# Thermoelectric Properties of Thin Films of Pure and Doped Tin Telluride

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Tin Telluride widely used in the semiconductor technology. It is a promising thermoelectric material for the region of average temperatures (500-750) K. Getting the thin film material greatly expands the range of the practical applications. Before now, the problem of stability over the time of the electrical parameters remains completely unresolved.

In this paper, the patterns of change thermoelectric parameters of pure and doped Tin Telluride films, which are obtained from the vapor phase thickness on the mica and the sital substrates, are investigated.

Tin Telluride films are characterized by a large concentration of the holes, which for the thick films reach the value of $10^{20}$ $cm^{-3}$, and with decreasing of the thickness increases by more than an order of magnitude. This behavior of the concentration dependences is related with the oxygen adsorption and it diffusion into the interior of film. The conductivity and the Seebeck coefficient increases significantly with the decreasing of the film thickness and reaches values of 5 $10^3$ $Ohm^{-1}$ $cm^{-1}$ and 70 mV/K. It is providing high values of thermoelectric power $S^2\sigma \approx 20$ mW/$K^2$cm. Thick films have a much lower values of the thermoelectric parameters $\sigma = 1,5$ $10^3$ $Ohm^{-1}$ $cm^{-1}$ and S = 20 mV/K, $S^2\sigma \approx 0,5$ mW/$K^2$cm.

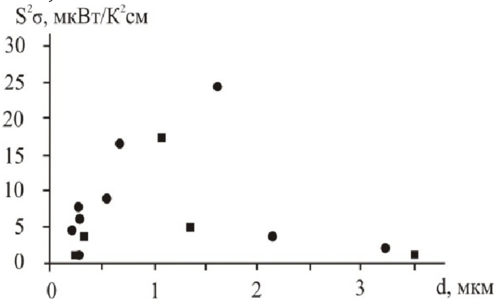


Fig. 1. The dependence of the thermoelectric power $S^2\sigma$ from the thickness d of the films SnTe:Sb. ● – films, which are obtained on the fresh cleavages of mica, ■ - film, which are obtained on the sital substrates.

For the samples, which are doped Stibium, the conductivity of films and the Hall carrier concentration decreases sharply at low thicknesses, and the Seebeck coefficient for the film of the thickness less than 250 nm is 5 times bigger than for the thick. But it is not enough to offset the sharp decline of the conductivity. Therefore, the thermoelectric power ($S^2\sigma$) is observed the maximum in the thickness 1-1.5 μm (Fig. 1) which reaches 25 mW/$K^2$cm.