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LASER-BEAM MICRO-WELDING IN BATTERY TECHNOLOGY

Task

As automobiles are increasingly being powered by electrical motors, demand is growing for high-performance energy storage systems. Various types of cells are used for the construction of battery modules or packs: 18650 round cells, prismatic cells or pouch cells. The joining processes required to interconnect the cells require high process stability and reliability irrespective of the type of battery, while at the same time providing low electrical transition resistances and high geometric flexibility.

Method

Laser-beam micro-welding with local power modulation is being used to firmly bond battery cells to one another. When the feed motion is overlapped with a circular oscillation movement, the attachment geometry and the mixing ratio can be adjusted. Thanks to the overlapping feed motion, the process can contact joining materials of different cell types, ranging from aluminum-copper up to copper-steel connections. The welding process has been designed to reduce the welding depth while the bonding width remains the same so that the active material in the battery cell is not damaged. In addition, the metallurgy of the joining compound can be specifically controlled by this approach.

1 *Welding on Li-ion pouch cells.*

2 *Contacting both poles of round cells on the top, laser bonding on the positive pole.*

Results

Laser welding processes have been developed to contact pouch and round cells as well as prismatic battery cells. The process is also able to generate reproducible joint connections with different material combinations (aluminum/copper/steel) and positioning on the cells (contact of positive and negative poles on one side of the round cell). The spatial laser power modulation improves the consistency of the welding depth of all the battery types and increases the connection width of the current-carrying joint connection.

Applications

The joining processes developed here are particularly suitable for contacting battery cells, e.g. for applications in electromobility. The results can also be transferred to the joining of other electrical connections.

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Contact

Sören Hollatz M.Sc.
Telephone +49 241 8906-613
soeren.hollatz@ilt.fraunhofer.de

Dr. Alexander Olowinsky
Telephone +49 241 8906-491
alexander.olowinsky@ilt.fraunhofer.de