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Enhancement of thermoelectric figure of merit of $BI_{1-x}SB_x$ thin wires under elastic stretch in a magnetic field

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Abstract

This paper studied a combined effect of a longitudinal magnetic field and elastic stretch on thermoelectric properties of $Bi_{0.88}Sb_{0.12}$, thin wires obtained by the Ulitovski method and doped with donor and acceptor impurities. Measurements were performed in the temperature range of 4.2 - 300 K, in magnetic fields up to 14 T. Maximum value of relative elongation under elastic stretch made up 1.3% at $T = 4.2 - 200$ K. Diameter of samples varied from 200 nm to 5 μ m and was controlled on a SEM. It was established that at temperature 120 K in a magnetic field up to 0.4 T a growth in thermopower by 14-20% is observed. By means of elastic stretch, drastic resistance growth in the region of magnetic fields 0.4 T typical of the bulk bismuth samples and non-deformed wires could be suppressed. This brought about considerable power factor increase in the region of temperatures beyond 120 K.

Keywords: magnetic fields, thin wires, elastic stretch