ELECTRICAL PROPERTIES OF $As_2S_3Ge_8$ - Te THIN FILMS GROWN FROM THE VAPOR PHASE

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Chalcogenide glassy semiconductors (ChGS) are widely used due to their remarkable physical properties. Unusual properties of these materials originate from peculiarities of their energy spectrum and special chemistry, caused by lone - pair electrons of chalcogen atoms, as well as spatial and compositional disorder. This paper is devoted to study the electrical properties of a complex ChGS from the quaternary system $As_2S_3Ge_8$-Te. Thin films of $As_2S_3Ge_8Te_8$, $As_2S_3Ge_8Te_{13}$, as well as the functional structures supplied with symmetrical electrodes of different metals, such as In, Au and Pt have been prepared and studied. Thin films were grown from priory synthetized materials, via thermal evaporation in vacuum of 10^{-4} Pa onto Pyrex or sintered Al_2O_3 substrates. The metallic electrodes have been deposited using the same method and similar technological conditions.

The work functions of ChGS in question have been determined and the current-voltage characteristics of the *metal-ChGS-metal* junctions at different polarizations and temperatures were studied. The electrical capacity of such junctions was studied in the frequency range between $5 \div 10^6$Hz, at different temperatures and different polarities of the applied voltage. The measurements showed a clear dependence of work function on the composition of the chalcogenide material, but for the composition $As_2S_3Ge_8Te_{13}$ it appears to be ≈ 5.03eV. We have found that In, Au, Pt and some Ag pastes form the ohmic contacts with studied thin films. The electrical capacity of the Pt / $As_2S_3Ge_8Te_{13}$ / Pt structure at < 10^4 Hz, dependent on the temperature and ChGS chemical composition, increases by more than 4 orders of magnitude with frequency decrease.

Finally, some quantitative parameters of the energetic spectra of $As_2S_3Ge_8$-Te glassy semiconductors were estimated and the energetic diagram of the Pt - $As_2S_3Ge_8Te_{13}$ - Pt functional structure has been designed, using the approach described in [1,2]. It is shown that the forbidden gap monotonically decreases with Te concentration increase as ~ 1.0eV for $As_2S_3Ge_8Te_{13}$ and ~ 0.4eV for $As_2S_3Ge_8Te_{130}$ [3]. Elucidated electrical properties of ChGS in the quaternary system $As_2S_3Ge_8$-Te indicate the possibility of their application to the development of toxic gas sensitive devices for environmental monitoring.

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