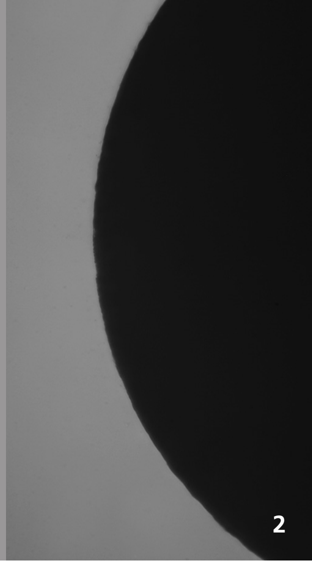

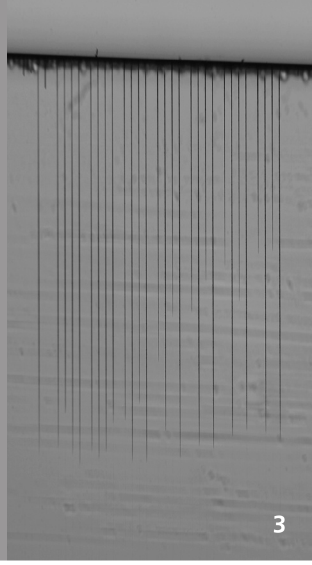

TRANSFER OF SELECTIVE LASER-INDUCED ETCHING PROCESS TO NEW MATERIALS

Task

Selective Laser-induced Etching (SLE) is an innovative laser-based manufacturing process for the production of micro and macro components and complex micro components made of transparent materials. The current materials that can be structured or cut in 3D are quartz and sapphire. As part of a project funded by the Federal Ministry for Education and Research, the SLE method is being investigated for processing other materials, such as Borofloat 33 and Willow, in cooperation with the Chair for Laser Technology LLT at RWTH Aachen University and industrial partners. The project aims to open up applications for these materials in the chip industry or microsystems technology, medical and chemical industry.

Method

Selective laser-induced Etching is a two-step process. In a first step the material transparent to the laser radiation is modified internally. For this ultrashort pulsed laser radiation (500 fs - 5 ps) is focused into the volume of the workpiece (1 - 2 µm). In a second step, the modified material is selectively removed by wet-chemical etching. For the digital photonic production of complex components, the path data for the laser focus are created from digital CAD data and synchronously controlled by the microscanner system with CAM software.

1 Glass knot of quartz glass (Source: Fa LightFab).

2 Cutting edge top of a hole in Willow, d = 200 µm.

3 Etched microchannels in Borofloat 33.

Result

In Borofloat 33, etching selectivities have been achieved between laser structured and unstructured regions from about 1000:1, in Willow glass from about 100:1. Further steps will investigate the possibilities for precision cutting or for generating 3D structures in these materials.

Applications

The 3D structures created here can be employed, for example, in biology, the chemical or chip industry and used as micro-components or microfluidic components. Cuts in thin glass can be used to manufacture display glass or interposers for microchip contacting.

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