
Processing of transparent materials using ultrashort laser pulses

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Abstract

Within the past years, ultrashort pulse laser structuring has been established as a powerful tool for the direct inscription of optical functionalities like waveguides, Bragg structures or artificial birefringence into the bulk of various glasses without damaging the surface. Moreover, cutting and welding of glasses has been demonstrated as well with ultrashort pulses. All these processes rely on a well-controlled nonlinear energy deposition inside the transparent material. I will briefly review the fundamental processes and report on our recent work on precise materials modification in glasses including the inscription fiber and volume Bragg gratings (FBG/VBG), waveguides for integrated quantum optical applications and welding glass to other materials. In addition, I will discuss the possibility to transfer these processes to semiconductors like silicon.

Keywords: ultrashort laser pulses, micromachining, internal structuring, waveguides, cutting, welding, Bragg gratings, FBG, VBG

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