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The structure phase transition in quantum wires of bismuth under elastic tension

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Abstract

It was established that at 4.2 K for thin (d<1μm)Bi wires there existed a complicated λ-form dependence of the resistance$\bar{R}$ on the strong elastic deformation ξ. The drastic fall in the oscillation amplitude of the flux-quantification type together with the$\bar{R}$ (ξ) behavior in dependence on the values of temperatureT, impurity concentrationC, wire diameterd and current densityJ indicate the presence of the structure phase transition within the subsurface region due to the shear deformation in the investigated layered structure. The intensive carrier scattering at the fluctuation oscillations of the atoms within the subsurface region brings about sharp resistance rise. Formation of a new long range order in the said region excludes the following rise in$\bar{R}$(ξ) and ensures the maximum of the said quantity.

Keywords: shear deformations, oscillations, phase transitions, Fermi level positions, thin wires

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