Optical Properties of $(As_2S_3)_{100-x}$ $(Sb_2S_3)_x$ Amorphous Films with Small Content of Antimony

Maryan V.M.[1], Pop M.M.[2], Gera E.V.[1], Mykaylo O.A.[2], Gatsenko A.A.[2], Horvat Yu.A.[1], Kostyukevych S.O.[3], Mykulanynets-Meshko O.S.[1], Yurkin I.M.[2]

[1] *Uzhgorod Scientific-Technological Center of the Institute for Information Recording, NASU, Uzhgorod Ukraine*
[2] *Uzhgorod National University, Uzhgorod, Ukraine*
[3] *V.E. Lashkaryov Institute of Semiconductor Physics, Kyiv, Ukraine*

Present report is devoted to investigation of influence of laser illumination on transmission spectra and optical parameters of $(As_2S_3)_{100-x}(Sb_2S_3)_x$ (x=2, 4, 10 and 15 mol.%) amorphous films.

Thin films were obtained by vacuum evaporation of the glasses of corresponding compositions from quasiclosed effusion cells onto cold (293 K) silica substrates. The films thickness was ~ 1 μm. Uniform thickness of layers was provided by planetary rotation of substrates. Unfocused illumination of semiconductor laser (λ=530 nm, P=100 mW) was used for exposure of films. Investigation of transmission spectra of films was carried out by means of "МДР-23" spectrometer in the wavelength region of 450 - 800 nm at T=300 K.

The investigations have shown that with growing of Sb content (from 0.8 to 6 at.%) in the composition of films, transmission spectra are shifted into longwave region testifying to decrease of pseudoforbidden gap width (E_g) of films. Refractive index (n) in this case is growing (Table).

x, mol.%	Parameter	Exposure, min			
		0	1	3	5
2	E_g, eV	2.354	2.298	2.292	2.287
	n	2.275	2.323	2.332	2.340
4	E_g, eV	2.349	2.309	2.305	2.297
	n	2.284	2.316	2.320	2.326
10	E_g, eV	2.342	2.264	2.262	2.260
	n	2.366	2.430	2.442	2.448
15	E_g, eV	2.334	2.276	2.270	2.267
	n	2.442	2.496	2.508	2.514

With the illumination time growing absorption edge of films is shifting into longwave region. E_g of films under illumination is decreasing and n is growing. Here, maximum edge shift under equal expositions conditions is observed for films with antimony content 4 at.%.

The obtained results are discussed from the point of view of films structure and photostructural transformations in them.