SSNN 12P THE HIGH-FIELD GALVANOMAGNETIC EFFECTS IN BICRYSTALS OF 3D TOPOLOGICAL INSULATOR Bi_{1-x} - Sb_x (0. 07 ≤ x ≤ 0.15)

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We report the results of the investigations at He-liquid temperatures of the galvanomagnetic effects of twisting bicrystals of 3D topological insulator (TI) $Bi_{1-x}Sb_x$ ($0.07 < x < 0.15$) to elucidate the peculiarities of electronic system behaviour in ultraquantum limit (UQL) of magnetic fields. The bicrystals, consisting of two single crystalline blocks and a crystallite interface (CI), were obtained by the zone recrystallization method using the double seed technique. Two groups of samples were studied: small crystallite disorientation angle (SDA) bicrystals ($\theta_1 < 9^0$) and large crystallite disorientation angle (LDA) bicrystals ($\theta_1 > 12^0$). The width of crystallite interfaces (~ 100 nm) was estimated by means of scanning electron microscopy (SEM) and by the magnetic field value at which quantum oscillations have been observed. The galvanomagnetic effects after transition of CI in the normal state (converted by magnetic field or a current) were registered in stationary (up to 18T) and pulse (up to 40T) magnetic fields, directed along the CI plane (near the C_3 axes of crystallites). The CI (composed of a solitary central part of ~ 60nm thickness and two similar adjacent layers of ~ 20nm thickness on both sides of it) of Bi_{1-x} Sb_x bicrystals exhibit simultaneously ferromagnetic and superconducting properties with the onset of transition ~ 36K [1, 2], while single crystalline blocks (crystallites) are 3D TIs and are not a superconductor or ferromagnetic. We specify some of the most important characteristic features of twisting bicrystals of 3D topological insulator Bi_{1-x} Sb_x ($0.07 < x < 0.15$). In high-field region, after semiconductor-semimetal transition of crystallites of SDA bicrystals, other two transitions jointed to central and adjacent layers of CI occur in much higher magnetic fields. On the other hand, in the same region of magnetic fields a semiconductor – semimetal transitions in CI of LDA bicrystals are unlikely, but clearly manifest the quantum oscillations of galvanomagnetic effects, denoting the high density of state in layer components of interfaces and the heavier than in crystallites charge carriers.

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