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Battery Production: Laser Light instead of Oven-Drying and Vacuum Technology

At the exhibition BATTERY + STORAGE as part of WORLD OF ENERGY SOLUTIONS 2015 in Stuttgart, the Fraunhofer Institutes for Laser Technology ILT and for Ceramic Technologies and Systems IKTS will be showing how laser technology can be used to manufacture batteries both cost- and energy-efficiently.

In the truest sense, it's all about watts at the Dresden-based Fraunhofer Institute for Ceramic Technologies and Systems IKTS and the Aachen-based Fraunhofer Institute for Laser Technology ILT. The joint project "DRYLAS - Laser-based Drying of Battery Electrode Slurries" focusses on the energy-efficient drying of electrode layers, so-called slurries, which are applied in a wet-chemical process to the current-conducting metal foils during battery production. Until now, continuous furnaces have been used, which remove the solvent contained in the slurry during the drying process. Dr. Dominik Hawelka, a scientist at the Fraunhofer ILT, gets to the heart of the reasoning behind this research project: "In these furnaces, the energy deposition is not very efficient as compared to a laser treatment. That is why we have decided to use the very precisely controllable laser radiation as the drying tool for this application."

Energy consumption halved

The two institutes have designed an in-line process and a fiber-laser based drying module which has already proven itself in initial tests in a so-called roll-to-roll plant of the Fraunhofer IKTS in Dresden. "The laser radiation is absorbed directly in the slurry and minimizes heat losses to the surroundings," says the physicist. "Our drying process uses about half of the energy that the continuous furnace needs." The two institutes have also demonstrated that the fiber-laser dried electrodes can be used to build sound battery cells that work just as flawlessly as components treated conventionally in a continuous furnace.

Continuous production with a roll-to-roll process chain

The Fraunhofer ILT is also using its expertise in laser technology to put photonic process and plant engineering into practice: in particular, in the project ProSoLitBat, funded by the German Federal Ministry of Education and Research (BMBF) and coordinated by SCHMID Energy Systems GmbH from Dunningen. This project focuses on the industrial,

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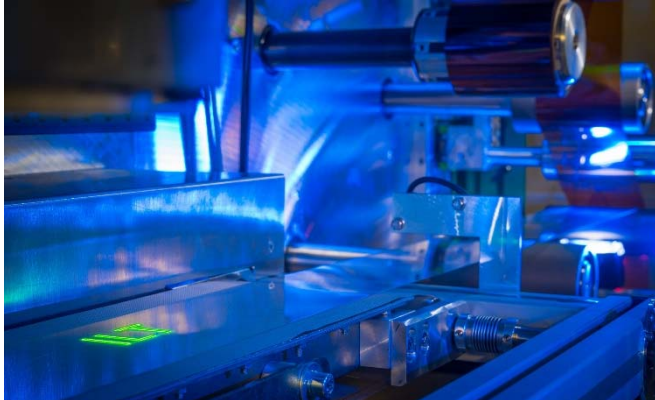
FRAUNHOFER INSTITUTE FOR LASER TECHNOLOGY ILT

continuous production of lithium, solid-state batteries in thin film technology. The aim of the current project, which will run until 2017, is to make a so-called roll-to-roll process chain viable as an alternative to the vacuum method previously used. The discontinuous, or batch-type vacuum process is extremely complex and costly. "In contrast, continuous production can produce significantly higher quantities at a lower cost, which will help the solid-state lithium batteries to find wider applications," explains Dipl.-Ing. Christian Hördemann, a scientist at Fraunhofer ILT. "We have built a pilot plant that works with an inert gas atmosphere, and with it we can now pattern and decollate batteries with integrated ultrafast lasers." The company SCHMID Energy Systems shall make the process from Aachen ready for series production.

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Fraunhofer Battery Alliance at the BATTERY + STORAGE trade fair

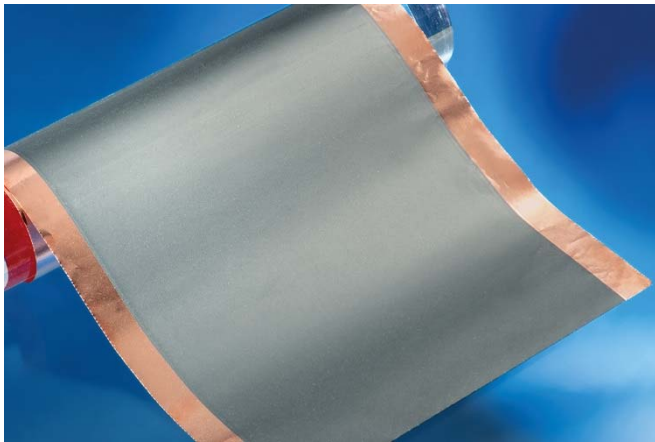
You can obtain details on both projects at the booth of the Fraunhofer Battery Alliance (Hall C2 B 41) in the BATTERY + STORAGE exhibition area at the WORLD OF ENERGY SOLUTIONS in Stuttgart. This international trade fair and conference for the convergence of energy generation, storage systems and mobility solutions will take place from October 12 to 14, 2015.



Picture 1:
In the project ProSoLitBat, funded by BMBF, a roll-to-roll process chain has been generated for the continuous production of lithium solid electrolyte batteries with the support of the project partner Fraunhofer ILT. Picture: Fraunhofer ILT, Aachen, Germany / Volker Lannert.

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Picture 2:
Scientists of the Fraunhofer Institutes IKTS and ILT have halved the energy consumption during drying of the layers applied with a wet-chemical process thanks to a laser-based inline drying module, without compromising the quality of the so-called electrode slurries (pictured). Picture: Fraunhofer ILT, Aachen.

The **Fraunhofer-Gesellschaft** is the leading organization for applied research in Europe. Its research activities are conducted by 66 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of nearly 24,000, who work with an annual research budget totaling more than 2 billion euros. Of this sum, around 1.7 billion euros is generated through contract research. More than 70 percent of the Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly financed research projects. International collaborations with excellent research partners and innovative companies around the world ensure direct access to regions of the greatest importance to present and future scientific progress and economic development.

For further information

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