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Conductivity inversion in $CdSe_xTe_{1-x}$ solid solutions

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Abstract

The results of electrical studies of $CdSe_xTe_{1-x}$ solid solutions synthesized using the zone of additional heating of the vapor phase are presented. It is established that solid solutions are dishonorable systems. It was found that $CdSe_xTe_{1-x}$ solid solutions are characterized by: high resistivity (at T = 298 K up to 10^9 Ohm · cm), which increases with tellurium content. It was found that a high value of activation energy (up to 0.64 eV), monotonously decreasing with temperature; an abnormally long time to establish equilibrium after a sharp change in temperature; low Hall mobility (at T = 413 K no more than 100 $cm^2V^{-1}s^{-1}$). It is established that the solid solutions are systems with a high degree of compensation and an inhomogeneous potential relief of the bands due to disordering of the structure. The disordering of the structure in $CdSe_xTe_{1-x}$ solid solutions is due to the difference in ionic radii. The ionic radius of cadmium is small (1.03A), and the ionic radius of tellurium is large (2.21A). Such systems are characterized by the Frenkel type of natural disorder. An increase in the tellurium content in them promotes the formation of cadmium VCd vacancies with acceptor properties, which at high concentrations lead to an inversion of the type of conductivity from electron to hole.

Temperature and concentration dependences of conductivity and Hall mobility are given.

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