NNN 29 P THE LONGITUDINAL MAGNETORESISTANCE AND FEATURES OF SHUBNIKOV DE HAAS OSCILLATIONS IN Bi

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The influence of anisotropic deformation on the Fermi surface topology change in quantum wires of bismuth has been studied. The Bi wires with a diameter of 50 nm were obtained by casting from the liquid phase by Ulitovskii method followed by repeated extraction [1, 2]. The most accurate information about the change of the Fermi surface and its change with the lattice deformation can be obtained from the Shubnikov de Gaaza effect. Methodically, under conditions of strong anisotropic elongations of wires the most convenient way was to investigate the quantum oscillations of magnetoresistance in the longitudinal orientation (H || I) and parallel to the stretching force.

It was shown that the reduction of the wires diameter d <100 nm, resulting in a semiconductor temperature dependence R (T) was accompanied by disappearance of the dimensional maximum on the longitudinal magnetoresistance R (H), as well as by increase of negative magnetoresistance in a strong magnetic field and disappearance of the SdH oscillations.

The SdH oscillations analysis showed that for elastic deformation of Bi wires of all investigated diameters non-equivalent displacement of the electron ellipsoids $L_{2,3}$ takes place down the energy scale up to an electronic topological transition 3ee +1 h → 2ee +1 h at $\xi \approx 1.2\%$.

In the Bi wires with d <120 nm SdH oscillations at $\xi = 0$ have not been observed. At some value of the elastic extension $\xi = 1\%$ the SdH oscillations appear, which display the same regularity as the wires with d> 200 nm when being further deformed, that is, reduction of the period of SdH oscillations of the $L_{2,3}$ - electron ellipsoids and the displacement of the quantum limit by L- carriers in the area of strong magnetic fields. However, if in the Bi wires with d> 150 nm, the frequency of oscillations increases by 3 times, in the wires with d <90 nm it increases by 1.4 times at the stretching deformation $\xi \approx 2\%$.

This fact is extremely important, proving that a semiconductor temperature dependence R (T) and the absence of SdH oscillations in Bi wires with d <100 nm are not related to the deterioration of the structural quality of Bi nanowires but are the result of manifestation of the quantum size effect and the transition semimetal-semiconductor.

It has been experimentally proved that the absence of oscillations in the field dependence of resistance R (H) for Bi nanowires with d <100 nm is due to the manifestation of the quantum size effect.

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[2] A.A Nikolaeva, L.A Konopko, G.I.Para, A.K.Turcan.. *Metallofiz. Noveishie Teknol.*, 33, N1, (2011) 65-75.