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Laboratory of Semimetal Physics,

Institute of Applied Physics, Academy of Sciences of the Moldavian SSR, Kishinev

Thermo- and Magneto-Thermo-E.M.F. in Bi-Sn Alloys

By

P. P. BODIUL, A. S. FEDORKO, and D. V. GITSU

Sn in Bi behaves as an acceptor and influences the anisotropy of kinetic effects sensitive to the band structure near the Fermi-level, such as the thermo- and magneto-thermo-e.m.f. described in the present paper.

Fig. 1 shows the Seebeck tensor components α_{11} and α_{33} vs. Sn concentration (our data and those of papers (1, 2)). This dependence can be explained with a band structure model of Bi consisting of three bands (3). In particular, the sharp decrease of the thermo-e.m.f. by doping with Sn up to 0.05 at% results from a decrease of the L-electron density. The approximate isotropy of α_{ii} in the Sn concentration range 0.05 to 0.1 at% is due to the principal contribution of H-holes into transfer phenomena. This is also confirmed by the disappearance of both magnetoresistance anisotropy (4) and magneto-thermo-e.m.f. (5, 6) at low temperature. Finally, the occurrence of thermo-e.m.f. anisotropy at Sn concentration > 0.1 at% is a result of the L-hole contribution. The scheme described excludes an additional hole group, the presence of which was assumed in (7, 8) unlike to (9).