EuroSciCon

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-003

LASER WRITING OF CRYSTALLINE TRACKS IN BARIUM TIANOSILICATE GLASS BY FEMTOSECOND LASER BEAM WAIST WITH ELLIPTICAL CROSS SECTION

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Barium titanosilicate glass system is of particular interest for of space-selective laser-induced precipitation of Ba_2TiSi_2O8 fresnoite crystals possessing high piezoelectric and pyroelectric properties. Recently, we have investigated the process of femtosecond laser writing of crystalline tracks in the bulk of $40BaO•20TiO_2•40SiO_2$ (mol %) glass and established the dependence of crystalline tracks morphology on the laser beam scanning speed and pulse energy. In the present study, we report direct laser writing of Ba_2TiSi_2O8 crystalline tracks by the femtosecond laser beam with an elliptical cross-section of the waist formed by anamorphic prism pairs as compared to the conventional Gaussian beam. It is found that applying the anamorphic prism pair allows to increase the maximum laser writing speed enabling homogeneous crystalline track growth. The longitudinal and transverse cuts of the laser-written crystalline tracks have been investigated by polarized optical microscopy, Raman spectroscopy and transmission electron microscopy. It is for the first time revealed that the fine annealing of the laser-written crystalline tracks erases a lot of defects in their structure. These results pave the way to the formation of high-quality crystalline waveguides in glass and their application in novel photonic and optoelectronic devices.

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