

CO₂ laser processing of glass using fast micro-ablation

Keywords: laser material interaction, laser fabrication, optical components

Scientific background

CO₂ laser processing of silica glass is used in many scientific and industrial applications, such as glass cutting or drilling, micromachining to produce optical components, processing of optical fibers, polishing of micro-optical components, production of free form optics, generation of holographic structures... All these applications take benefit of the high power available for CO₂ laser and the high absorption coefficient of silica at the corresponding laser wavelength.

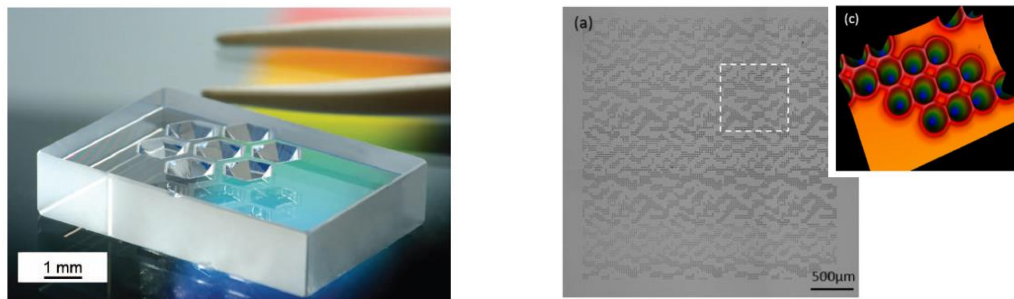


Figure: (left) Photograph of a CO₂ laser-ablated honeycomb structure on fused silica (from C. Weingarten et al, Appl. Opt. 56, p.777, 2017) ; (right) Holographic structure produced on the surface of borosilicate glass by fast CO₂ laser ablation (from K. Wlodarczyk et al, Opt. Express 24, p.1447, 2016)

Subject

The physics of glass modifications with the use of CO₂ laser irradiation is mainly governed by thermal effects, which have detrimental effects such as residual thermo-mechanical stresses. A new process based on fast micro-ablation has been developed at the Institut Fresnel and in the framework of this internship we would like to explore possible applications in the field of optical component manufacturing: laser polishing, laser micromachining,... This work involves experiments with the use of high power lasers and numerical simulations of the laser material interactions.

Location: Institut Fresnel, Marseille

References: <http://www.fresnel.fr/perso/gallais/>

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