



International Meeting

CLUSTERS AND NANOSTRUCTURED MATERIALS (CNM'4)

PROGRAM and MATERIALS



Uzhgorod Ukraine
12 – 16 October, 2015

National Academy of Sciences of Ukraine
Institute of Physics
G.V.Kurdyumov Institute for Metal Physics
V.E. Lashkaryov Institute for Semiconductor Physics
Institute for Information Recording
Uzhgorod Scientific-Technological Center of the Institute for Information Recording
Uzhgorod National University

INTERNATIONAL MEETING

**CLUSTERS AND NANOSTRUCTURED
MATERIALS
(CNM-4)**

**Uzhhorod *Vodohraj* Ukraine,
12-16 October 2015**

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OF THE MEETING**

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The materials represent the contents of meeting's reports based on the results of fundamental and applied works on topical questions in the field of nanostructured systems, nanomaterials and nanotechnologies. Main attention is given to the consideration of problems of nanophysics and nanoelectronics, to atomic and electronic structure of cluster and nanostructured materials, amorphous alloys, nanostructured films and coatings, colloidal and biofunctional materials, to study of their properties. The results of investigations in the field of supramolecular chemistry, synthesis of nanoparticles, nanostructures and multifunctional nanomaterials, physico-chemistry of superficial phenomena and diagnostics of nanosystems are presented.

The edition is designed for scientists, engineers, higher school lecturers, post-graduates and students of corresponding specialities.

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XPS INVESTIGATION OF PHOTOSTRUCTURAL CHANGES OF $\text{As}_{20}\text{Se}_{80}$ NANOLAYERS

Kondrat O.B.¹, Holomb R.M.¹, Popovych N.I.¹, Tsud N.², Mitsa V.M.¹

¹Uzhhorod National University, Pidhirna str., 46, 88000 Uzhhorod, Ukraine;
e-mail: o.b.kondrat@gmail.com

² Charles University, Faculty of Mathematics and Physics, Department of Surface and Plasma Science, Prague, Czech Republic; e-mail: tsud@mbox.troja.mff.cuni.cz

The high quality optical elements are required for the development of all optical-signal processing systems. The high level of integration of these elements in future optical chips implies that their fabrication technology has to be improved in order to achieve the low optical losses at the near surface layers and the high level of laser damage threshold at femtosecond laser pulses. The optical properties of amorphous As-S and As-Se binary systems, e.g. large IR transparency, high optical nonlinearity etc., make them a prospective optical media for the future ultrafast photonic systems. Arsenic selenide glasses are among the most important of the glassy chalcogenide materials. Amorphous films of chalcogenide glassy system $\text{As}_x\text{Se}_{100-x}$ are currently of interest as materials for optoelectronic devices and optical information storage. The stoichiometric composition As_2Se_3 is a classic glass former and also has the interesting feature of having a composition exactly at the floppy-to-rigid transition [1]. The composition AsSe has special interest because of the opto-mechanical effect [2] (the only known direct mechanical signature of the polarization of light). Film thicknesses used in advanced optical devices are becoming smaller. In this case, the effect of film surface becomes more important, but up to date such studies were not conducted. The surface characterization becomes important scientific task. For this reason the photoelectron spectroscopy is well suitable method: the sampling depth of the incident and ejected particles is approximately 10 nm [3]. In this paper we report results on the investigation of the $\text{As}_{20}\text{Se}_{80}$ thin films surface structure at the atomic scale by means of X-Ray photoelectron spectroscopy (XPS) comparison obtained results with the Raman spectra of the $\text{As}_{20}\text{Se}_{80}$.

Amorphous $\text{As}_{20}\text{Se}_{80}$ thin films with thickness of about 0.5 μm were prepared by thermal evaporation from bulk glass on the (100) silicon crystal wafer substrates. The high-resolution photoemission spectra were taken using the Mg K- α ($h\nu=1253.6$ eV) X-rays source. The photoelectron As 3d and Se 3d core-level spectra of $\text{As}_{20}\text{Se}_{80}$ films were measured and analyzed.

The composition and local structure of the surfaces were determined by curve fitting of the experimental As 3d and Se 3d core levels, and studies show significant Se-enrichment in the top surface layers of the films. The interconnection between the surface composition, local structure formation and the features of the valence band spectra of $\text{As}_{20}\text{Se}_{80}$ films are analyzed and discussed in detail. Obtained results are in a good agreement with results of the compositional analysis of the same samples with using of the synchrotron radiation photoelectron spectroscopy [2].

[1] Phillips J C J. Non-Cryst. Solids 43 (1981) 37.

[2] Krecmer P, Moulin A M, Stephenson R J, Rayment T, Welland M E and Elliott S R Science 277 (1997) 1799.

[3] Kondrat O., Popovich N., Holomb R., Mitsa V., Lyamayev V., Tsud N., Cháb V., Matolín V., Prince K.C., J. Non-Cryst. Solids 358 (2012) 2910.

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