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The materials represent the contents of meeting's reports based on the results of fundamental and applied works on topical questions in the field of nanostructured systems, nanomaterials and nanotechnologies. Main attention is given to the consideration of problems of nanophysics and nanoelectronics, to atomic and electronic structure of cluster and nanostructured materials, amorphous alloys, nanostructured films and coatings, colloidal and biofunctioal materials, to study of their properties. The results of investigations in the field of supramolecular chemistry, synthesis of nanoparticles, nanostructores and multifunctional nanomaterials, physico-chemistry of superficial phenomena and diagnostics of nanosystems are presented.

The edition is designed for scientists, engineers, higher school lecturers, post-graduates and students of corresponding specialities.

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OPTICALLY ACTIVE COATING BASED ON CHALCOHENID GLASSES FOR MIDDLE IR RANGE PHOTODETECTORS

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The main elements of a modern optoelectronic sensor are known to be semiconductor sources and photodetectors. One of the important components of such a sensor is a photodetector, which must not only have a high efficiency to convert the incident radiation into electric current, but also have the appropriate spectral distribution of photosensitivity and speed. Therefore, the improvement of photodetectors (PhD), especially in the infrared (IR) range of the spectrum is of great importance [1].

The purpose of our research is to increase the sensitivity of PhD operating in optoelectronic sensors at room temperature in the spectral range of 2-5 μm by applying to the active elements (AE) PhD optically active coating of a given shape based on multicomponent glassy alloys from chalcogenide systems Ge– (Ga, As, Sb) - Se.

PhD placed on the substrate of the TO-18 case were investigated. The active elements of the AF are made on the basis of heterostructures with p-n junctions based on solid solutions InAs / InAsSb / InAsSbP / and GaSb / GaInAsSb / AlGaAsSb.

A radical solution to simplify the technology of obtaining AE structures and increase the critical angles is achieved by applying an optically active coating of a given shape on AE PhD flat design with a high refractive index and low absorption coefficient for incident radiation.

Promising and technological materials for applying an optically active coating are transparent in the IR region of the spectrum chalcogenide glassy semiconductors. Chalcogenide glasses (ChG), which were used in studies, are transparent in a wide range of the optical range with a given refractive index, provide good adhesion to the material of the AE and the body, are consistent with their coefficients of thermal expansion, do not change the spectral characteristics of AE and technology good in manufacturing.

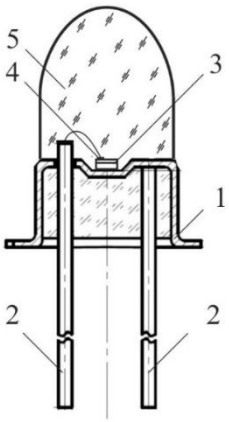

Fig.1 Optical coating of AE photodetector on TO-18 body:
1 – body; 2– current leads;
3– AE of the photodetector;
4– electrical contact;
5– chalcogenide glass

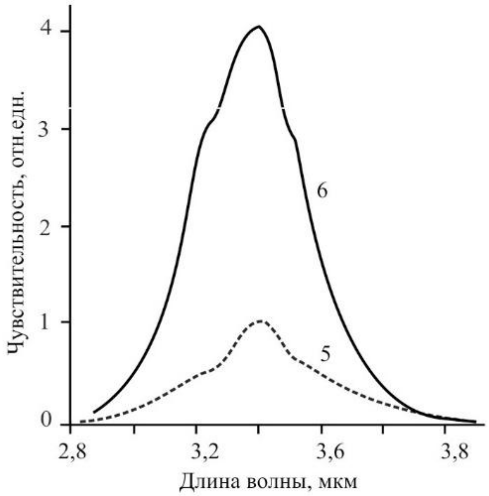

Fig 2. Spectra of AE photosensitivity before (5) and after applying the optical coating (6).

To obtain the maximum external output of the AE radiation, the optimal geometric shape of the optical coating was calculated (Fig. 1). The lower part of the optical coating shape takes into account the height of the coating surface, which does not emit radiation, due to total internal reflection, and the upper part of the coating shape was obtained taking into account the necessary (given theoretically) directional pattern. This form of optical coating conveniently combines the possibility of a more complete use of the light flux emitted by the AE with the possibility of its simultaneous focusing in the desired direction [2].

Our proposed method for applying an optical coating of a given shape based on multicomponent chalcogenide glasses [3] and a device for its implementation [4] have shown high reproducibility of specified forms of an optical coating. The photosensitivity spectra of the PhD obtained by us before and after the application of the optical coating are shown in Fig. 2.

The use of glassy alloys from multicomponent chalcogenide systems Ge - (Ga, As, Sb,) - Se as materials for optical coating made it possible to increase the efficiency of the used emitting AEs by 3.0–5.0 times, and the AE of photodetectors is at least 2.0-2.5 times in relation to similar photodetectors in which a hermetically sealed coating is used based on a polymer compound and 3.0-4.0 times in relation to photodetectors in which the sealing is carried out using a metal cover and transparent window for radiation.

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