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Title: Features of correlation of electronic properties with an atomic scale characterization in the Bi bicrystal interfaces

Abstract
We present the results of study of the quantum transport, magnetic and superconducting properties of Bi bicrystals at low temperatures and high magnetic fields up 40T to highlight the electronic properties correlations with an atomic scale characterization in the inclination and twisting crystallite interfaces. The A7 crystal structure of Bi differs only slightly from the cubic and may be obtained under two separate distortions: an internal displacement of the two interpenetrating fcc lattices along a (111) diagonal and a trigonal shear angle associated with an extension along the same diagonal. In [1] the effect of both the trigonal shear angle and internal displacement on electronic structure is studied. It is shown that the internal displacement changes the Bi electronic structure from a metal to a semimetal. An increase of trigonal shear angle leads to a semimetal-semiconductor transition in Bi. All this is in qualitative agreement with a Jones-Peierls-type transition. It is necessary to note, that under a Peierls distortion of the lattice, the band displacement an energy scale occurs and essential changes in the Fermi structure surface take place. None of these features were revealed in Bi bicrystals with twisting superconducting crystallite interfaces. This clearly follows from the results of [2], where the quantum oscillations of Hall resistance and magnetoresistance of Bi twisting bicrystals with the superconducting interfaces were studied in detail and a similar Fermi surface consisting at CIs of SDA and LDA bicrystals and bulk Bi was found. The changes in the atomic arrangement taking place at interfaces affect the electronic structure so that the Fermi surface for electrons is less anisotropic and much larger in volume than in bulk single crystals. Considerable changes in the topology (changes of the shape, elongation and volume) of the hole isoenergetic surface at interfaces were also revealed. Moreover, the topological changes in anisotropy of the angular dependences of the frequencies of quantum oscillations for bicrystals with different disorientation angles provide a possibility of determining the degree of deformation of the crystalline lattice at the interface region.
Key words: bicrystals, crystallite interfaces, bismuth and bismuth-antimony alloys, superconductivity and weak magnetism

References
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