Thickness of two nearby layers is changed from 20 up to 100 nm. Total film thickness is 1 μm. Temperature dependencies of multilayered film specific conductivity were studied using impedance spectroscopy method. To specify phase transitions occurring in the thermal treated film, dependencies of XRD spectra on temperature were studied.

The method of fabrication via laser ablation of stoichiometric and perfectly oriented film of silver selenide is developed. Furthermore, Ag_2Se amorphous stoichiometric thin film stable at room temperature was prepared and investigated. AgI stoichiometric films were obtained by laser ablation also.

"Imprint mechanism" of interlayer influence is discussed in the report. Suppose that glass-forming temperature is higher than the temperature of the AgI (for example) $\alpha \leftrightarrow \beta$ phase transition. α-AgI strongly impacts the glass structure if the temperature of the multilayered film is higher than the T_g and the glass layers are soft. When temperature decreases below the T_g, a glass structure adapted to the α-AgI structure freezes. During further a temperature decrease, when the temperature falls below the temperature of $\alpha \rightarrow \beta$ phase transition, the frozen glass structure preserves the alpha modification of AgI. All of this can be implemented only if the thickness of AgI layer is sufficiently small.

It is observed that nanolayered films after heat treatment usually form a metastable state with high conductivity (about 1 $Ohm^{-1}cm^{-1}$) and low activation energy (about 0.1 eV).

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Polarization holographic recording of diffractive elements on amorphous chalcogenide nanomultilayers

E. Achimova

Institute of Applied Physics, Academiei str. 5, Chisinau, Moldova,

Corresponding author: achimova@phys.asm.md

In contrast to the conventional holographic process, in which intensity variations in an interference pattern between an object beam and a reference beam are recorded, polarization holography employs beams with two different polarizations for recording information. In this case, the polarization state of the resultant beam is recorded on a suitable medium. In present work we have shown that nanomultilayers structures (NML) based on ChG-Se are sensitive to different states of polarizations of recording beams which gives the possibility to increase the diffraction efficiency of patterned surface relief gratings.

To further improve quality of diffraction structures we apply the direct surface patterning of materials by a laser beam without chemical etching, what attracts high interest due to advantages like high flexibility and precision, moderate cost, and high speed. Absence of selective wet etching is the advantage of such media because used etchants are toxic and during selective etching process it is necessary to control many parameters (temperature, concentration of etchant, etc.). Nowadays direct surface relief writing is a well-developed technique to fabricate 2D or 3D

structures with sub-micrometer resolution for diverse fields of application.

In present work the direct one-step diffraction relief grating formation by polarization holography with the use of ChG NML of the composition based on As_2S_3–Se, $As_{37}S_{58}Ge_5$–Se and As_2S_3:Mn–Se was studied. It was shown that vector holographic gratings are formed on the surface of the samples under the two linear polarized beams falling on the sample surface at ±45° and the left-right circular polarizations relative to grating vector. The kinetics of diffraction efficiency of polarization gratings were compared with intensity gratings recorded at two paralel linear polarizations. The possible explanations based on dielectrophoretic forces existing in fluidic systems, and H. Fritzche' model supposing the presence of minimum isotropic volume with the anisotropic structural units are discussed.

2D transition metal dichalcogenides for spintronics

M. V. Costache [1] L. A. Benitez,[1,2], A. Arrighi,[1,2] W. S. Torres,[1]
M. Timmermans,[1] J. F. Sierra,[1] Sergio O. Valenzuela[2,3]

[1] *Catalan Institute of Nanoscience and Nanotechnology ICN2, CSIC and the Barcelona Institute of Science and Technology (BIST), Bellaterra, 08193 Barcelona, Spain*
[2] *Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain*
[3] *Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain*

Corresponding author: mcostache@.icn2.cat

In this talk I will present recent results regarding spin dynamics in graphene - based *transition metal dichalcogenides (TMDC)* heterostructures.

Identifying the main microscopic process for spin relaxation in graphene and graphene-based van der Waals heterostructures is one of the most fascinating puzzles for the graphene and spintronics communities [1]. Key information can be obtained from the spin-lifetime anisotropy, which is determined by the preferential direction of the spin-orbit fields that cause the spin relaxation and can be quantified by the ratio between the spin lifetimes for perpendicular and parallel spin components to the graphene plane. We have recently developed a reliable experimental approach to measure such anisotropy ratio [2]. We found that the spin-lifetime in graphene on silicon oxide or hBN is isotropic and independent of carrier density and temperature down to 150 K. Current understanding indicates that the spin relaxation is driven by magnetic impurities or weak random spin-orbit or gauge fields [2]. On the other hand, a large SOC enhancement has been predicted when graphene is interfaced with TMDCs. Signatures of the enhancement have been reported, but the nature of the spin relaxation remained unknown. Here we observe strongly anisotropic spin dynamics at room temperature in bilayer heterostructures comprising graphene and tungsten or molybdenum disulphide [3]. The spin lifetime varies over one order of magnitude depending on the spin orientation and is largest when the spins point out of the graphene plane. The latter suggests that the strong spin–valley coupling in the TMDC is imprinted in graphene and felt by the propagating spins (Fig. 1) [4].