



Fraunhofer

IWS



Dresden

FRAUNHOFER-INSTITUT FÜR WERKSTOFF- UND STRAHLTECHNIK IWS



INNOVATIVE TECHNOLOGIES FOR ENERGY STORAGE DEVICES OF THE NEXT GENERATION

The task

Electric storage devices are the key and simultaneously the bottle neck of many future technological areas, i. a. for electric and hybrid vehicles. High costs, insufficient performance capacity according to energy and power density as well as to life time and security issues still impede in different areas the breakthrough into the mass market. An efficiency improvement of energy storage devices and a cost reduction could only be developed particularly by innovative material concepts and by efficient manufacturing. Prerequisites for this purpose are the high process velocities and the efficient utilization of raw materials.

Our solution

Facing these challenges Fraunhofer IWS Dresden works on solutions alongside the process line for the manufacturing of battery and super cap cells.

Our offer

- evaluation of materials and components in test and prototype cells
- process development
 - manufacturing of electrodes
 - shaping through cutting
 - contacting through welding
- installation of testing and prototype cells according to customer request

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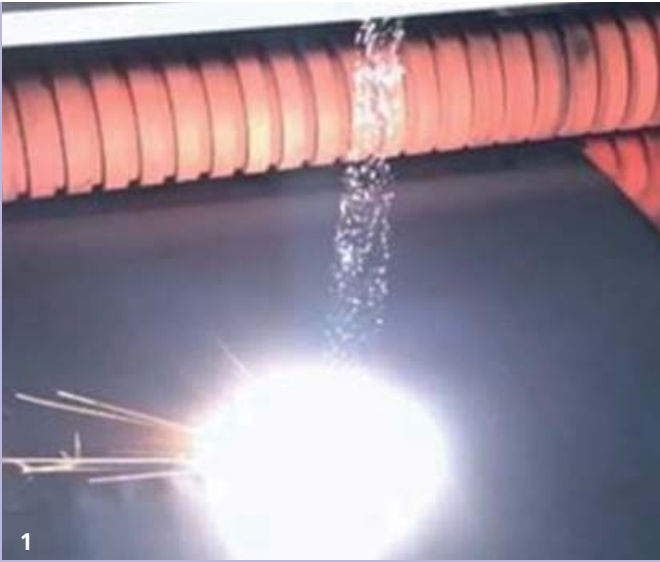
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Manufacturing of electrodes in the dry film process

Free-standing or substrate-based films are manufactured on the basis of conventional or innovative active powder materials for lithium-ion batteries or supercapacitors without utilization of solvents.

Advantages of the dry film process are:

- reduction of costs by avoidance of solvents and drying process steps
- high electrochemical activity due to fine fibrillary dispersion of the binder
- degree of freedom in the electrode design (high film thickness, perforated current collectors) by the manufacturing of free-standing films from powders

Alternatively to the dry film process, for electrode manufacturing at IWS water-based dispersions are applied on metal by a roll-to-roll process.

Laser cutting „on the fly“

The cutting of electrodes from a roll in a continuous process enables short manufacturing times at high cutting quality. At IWS this process has been integrated into a demonstration facility for the manufacturing of cells and can be utilized for testing of different electrode materials.

Laser welding

The bonding of the electrode packages is done at IWS by a laser welding process. A mechanically stable connection of the electrode packages to the battery tabs and minimal transition resistances can be implemented for different material combinations.

Automatized assembly

The laser processes are embedded in a process chain for the fully automatized manufacturing of cells under local dry room conditions. The assembly of cells is done by stacking.

Prototype cell assembly and evaluation

Due to the closed process line cells can be assembled and tested at IWS on the basis of various source materials (active material powder or electrodes).

The possibilities range from pure material evaluation in coin cells to 30 Ah prototype pouch cells.

- 1 *Continuous laser cutting process „on the fly“*
- 2 *Automatized stacking facility with integrated laser processes*

Scheme of the solvent-free dry film process for the manufacturing of electrodes



Equipment

manufacturing of electrodes: R2R coating facility, calendering systems for densification, and continuous dry film process

laser processes: laser equipment for laser remote cutting and welding for electrode materials

manufacturing of cells: automatized stacking facility under dry room atmosphere, 3 Ar-glove boxes

tests: 200 test channels for electrochemical analysis