

Spectral Dependence of Photoinduced Surface Relief Grating Formation in Amorphous Chalcogenides

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The surface relief grating (SRG) formation in $\text{As}_{40}\text{S}_{60}$ and $\text{As}_{40}\text{S}_{15}\text{Se}_{45}$ thin films by holographic recording with the laser wavelengths in the spectral region of 375 – 671 nm was studied. A strong dependence of SRG formation efficiency on recording light penetration depth in the films was observed. The best SRG recording efficiency in $\text{As}_{40}\text{S}_{60}$ films was observed at 491 nm, but for $\text{As}_{40}\text{S}_{15}\text{Se}_{45}$ films by recording with a red light. The studies of spectral dependence of photoinduced birefringence (PIB) and its development during the holographic recording in studied chalcogenide films showed that PIB plays an important role in SRG formation process. In order to improve the photo sensitivity of the SRG recording, the effect of additional lighting on the recording process was studied both during recording and after the recording process. The studies of spectral dependence of additional illumination influence on SRG formation efficiency during holographic recording showed a good correlation with the measurements of spectral dependence of photoinduced birefringence.

An enhancement of diffraction efficiency of holographic recording in $\text{As}_{40}\text{S}_{60}$ after recording was observed already in 1994 [1]. Such enhancement of diffraction efficiency after holographic recording can be obtained by an increase of the depth of SRG as well. The effect of the laser beam wavelength and its polarization direction on the SRG vector was studied, as well as the effect of angular dependence of the illumination upon holographic recording.

References

- [1] A. Ozols, O. Salminen, M. Reinfeldē, *Relaxation self-enhancement of holographic gratings in amorphous As_2S_3 films*. J. Appl. Phys., **75** (1994) 3326-3334.