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Transport studies in topological insulator Bi_2Te_2Se[1] HELIN CAO, IRENEUSZ MIOTKOWSKI, JIFA TIAN, Department of Physics, Purdue University, YONG CHEN, Department of Physics, School of Electrical and Computer Engineering, Purdue University — Recently, 3D topological insulators, featuring spin helical topological surface states (SS), have attracted strong attention in condensed matter physics. Although the SS have been directly revealed and intensively studied by surface sensitive measurements, such as ARPES and STM, transport measurements remain challenging due to coexistence of the surface and bulk conduction channels and the sensitivity of sample surfaces to ambient exposure. We have grown high quality Bi_2Te_2Se crystals by the Bridgeman method. Resistance showed an insulating behavior followed by saturation at low temperature, indicating surface conduction. Through magnetotransport measurements, we demonstrated high mobility SS on freshly cleaved crystals. The transport signatures of surface Dirac fermions were uncovered from 2D SdH oscillations and non-linear Hall effect. We have also compared transport properties of the samples before and after exposure to air. A giant cusp in magnetoresistance at zero B field was observed after exposure. Our studies may help understand the interplay between the surface and the bulk conduction channels and the degradation of SS due to environmental exposure. We will also present some experimental results of gate tuning and thermoelectric measurements on Bi_2Te_2Se.

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