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Topological features of quantum magnetotransport in $Bi_{1-x}Sb_x$ ($0 \le x \le 0.2$) bicrystals

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Unusual topological features related to the interface Dirac electrons [1, 2] have been revealed: the longitudinal Hall quasi-plateaus, along with minima in magnetoresistance; the manifestation of Umkehr effect, non- allowed by the crystal symmetry; two new harmonics of quantum transport from interface layers, which characterizes larger than cross-sectional areas of the FS of crystallites; the magnetoresistance peculiarities, indicating both the occurrence of a small group of the infinitely moving electrons and the electronic phase transitions of the semiconductor–semimetal type in magnetic field. A high-field behaviour of $\alpha_{ii}(B)$ has been identified (it linearly increases in magnetic field without saturation, the sign changes from negative to positive, the nontrivial π-Berry phase is observed, etc.) in CIs layers, specifying the signature of 3D topological semimetal at 3D Dirac point forming (x ~ 0.04). In addition, it has been found that the bicrystals of $Bi_{1-x}Sb_x$ ($0.07 \le x \le 0.2$) alloys exhibit peculiarities typical of 3D TI: $\alpha_{ii}(B)$ undergoes saturation in magnetic field or smoothly increase, the Landau level index n in all CIs layers linearly depend on $1/B_n$ and extrapolated to –0.5 if $1/B_n \rightarrow 0$.

References

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