraunhofer ITWM.

Presentation at the Battery Show Europe 2025

At the Battery Show Europe 2025 from June 3 to 5, our experts will be represented with an exhibit on inline layer thickness measurement of battery foil coatings. Our researchers will also be presenting the latest developments of our simulation tool BEST as well as possibilities for physical cell simulation and the simulation of battery production processes.

Meet us at the joint stand of the Fraunhofer Battery Alliance in Hall 10, Stand J40. We look forward to your visit!

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The physics-based simulation software **BEST** of Fraunhofer ITWM offers deeper insights into the internal electrochemical transport processes for various cell formats of Li-ion batteries. © Fraunhofer ITWM



The Fraunhofer ITWM supports battery production with its wide range of expertise, from energy management, quality control and simulation-based processes to the design of electric vehicles. © Fraunhofer ITWM

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The pilot plant for battery cells of our project partner, the Fraunhofer Research Institution for Battery Cell Production FFB. Studio Wiegel for Fraunhofer FFB

More information online: [Electrochemistry and Batteries - Fraunhofer ITWM](#)

About the Fraunhofer Institute for Industrial Mathematics ITWM

The Fraunhofer Institute for Industrial Mathematics ITWM in Kaiserslautern is one of the largest research institutes for applied mathematics in the world. We see it as our task to further develop mathematics as a key technology and to provide innovative impulses. Our focus is on the implementation of mathematical methods and technology in application projects and their further development in research projects. The close cooperation with partners from industry guarantees the high practical relevance of our work.

Their integral building blocks are consulting, implementation and support in the application of high-performance computing technology and the provision of customized software solutions. Our various areas of expertise address a wide range of customers: the automotive industry, mechanical engineering, the chemical industry, energy and the financial sector. This also benefits from our excellent networking, for example in the Simulation and Software-based Innovation Center.

About the Fraunhofer-Gesellschaft

The Fraunhofer-Gesellschaft, based in Germany, is the world's leading organization for application-oriented research. With its focus on future-oriented key technologies and the utilization of results in business and industry, it plays a central role in the innovation process. As a guide and driving force for innovative developments and scientific excellence, it helps to shape our society and our future. Founded in 1949, the organization currently operates 76 institutes and research facilities in Germany. More than 30,000 employees, most of whom are trained in the natural sciences or engineering, work on the annual research volume of 2.9 billion euros. Contract research accounts for 2.5 billion euros of this total.

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