

The influence of a pseudo-randomly polarized beam patterning in nanomultilayer structures based on chalcogenide glasses.

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Abstract: Chalcogenide glasses (ChG) are known to exhibit several photoinduced phenomena, both scalar and vectorial, which are associated with photoinduced structural transformations. Laser processing of nanomultilayer (NML) structures based on chalcogenide glasses [1] for the formation of surface relief in these glass films has been studied. A single Gaussian beam with a spatially variant polarization distribution was employed to generate optical phase surface-relief structures in the form of a diffraction grating [2]. The polarization distribution on the NML surface was recorded using a DPSS laser (single transverse mode, power 100 mW, wavelength $\lambda = 532$ nm) after illumination of a liquid crystal polymer (LCP) depolarizer. The Thorlabs LCP DPP25-A depolarizer [3] was mounted in the optical setup within an expanded, parallel, and polarized laser beam.

A patterned micro-retarder array converts a linearly polarized light beam into a pseudo-randomly polarized beam. The term “pseudo-random” is used because the transmitted beam does not become fully unpolarized; rather, its polarization state is randomized. The laser is then focused onto the NML using a microscope objective, creating a polarization distribution across the sample.

Thus, the optical phase distribution is recorded in the form of a diffraction grating. The setup made it possible to control both the period of the diffraction grating grooves and their orientation. The phase properties of the recorded structures were studied using a polarization digital holographic microscope. The four obtained holograms were processed using LabVIEW software to determine the optical phase of the sample as an indicator of the induced parameters.

Keywords: Chalcogenide glasses, Diffraction grating, Depolarizer, Polarization digital holographic microscope

References:

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