(SLM) for computer-aided direct formation of diffraction elements.

The LC 2002 SLM from HOLOEYE was used in set-up for phase spatial modulation of laser beam at 0.532μm. The display resolution is 800(V) x 600(H) pixels and pixel pitch 32x32 μm. The files of DOE in image format were loaded and transformed to a pictures with 256 gray-scale values. The SLM provides a phase shift up to 1.8 π radians at 543 nm. The LC 2002 SLM can be used for phase (phase mostly) and amplitude modulation applications dependent on the configuration. Expanded laser beam was directed on MLN through the SLM which produces phase and polarization modulation according to diffraction element file.

Key features of the method:

- computation of computer generated holograms (CGH) from user defined images;
- generation of SLM signals representing basic optical functions such as lenses, gratings, axicon and vortex functions;
- superposition of CGH's with basic optical functions to combine functionalities.

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Switching effect properties on Sn-doped $Sb_{70}Te_{30}$ thin films

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Ge-Sb-Te phase-change materials in compositions close to $Ge_2Sb_2Te_5$ and doped with Sn have been proposed to improve performance of phase-change memories (PCM) [1]. In a previous work we found that $Sb_{70}Te_{30}$ thin films show a sharp fall in the electrical resistance in a narrow temperature range when heating [2]. Thus, in this work we studied the effect of the addition of tin to this composition.

Undoped and tin doped thin films ($Sn_x[Sb_{0.70}Te_{0.30}]_{100-x}$, with x = 0, 2.5, 5 and 7.5 at. %) were obtained by pulsed laser deposition (PLD) using a Nd:YAG laser (λ = 355 nm). Their electrical resistance was measured in a two-probes configuration while heating from room temperature to 650 K, at rates below 5 K/min. A sharp fall in the electrical resistance is detected within a narrow temperature range in all the samples. Both as-obtained and thermally-treated films were structurally characterized by X-ray diffraction (XRD) using Kα(Cu) radiation and Mössbauer spectroscopy.

We compare results for these compositions in terms of identified crystallization products, transformation onset temperatures, transformation temperature ranges and amorphous/crystallized electrical resistance ratio.

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Optical properties of $CuInSe_2$ nanocrystals prepared by electrical discharge induced chemistry in solution

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The paper discusses the results of characterization of $CuInSe_2$ (CIS) nanocrystals (NCs) synthesized by plasma treatment of a stoichiometric mixture of copper, indium, and selenium micropowders in an electric discharge in ethanol. From the analysis of the absorption spectra, the band gap values for particles obtained under different discharge conditions were determined. The effect of additional exposure to laser radiation on the change in the NCs optical properties is discussed. During the electric discharge treatment, the particles of the powders are heated, melted and evaporated in the channel of the generated discharge. Spectroscopic studies confirm the presence of excited atoms and ions of copper, indium, and selenium in the discharge gap. An important condition for the reaction is to ensure not only the required temperature range, but also the necessary time for the interacting particles to remain in the discharge plasma gap. As shown by TEM studies, the synthesized CIS NCs had a spherical shape and size of about 20–30 nm. The composition of the synthesized NPs was controlled using X-ray diffraction analysis and Raman spectroscopy. The results proved the formation of NCs with the chalcopyrite structure, which is a stable phase of bulk $CuInSe_2$ crystals at room temperature. The band gap values estimated from the optical absorption spectra were slightly higher than the value of 1.04 eV, which was reported for bulk CIS [1] and lay in the range of 1.1-1.2 eV. The additional irradiation of the prepared colloid by the second harmonic of the Nd:YAG laser (532 nm, laser fluence 0.4 J/cm^2) leads to a shift of the absorption edge to the blue region, which may indicate the reduction in particle size, as well as partial decomposition of the $CuInSe_2$ compound upon exposure to laser radiation. The synthesized nanocrystals exhibit a luminescence with the maximum in the range of 1192 - 1204 nm. The position of the maximum was shifted to the blue region compared to the position of the luminescence peak for bulk CIS material (1211 nm) [2]. The features of the luminescent properties of synthesized CIS nanocrystals are discussed.