which can be used for optimization of the characteristics of the material for PCM application. In this work, we investigated the influence of In and Sn dopants introduced by implantation on the properties of GST225 thin films. The ion implantations were carried out on Multipurpose Test Bench (MTB) at NRC "Kurchatov Institute"-ITEP. The MTB consists of the MEVVA type ion source, electrostatic focusing system, the system for the current and beam profile measurements. The beam charge spectra were measured by the time-of-flight method. The beam`s accelerating voltage was calculated by SRIM code to implant ions on the required film`s depth [3]. The composition distributions for the investigated thin films were investigated by Auger Electron and TOF-SIMS spectroscopies.

It was found that ion implantation leads to the change of the electrical properties of amorphous films in the temperature range from -120 to 100 °C, in particular, the conductivity activation energy, and also optical characteristics. Influences of the ion type and irradiation dose on the crystallization temperature range were determined. The results of the simultaneous measurements of resistivity and Raman spectra in the temperature range from 25 to 400 °C allowed to obtain additional information about the phase transitions. The transmission electron microscopy was used for the identification of the structure for thin films after annealing. Femtosecond laser pulses were used to excite the amorphous doped thin films. The effect of excitation by different energy and the number of laser pulses was investigated. The correlation between the dopant concentration and the range of laser fluence needed for crystallization was analyzed.

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The similarity between two-dimensional magnetoexcitons and the excitons in transition metal dichalcogenides

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1. The exchange *e-h* Coulomb scattering takes place with the annihilation and the creation of the *e-h* pairs with the resultant electronic charges equal to zero. During the direct Coulomb scattering the electron and a hole remain in the same energy bands interacting as a charged particles. They have dipole-dipole interaction, when the interband dipole moments ρ_{c-v} are different from zero. It happens when the crystals have the dipole active optical quantum transitions. We have considered the semiconductor layers of the type *GaAs* with *s*-type

$j_z^h = \pm 3/2$. The Lorentz force in the Landau gauge description determines the positions of the Landau quantization oscillations of the electrons and holes and their distances in the frame of the magnetoexcitons. Their relative and center of mass motions are interconnected. In difference on the direct Coulomb *e-h* interaction, which gives rise to the quadratic dispersion law $\hbar^2 k^2 / 2M(B)$ with magnetic mass $M(B)$ depending on the magnetic field strength B, the exchange *e-h* Coulomb interaction gives rise to linear dispersion law known as Dirac cone $\hbar \mathrm{v}_g k$ with group velocity v_g depending on the interband dipole moment in the way: $\mathrm{v}_g \approx |\rho_{c-v}/l_0|^2 \approx B$, where l_0 is the magnetic length.

2. The thermodynamic properties of the ideal 2D Bose gas with linear dispersion law were discussed in the Ref [1]. The critical temperature of the Bose-Einstein condensation (BEC) of the 2D magnetoexcitons is different from zero even at the infinite homogeneous surface area and following [1] is proportional to the group velocity: $T_c \propto V_g \propto B$. In the case of the magnetoexcitons it increases with the increasing magnetic field strength B. The new possibilities to study the BEC phenomenon of the 2D magnetoexcitons appeared. But it takes place only at the filling factors ν of the lowest Landau levels smaller than unity $(\nu < 1)$ [2].

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Diffraction optical elements digital recorded in nanomultilayers As_2S_3- Se

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It is well known that films of chalcogenide glasses are an appropriate material for fabrication of diffraction optical elements (DOE) which manifest high resolution and transparency in the wide range of spectrum. However, there are problems related mostly with transmission changes in the films during recording. The low diffraction efficiency of DOE after recording is increased by subsequent chemical selective etching of the surface. This is a rather complex technological step, and the wet etching may distort the quality of optical surface of DOE.

In order to overcome these limitations in the holographic recording of diffraction elements it is proposed to use the method of their creation by direct formation of a relief on the surface, i.e. eliminating the etching operation. For this aim, multilayered nanostructures (MLN) As_2S_3- Se and the polarization holography were used [1]. We are used spatial light modulator