Structure and Thermoelectric Properties of Doped Telluride Films Condition

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Tin Telluride widely used in semiconductor technology. He also promising thermoelectric material for medium range (500-750) K [1,2]. Getting thin film material greatly expands the boundaries of practical application. Before now remains unresolved by the end of the problem of stability over time of electrical parameters. In addition, the exposure of films in the air due to the acceptor action of oxygen on the surface layer is enriched with native p-type conductivity [3].

Introduction Bi leads donor action in Tin Telluride, manifested in descending order of concentration of holes in the bulk of the film. Results of the study of thermoelectric parameters based on vapor-phase condensation doped Tin Telluride for different compositions given in the table. With increasing dopant content thermoelectric power first increases and then decreases sharply, due to the exit from the region solubility of Bi in SnTe. The maximum thermoelectric power is achieved at the impurity content of about 0.3 mol.%, But condensates obtained on fresh cleavages (0001) muscovite mica, it is much higher than for samples in ceramics.

The thickness dependence of thermoelectric parameters SnTe vapor-phase condensates containing 0.3 mol.% Bismuth, with reduction of condensates d, regardless of the composition, the conductivity increases significantly, and for thickness over d ≈ 0,5 microns virtually unchanged. This is due to increasing concentration of carriers in the small film thickness due acceptor action adsorbed surface oxygen. And the concentration of charge carriers pure Telluride is greater than through the donor doped bismuth action. As the film thickness obtained on mica substrates and Seebeck coefficient increases, leading to a significant increase in the thermoelectric power.

Films obtained on fresh cleavages (0001) muscovite mica-characterized by much higher thermoelectric power thanks to twice the Seebeck coefficient than samples obtained on ceramics, thanks to better structural ordering through the influence of the substrate orientation. Condensate obtained at sytalovyh lining the thickness dependence of the Seebeck thermoelectric power and have a clear maximum in the thickness of ~ 0.6 microns due to the manifestation of size effects at small thicknesses condensate.

There are investigated the thermoelectric properties of vapor-phase condensates based on doped tin telluride SnTe:Bi OF THE different composition obtained in the on ceramics and mica substrate by open vacuum technology. It is shown, that thin films on fresh chips (0001) mica containing ~ 0.3 ml.% Bi characterized by maximum values of the thermoelectric power ~ 42 mkW/K^{2}cm.

Literature

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