Finally to elucidate the quantum properties of MoS_2 QDs we investigated the entanglement generation between one, two and three MoS_2 QDs that could underlie at the composition of the MoS_2 triangular monolayer, and by coupling them to a photonic crystal nanocavity[3] we theoretically investigate the degree and dynamics of the entanglement.

References

[1] Huang H, Du C, Shi H, Feng X, Li J, Tan Y and Song W 2015 Water-Soluble Monolayer Molybdenum Disulfide Quantum Dots with Upconversion Fluorescence, Part. & Part. Syst. Char. 32 72–9
[2] Fan J-H, Gao P, Zhang A-M, Zhu B-R, Zeng H-L, Cui X-D, He R and Zhang Q-M 2014 Resonance Raman scattering in bulk 2H-MX2 (M = Mo, W; X = S, Se) and monolayer MoS2, J. App. Phys., 115 053527
[3] Liu T, Qiu H, Yin T, Huang C, Liang G, Qiang B, Shen Y, Liang H, Zhang Y, Wang H, Shen Z, Hewak D W and Wang Q J 2017 Enhanced light-matter interaction in atomically thin MoS2 coupled with 1D photonic crystal nanocavity, Opt. Express, OE 25 14691–6

Surface relief formation in Yb doped As_2S_3–Se nanomultilayer structures

O. Paiuk[1], A. Meshalkin[2], A. Stronski[1], E. Achimova[2], V. Abashkin[2], A. Prisacar[2], G. Triduh[2], A. Korchovyi[1] & P. Oleksenko[1]

[1]*V. Lashkaryov Institute of Semiconductor Physics, NAS in Ukraine, 41 Nauky ave., 03028 Kyiv, Ukraine,*
[2]*Institute of Applied Physics, 5 Academiei str., MD-2028 Chisinau, Moldova*

Corresponding author: paiuk@ua.fm

Chalcogenide glasses and films are promising materials for application in optoelectronics and photonics. Nanomultilayer structures based on chalcogenide glasses attract much attention due to their property of direct surface relief formation under light or e-beam exposure with the ability to use them for optical element fabrication, holography, etc. The aim of this study is investigation of photo-stimulated processes during surface relief formation in Yb doped As_2S_3–Se nanomultilayer structures. The As_2S_3 glasses doped with Yb were prepared using melt-quenching technique. Modification of chalcogenide glasses by rare-earth elements changes their thermal, optical, structural and magnetic properties. Properties of As_2S_3:Yb glasses were studied using DSC measurements, Raman, optical spectroscopy. The main observed effect under the introduction of ytterbium into As_2S_3 is the change of relative concentration of the main and non-stoichiometric structural units characteristic for As_2S_3 glasses. Chalcogenide glasses are diamagnetics, in particular As_2S_3 glass. Introduction of Yb dopant changes magnetic properties of glasses. In constant magnetic field (B=6T) dependence of mass magnetization M=M(T), is observed which is characteristic for paramagnetics and ferromagnetics in paramagnetic region of temperatures and described by Curie-Weiss law. As_2S_3:Yb–Se nanomultilayer structures were

prepared by cyclic thermal deposition in one vacuum deposition cycle with chalcogenide thickness of 13 nm and Se –10 nm. The total number of nanolayers was 200.
Optical transmission was measured in 450-900 nm optical range in order to determine refractive index, thickness and optical band-gap energy of As_2S_3:Yb and Se layers and As_2S_3:Yb– Se nanomultilayers. Diffraction gratings were recorded by two laser beams (λ=532nm) with synchronous diffraction efficiency measurement at 650 nm wavelength.

Process of surface relief formation depended on the polarization of recording light beams. Diffraction efficiency in transmission of recorded gratings was ~ 25% in absolute value. AFM measurements have shown high quality of the recorded gratings relief.

Composition- and electrical field-dependent surface relief recording in amorphous chalcogenide layers and structures

S. Molnar[1], R. Bohdan[1], P. Nemec[2], A. Bonyar[3], A. Reznik[4], S. Kokenyesi[1]

[1]*Institute of Physics, University of Debrecen, Debrecen, Hungary*
[2] *Department of Graphic Arts and Photophysics, Faculty of Chemical Technology, University of Pardubice, Pardubice, Czech Republic*
[3] *Department of Electronics Technology, Budapest University of Technology and Economics, Budapest, Hungary*
[4]*Department of Physics, Lakehead University, Thunder Bay, Canada*

Corresponding author: molnar.ms.sandor@science.unideb.hu

Optical recording processes, formation of amplitude-phase optical and even geometrical reliefs in amorphous chalcogenide layers are rather well known. In spite of established compositional, illumination, temperature dependences the influence of electrical parameters, applied electric fields on these processes is not so much analyzed

The goal of the present work was the development, selection of light sensitive chalcogenide layers and heterostructures made of As(Ge, Bi)-S(Se,Te) glass compositions and their application for optical, holographic recording in one step, direct processes, which are sensitive to the electric fields and conductivity of the chalcogenide layer.

It is shown, that small changes of As and Cl concentration in Se cause changes in direction and value of light-induced mass-transport processes. These effects can be observed in special heterostructures as well. New functionalities, operated recording processes can be realized this way, enabling the creation of special photonic, sensor structures.

Acknowledgments

Authors acknowledge the support of the GINOP-2.3.2-15-2016-00041 project and SandorMolnár acknowledges the support of ÚNKP-18-3 New National Excellence Program of the Ministry of Human Capacities.