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BOOK OF ABSTRACTS

Photosensitive nanocomposites based on chalcogenide glasses and organic polymers

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The composites based of chalcogenide glasses and polymer materials represent an important and growing class of hybrid materials with promising physical and optical characteristics [1]. For application in optoelectronics it is very important that both chalcogenides and polymer materials exhibit high photoinduced changes [2]. It was shown that organic polymers manifest high photoinduced changes and low stability and on the contrary the chalcogenides glasses – comparatively low photoinduced changes and good stability. The combination of these properties by creation of new composites based on chalcogenide glasses and polymers can allow obtaining new materials with new multifunctional properties.

The paper shows the fabrication technology and deposition of thin films, and also presents the optical properties of these films, depending on the concentration of semiconductor, which can be varied within wide limits. New nanocomposite materials consisting from amorphous chalcogenide (As_2S_3) and polymers such as polyvinylalcool and polyvinylpyrrolidone were prepared by inexpensive and easy spin-coating technique from solution. Composite retains many properties of the initial components from which they are prepared. The optical properties of deposited materials in the form of films were studied. The decreasing of the As_2S_3 component in the composite leads to the shift of the absorption edge to higher energies and spheroid dimensions are decreased. It was shown that refractive index of composite linear varied from 1,4 up to 2,1 depending on concentration of semiconductor in composite. As a result of ultraviolet light irradiation of the composite changes of optical properties was observed. For example the refractive index changed in value of 0,1. This allows utilizing these structures for holographic recording of diffraction gratings. The investigated new composites are perspective for different photonic devices as well as for recording media with high resolution.

1. *Zakery A., Elliott S. R.* Optical properties and applications of chalcogenide glasses: a review // J. Non-Cryst Solids., 2003. – **330**. – P. 1–12.
2. *Jain H.* Comparison of photoinduced atom displacements in glasses and polymers // J. Opt. Adv. Mater., 2003. – **5**. – P. 5–22.

The effect of thermal activation on structure of nanoporous carbon materials

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The method of small-angle X-ray scattering was studied the changes in the porous structure of carbon material obtained by hydrothermal carbonization of plant material at 750 °C, as a result of thermal activation at temperatures 300, 400, 500, 600 °C and different activation times. An homogeneous model approach was used to calculate the parameters of porous structure (Porod invariant Q_p, Porod constant K_p, specific surface area S/V, the average pore radius R_p) of carbon materials [1].

As results shown, there was a non-monotone change the parameters of the porous structure in the samples activated at 300 °C. Porous volume and pore surface area reaches its maximum value after treatment for 1 h. Pore radius is decreased to 70 Å. Small-scale three-dimensional fractal structure is formed in samples from carbon nanoclusters, the size of which varies between 40÷90 Å. Simultaneously a large-scale cluster structure is formed by clusters of size 160÷250 Å.

Thermal activation at 400 and 500 °C increases both the Porod invariant and Porod constant, indicating the growth of both porous volume and pore surface area. An increasing of activation time does not change the ratio of porous volume, but a growth in the average pore radius take place. In addition, the specific surface area of pores decreases due to an increase in their size.

Activation at 600 °C leads also to an increase in the threshold volume and pore surface area. These changes are less expressed due to the smaller activation time compared to treatment at 400 and 500 °C.

Thus, the activated carbon materials can be examined as the two-phase porous structure formed by carbon clusters with radius R_c, which consist of nanoclasters with radius r_c, and pores with the developed fractal surface.

1. *Kayushyna R. L., Rolbin Y. A., Feygin L. A.* About effect of the nonuniform electronic density distribution within a particle on small-angle X-ray scattering intensity // Crystallography, 1974. – **19**. – P. 724–729.