TOPOLOGICAL SURFACE STATE IN THE THERMOELECTRIC PROPERTIES OF Bi_2Te_3 LAYERS

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Topological materials have elicited interest from a wide variety of fields due to their unique symmetry- protected electronic states. Using the new developed by us technology preparing single-crystal layers of topological insulator Bi_2Te_3 and Bi_2Se_3 , *n* and *p*-tip without substrate [1] , we received layers with thickness 10-20 µm and with orientation the trigonal axis C_3 perpendicular to the cleavage plane layers (according X-ray-diffraction studies).The process was repeated several times to obtain layers with different thickness. Thermoelectric properties at 4.2-300K- and Shubnikov de Haas (SdH) oscillations of single crystals layers of an n- and *p*-type bismuth telluride topological insulator (TI) are investigated. Using experimental data on SdH oscillations in both longitudinal (H||I) and in transverse (H⊥I) magnetic fields at temperature of 2.1–4.2 K, the cyclotron effective mass, Dingle temperature and the quantum mobility of charge carriers are calculated.It has been revealed that the phase shift of the Landau levels index is 0.5 for both the longitudinal and transverse magnetic fields, like as in Bi_2Te_3 microwires [2]. This finding is attributed to the Berry phase of the surface state. From temperature dependences of resistance and thermo-power, the power factor in a temperature range of 2–300 K was calculated. It has been found that the maximum value of the power factor $S^2\sigma = 4.5 \times 10^{-5}$ W/m K^2 for *p*-layers at 300 K. Structures based on Bi_2Te_3 can be used to design miniature sensors for thermoelectric devices, such as thermoelectric micro-coolers for cooling a computer processor.
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References

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