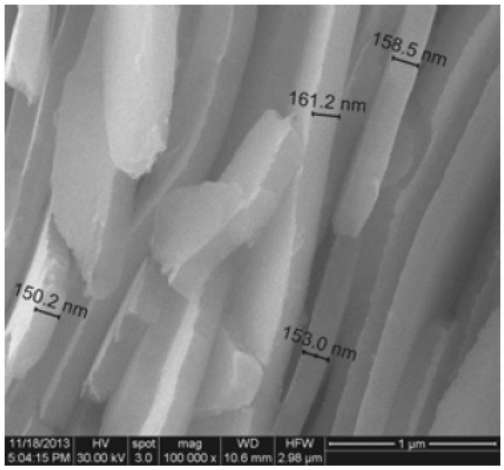

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Preparation of As_2S_3 thin layers for applications in optoelectronics

O. T. Bordian[1], V. I. Verlan[1], I. P. Culeac[1], V. E. Zubarev[2], L.A. Malahov[3]

[1)]Institute of AppliedPhysics,5, Academy Str., Chisinau MD-2028, Republic of Moldova;
[2)]Institute of Chemistry, 3, Academy Str., Chisinau MD-2028, Republic of Moldova
[2)]Institute of Mathematics, 5, Academy Str., Chisinau MD-2028, Republic of Moldova

Corresponding author*:* vverlan@gmail.com

The experimental results on the technology of As_2S_3 thin films and their characteristization using optical methods as a study of surface plasmon resonance (SPR), a light modulators that contains an amorphous As_2S_3 films as a waveguides are presented. This is due to refractive index changing when illuminated. As_2S_3 thin films were obtained by thermal evaporation in vacuum (5x10-6 Torr) from As_2S_3 powder. The conditions of vacuum thermal evaporation were chosen in such a way that the formation of atomic and molecular flows upon heating of the starting material were satisfactory. The thickness distribution are determined by shape and relative position of the source and substrate. During the deposition of As_2S_3 detailed temperature control of the evaporator and the substrate were made. To obtain high quality thin films a special evaporator was developed, which uses indirect heating.

To investigate the optical properties of the As_2S_3 layers in the waveguide regimen were obtained bilayer thin films of Au/As_2S_3. The thicknesses of the $As_2S_{3\ top}$ layers were 125 - 500 nm and bottom layers were Au of thickness 5, 10 and 15 nm respectively. We have compared the optical changes due to the thickness variation of As_2S_3 layer on *Au* film. The amorphous nature was confirmed by taking by FTIR and XPS techniques. We analyzed the As_2S_3 thin film surfaces and the cross sections obtained by fracture. Figure present a SEM image of the surface of As_2S_3 thin film deposited on Au with a magnification 400000x for 30000 V acceleration voltages. It can see that the nanometric thickness and structure of the surface are uniform and continuous. On the same sample, a scratch procedure was performed in order to measure the thickness of the As_2S_3 thin film in the zones in which fragments of As_2S_3 thin film are perpendicular on the image plane and the thickness is about 160 nm. The thin films have suitable transparency for obtaining optical elements of good quality.

The modulation of the light is enhanced in the amorphous chalcogenide film which is placed in a resonance structure. From reasons of practical applications, the opportunity to use prism with low refractive index such as the BK7 glass were examined, in order to achieve surface plasmonic resonance with waveguide modes. It was obtained the maximum value of the refractive index dispersion about 0.02 of the anisotropy of the refractive index in the range 0.80 µm-0.85 µm optical wavelengths from the refractive index dispersion measurements of As_2S_3 thin films . In the As_2S_3 thin film it is possible to produce a permanent modulation of the optical transmission induced by the pumping laser radiation.

There was investigated optical hysteresis in As_2S_3 thin films that is lead to optical bistability and can lead high-speed signal processing. Fundamental absorption edge is slowly changed in case of thin films and oscillations caused by the interference of light are present in the domain of transparency. The higher the pump beam intensity, the faster changes of the optical transmission may be obtained. This effect may be used for the fabrication of a 2D optical memory cell.

Imaging complex superimposed gratings by digital holographic microscopy

V. Cazac[1,2]

[1]*Tampere University, Korkeakoulunkatu 7, 33720 Tampere, Finland,*
[2]*Institute of Applied Physics, Academiei str. 5, Chisinau, Moldova*

Corresponding author:veronica.cazac@student.tut.fi

This paper concerns holographic gratings recording on chalcogenide nanomultilayers (NML) of the composition As_2S_3–Se. Photosensitive NML of As_2S_3–Se and constituents films of As_2S_3, Se were prepared by a computer controlled cyclic thermal vacuum deposition through the mask. The NML sample contained alternating As_2S_3 and Se nanolayers with thickness of each nanolayer of 12 nm. Mass transport phenomenon is the physical process responsible for the formation of the surface relief on this material during interferometric laser inscription.

The relief symmetrical grating is formed directly without additional chemical treatment. The advancement of this paper in comparison to our previous work [1] is the performance of the extra deep surface profile of the diffraction gratings (DG) with a complex hexagonal shape. Two complementary techniques were applied for the surface investigation of the DG: digital