## *NNN 27 P* PECULIARITIES OF PHONON DRAG EFFECT IN BISMUTH WIRES

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Low dimensional materials, such as nanowires, have attracted substantial attention in theoretical and experimental studies [1,2]. In work [1] predicts an enhancement of the thermoelectric power for nanowires.

It is known that the thermoelectric power contains two main contributions, namely, the diffusion thermoelectric power and the contribution due to phonon drag. The diffusion thermopower is due to the difference in broadening of the Fermi distribution between hot and cold parts of the sample. This thermopower is proportional to temperature for T<50 K and it is around 1 μV/K at 4 K. However, investigation of bulk bismuth samples at low temperatures clearly demonstrates that the thermopower transcends by at least an order of magnitude this value.

The thermopower of single crystalline pure Bi microwires with diameters ranging from 0.1 to 14 μm were measured in the temperature range 4 – 300 K. Cylindrical crystals with glass coating were prepared by the high frequency liquid phase casting in a glass capillary [3]. The dominant feature of the thermopower of Bi microwires at temperatures below 12 K is a peak, which is due to phonon drag. In the temperature range of 8 K<T<12 K the phonon drag contribution fits into an exponential temperature dependence. This suggests that the two stage phonon drag is an important transport mechanism in Bi microwires. The phonon-drag thermopower depends on the wire diameter and increases with increasing diameter of the sample, which is qualitatively explained by the suppression of two-step phonon processes in the finer wires due to the shortening of the phonon mean free path for normal (momentum conserving) processes due to diffusive wall scattering.

We have also studied the dependence of the phonon drag thermopower on transverse magnetic field. As opposed to thick sample $d$=6.5 mm where phonon drag thermopower strongly depend on magnetic field. In thin sample $d$=0.56 μm phonon drag thermopower has no dependence on magnetic field. In theoretical and experimental papers [4,5] have been shown that in bulk Bi samples phonon drag thermopower does not depend on magnetic field only in samples with one group of carriers (electrons in Bi exist as 3 different groups of carriers). This means that in our single crystalline Bi microwires at low temperatures mobility of electrons are much smaller than holes (due to strong surface scattering of electrons on surface roughnesses [3]) and a broad positive maximum near 40 K can be attributed to this mobility differences.

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