



LASER MEETS HYDROGEN – THE HYDROGEN LABORATORY AT FRAUNHOFER ILT

Task

In addition to battery-based electric mobility, using green hydrogen in fuel cells is also a way out of our dependence on fossil fuels and towards sustainable mobility. The production costs of fuel cell systems, however, are still too high for the mass market. Currently, the bipolar plate (BPP) is the second most costly component of a fuel cell after the membrane electrode assembly (MEA). A bipolar plate usually consists of two stamped sheets that are welded together and then coated with corrosion protection. To reduce the production cost of the bipolar plate, the industry needs new high-rate cutting, welding and coating processes.

Method

As it develops innovative laser processes and equipment technology, Fraunhofer ILT provides solutions for the cost-efficient and, at the same time, flexible production of high-quality and functionalized BPPs. On the one hand, processes under examination are BPP laser-beam welding and cutting with a focus on increasing the process speed while maintaining the quality. On the other, the institute is investigating processes for functionalizing bipolar plates with USP laser microstructuring as well as the wet-chemical application of corrosion protection layers with coupled thermal laser post-treatment. In addition, it is developing laser-based MEA thin film fabrication.

Results

To investigate these novel laser-based manufacturing processes for the production of BPPs, the Fraunhofer ILT has established a hydrogen laboratory with the help of a strategic investment. Thanks to a total volume of more than € 1.7 million, the new laboratory will be equipped with state-of-the-art machine technology specifically designed to increase the productivity of laser-based manufacturing processes for fuel cell production. From the beginning of 2022, laser processes will be developed here and the bipolar plates produced will be installed and tested in fuel cells.

Applications

The Fraunhofer ILT's hydrogen laboratory provides a development platform for customers from industry and research. Since it is equipped with laser-based machine technology that goes beyond the state of the art, researchers can develop future laser processes in the context of fuel cell production and evaluate how they influence functionality and performance using prototype fuel cells.

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2 Laser-welded bipolar plate (bipolar plate design: Dana Victor Reinz).

3 Bipolar plate functionalized by USP laser microstructuring (bipolar plate design: Dana Victor Reinz).