



LASER-BASED INLINE PROCESS FOR DRYING BATTERY ELECTRODE LAYERS

Task

In order for electromobility to become competitive on the mass market, production costs of battery cells must be reduced significantly. One promising approach to accomplish this is by substituting conventional furnace processes in battery manufacturing with innovative laser processes. When battery electrode layers deposited with knife-coating are dried, laser-based processes have a considerable potential for energy savings due to the efficient energy input in comparison to conventional drying in a continuous furnace. In addition, they can also enable a substantial reduction of the installation space for the corresponding roll-to-roll system.

Method

As part of the research project »DRYLAS«, Fraunhofer ILT, along with Fraunhofer IKTS, has developed a laser-based method for drying water-based battery electrode layers. The process requires the laser-induced temperature distributions to be adapted in such a way that the material is dried completely while peak temperatures do not exceed 300 °C. This way, the temperature sensitive components of the 50 - 100 µm thick layers are not damaged.

Result

Electrochemical testing of button cells on the basis of laser-dried electrodes shows that, with capacity of about 355 mAh/g, the performance of conventionally produced cells is achieved. By implementing a technology demonstrator in the form of a laser-drying module, Fraunhofer ILT has demonstrated the scalability of the process in an in-line coating unit. With 400 W laser power, a drying rate of about 60 cm²/s can be achieved while the energy consumption is reduced by about 50 percent.

Applications

In addition to drying conventional electrodes in the battery sector as described here, this laser-based temperature treatment can be applied for the sintering of solid electrodes for thin film batteries.

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Contacts

Delil Idris Demir
Telephone +49 241 8906-292
delil.demir@ilt.fraunhofer.de

Dr. Jochen Stollenwerk
Telephone +49 241 8906-411
jochen.stollenwerk@ilt.fraunhofer.de

1 Laser-dried battery electrode layer on copper foil.