SSNN 14P SUPERCONDUCTING FEATURES AT Bi-Sb TWISTING CRYSTALLITE INTERFACES

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We present the results of the study of quantum oscillations, magnetic and superconducting properties of the twisting bicrystals of 3D topological insulator $Bi_{1-x}Sb_x$ (0.07 < x < 0.15) at low temperatures and in magnetic fields up to 400 kOe.It has been found that the small crystallite disorientation angle (SDA) interfaces, which consist of a solitary central part (thickness of about 60 nm) and two similaradjacent layers (~20 nm) on both sides of it, exhibit two superconducting transitions with critical temperature T_c~ (3.7 - 4.6)K and T_c~ (8.3 – 21)K.For varioussamplesthe orbital uppercritical field $H^{orb}{}_{c2}$ (0) lies within the range of 24–27 kOe (for the first superconducting phase with higher critical temperature) and 11–16 kOe (for the second phase with lower critical temperature). Critical paramagnetic field $H_{c2}{}^{p}(0)$ estimated from the relation $\mu_B\ H_{c2}{}^{p}(0)\ =1.84\ kT_c$($\mu_B$is the Bohr's magneton) gives a value of 232 kOe (for first phase) and 120kOe (for second phase), which is an order of magnitude higher than the upper orbital critical field. Consequently, the Maki parameter $\alpha\ =\ \sqrt{2}H^{orb}{}_{c2}\ (0)\ /H^{p}{}_{c2}(0)$ in our CIs is very small ($\alpha \approx$ 0.1 – 0.14), the spin-paramagnetic effect is unimportant, and the conventional orbital upper critical field at zero temperature fully determines the magnitude of $H_{c2}(0)$. The critical field anisotropy $\gamma\ =\ H^{\parallel}{}_{c2}(0)/\ H^{\perp}{}_{c2}(0)$ at CIs ofbicrystals of $Bi_{1-x}Sb_x$ (0 <x< 0.2) alloysis relatively weak, decreases from $\gamma \approx$ 1.3 – 1.5 (near T_c) up to $\gamma \approx$ 1.0 - 1.1 (at $T \approx$ 0K), and insignificantly deviates from the temperature-independent behavior of one-band superconductor. The Ginzburg-Landau coherense lengths, estimated using the formula $\xi^2\ =\ \phi_0/2\pi\ H^{\perp}{}_{c2}(0)$ ($\phi_0$is the fluxquantum),make upin the first superconducting phase of CIs of our bicrystals 11-12nm, whereas in the second phase reach 14-17nm.The hysteresis loops in SDA bicrystals are symmetric and typical for strong type-II superconductors, leading to lower critical field values ofH_{c1} ~ (100-130) Oe. The shape of theloopsdoesnotchangeessentiallywithtemperature; some of them do notexhibitanyinitial diamagnetic magnetizationpeak. The sesuggestthatinteraction between Dirac fermions in a topologicalinsulatormaybecoherentlycontrolledbysuperconductingphase.So, the results revealthat superconductivity features of SDA interfaces, consisting of two types of layers with different behavior are a direct consequence of the notable Fermi surface topology changes, significant charge carriers concentration increase[1] and phonon spectra transformations compared to crystallites.

[1] F. M. Muntyanu, A. Gilewski, K. Nenkov, A. Zaleski and V. Chistol, Phys. Rev.B **76,** 014532 (2007).

SSNN 15P OPTICAL PROPERTIES OF Eu DOPED GaS SINGLE CRYSTALS

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GaS is a n type layered semiconductor with wide band gap (E_g^i=2.57 eV, and E_g^d=3.1 eV). The elementary packings of the crystals are bonded by Van der Waals forces. Between the atoms inside the S-Ga-Ga-S elementary packings there are strong ionic-covalent bonds. GaS is typical representative of the $A^{III}B^{VI}$ compounds with self-cleaning properties of impurities, i.e. the impurity