Nanoobjects microscopy

Kelvin probe force microscopy study of optically driven mass-transport in light-responsive chalcogenide glasses

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Chalcogenide glasses (ChG) exhibit a number of remarkable structural and optical changes when exposed to light or electron beam. One of them is mass-transport induced by band-gap laser light [1] or electron beam irradiation with moderate energy (10-30 kV, 3-10 nA) [2], which opens capabilities for one-step, direct microfabrication of ChG.

The transformation of the mass-transport in ChG into commercially viable applications will be decided from the improvement of our knowledge on the basic mechanisms underlying the effect. This mechanism, however, is still not well studied, despite some attempts to develop appropriate model with a complete description of the basic microscopic mechanism [3]. In this investigation we will develop a new model of photoinduced mass-transport in light-responsive ChG in which the existence of moving anisotropic dipolar units and internal electric field in amorphous semiconductors as a main driving force of this movement will be suggested. Evidence of this hypothesis is delivered by atomic force microscopy measurements of surface nano-morphology and corresponding surface potential for some ChG films under polarized band-gap laser irradiation and e-beam exposure that were taken by Kelvin probe force microscopy technique.

1. *Trunov M.L.* Polarization-dependent laser-induced giant mass transport in glassy semiconductors // JETP Letters.-2007.- **86.**-P. 313-316.
2 *Trunov M.L, Cserhati C., Lytvyn P.M., Kaganovskii Y., Kokenyesi S.* Electron beam-induced mass transport in As–Se thin films //J. Phys. D: Appl. Phys.- 2013.- **46**. –P. 245303 (9pp).
3. *Lu C, Recht D., Arnold C.* Generalized model for photoinduced surface structure in amorphous thin films // Phys. Rev. Lett. -2013.- **111.-** P. 105503.