

Nanostructured surfaces

Photo-degradation processes and thermoconductivity in technologically modified g-As₂S₃ with nanosize inclusions

V.Mitsa¹, R.Holomb¹, S.Petretskij¹, A.Feher²

¹ *Institute of Solid State Physics and Chemistry, Uzhhorod National University, 88000 Uzhhorod, Ukraine,
E-mail: v.mitsa@gmail.com*

² *Pavol Jozef Šafárik University, Kosice, Slovakia*

Recently by macro FT-Raman and energy-dependent micro-Raman spectroscopy we found the light-induced structural changes in glassy As-S system with realgar As₄S₄ inclusion [1]. Being initially in the structure of glassy closed and connected with glassy network only by weak Van der Waals forces α (β)-As₄S₄ molecules are transformed into pararealgar p-As₄S₄ form during laser illumination. The effectiveness of transformations depends mainly from photon energies used for irradiation but transformation tendency observed for all used photon energies ranged from 1.65 to 2.54 eV. Our finding is multidisciplinary. It together with another following publication to describe photo-degradation processes in pigment was used since antiquity. The red color of the pigment based on realgar α -As₄S₄ on exposure to light transformed to pararealgar p-As₄S₄ that exhibits yellow color. So light, necessary for viewing a work of art can damage the artwork. Process of light induces polymorph transformation on air is accompanied with formation arsenolite As₂O₃. The process is not completely clarified so far. Based on SRPS and surface enhance Raman spectroscopy studies we found new photo-aged processes occurring on the surface of amorphous As₂S₃ nanosize films for chalcogenide photonics. In energy dependent luminescence in films and glassy As-S with realgar inclusion we have found new evidence not only arsenolite formation but found PL band typical for substance known in general formula As₂O₃xH₂O.

Influence of realgar inclusion on thermal properties photodegradation of glassy As₂S₃ prepared in different technological regime was found. With increasing of melt temperature and the rate of quenching the content of realgar in g-As₂S₃ is increasing what is accompanied with increasing photoaging and decreasing of thermal conductivity from 0.25 to 0.23 (W/K*m).

1.R. Holomb, N. Mateleshko, V. Mitsa, P. Johansson, A. Matic, M. Veres,

New evidence of light-induced structural changes detected in As–S glasses by photon energy dependent Raman spectroscopy// J.Non-Cryst.Sol., -2006.-**352**. -P.1607-1610.