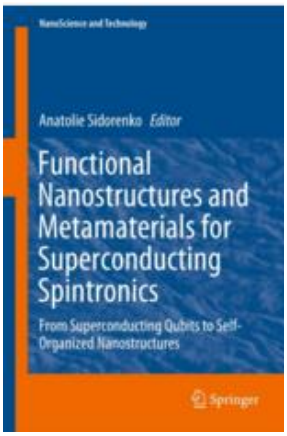

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Quantum Transport, Superconductivity, and Weak Ferromagnetism at Bicrystal Interfaces of Bi and 3D Topological Insulator BiSb

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Abstract

This chapter reviews the results of study of electronic quantum transport, superconductivity, and magnetic phenomena of bicrystals of Bi and BiSb alloy system at temperatures 1.8–100 K and magnetic fields up to 400 kOe. A similar Fermi surface (FS) consisting of crystallite interfaces (CIs) and bulk crystallites has been found. In the quantum transport oscillations spectrum, a number of new oscillation harmonics have been detected, characterizing the much larger cross-sectional areas of FS in CIs than in Bi single crystals. A number of quantum Hall plateaus were observed in inclination-type bicrystals. They vanish after the magnetic field reversal and thereby indicate that the flow of Dirac fermions is dependent on the field orientation. It has been found that the semiconductor–semimetal transition is induced in the central and adjacent layers of the CIs at different values of the magnetic field. Two/one superconducting phases with the onset of transition ≤ 36 K are observed at CIs of bicrystals, while the rhombohedral Bi and 3D topological insulator (TI) BiSb are diamagnetic and do not exhibit superconductivity. In large crystallite disorientation angle BiSb interfaces, both superconductivity and weak ferromagnetism were revealed simultaneously.