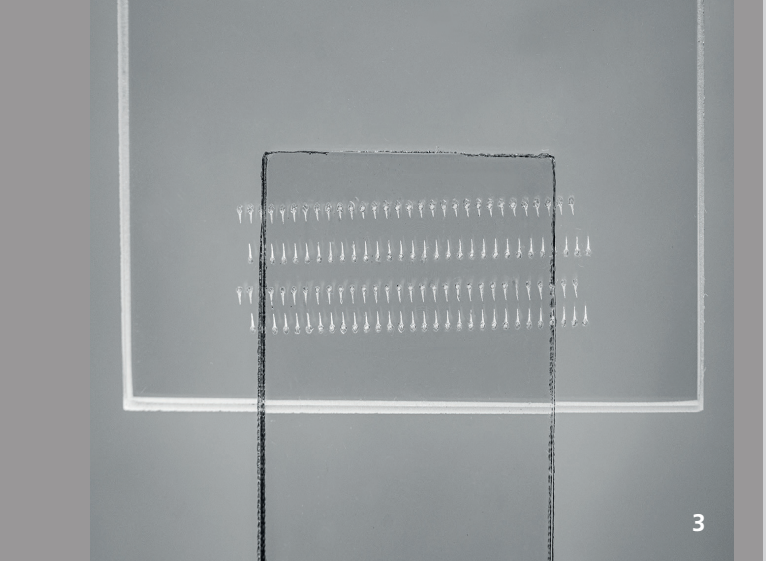

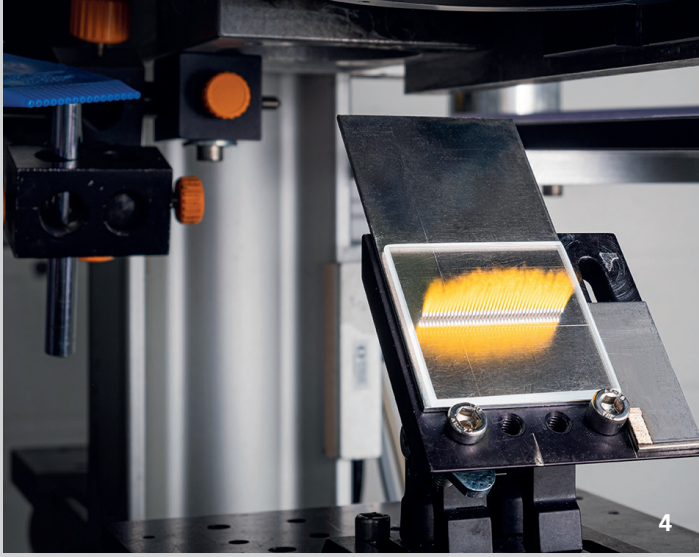

LASER-BASED PRODUCTION OF GLASS-PLASTIC HYBRID JOINTS

Task

Transparent functional and design elements are often composed of glass and plastic materials. While glass materials are scratch-resistant and insensitive to temperature, plastics can be more easily shaped. When both classes of materials are combined, the industry could use the advantages each has to offer. Normally, they are connected with adhesives or bonding agents, but these bonds are often not temperature-resistant, or mechanical stresses arise due to different expansion coefficients.

Method

Fraunhofer ILT has developed a laser-based manufacturing process that joins the two materials – within the NRW research project HyTraM and in cooperation with the industrial partners Hella (Lippstadt), SIMCON (Würselen) and Krallmann (Hiddenhausen). In this two-stage process, laser structuring is first used to create defined undercuts in the glass; depending on the application, either a CO_2 or a USP laser is used as the beam source. For the subsequent joining process, a thulium fiber laser is used, which emits radiation in the intrinsic absorption range of the plastics. The laser radiation penetrates the glass sample and melts the plastic. The molten plastic flows into the previously created microstructures, so that a form-fit joint is formed after the melt has cooled.

Results

Additives such as adhesion promoters or adhesives are not required in this laser-based production of glass-plastic hybrid joints. The project partners also demonstrated that the mechanical strength of the joints is critically dependent on the structure density and orientation. In future work, they will overmold structured glass samples with injection molding in order to establish this process in an industrial environment.

Applications

Glass-plastic hybrid compounds can be used wherever the specific advantages of both material classes should be exploited. Possible fields of application include automotive headlights.

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3 Glass-plastic hybrid joint after joining process.

4 Laser structuring of a glass sample.