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Magnetotransport study of the ternary topological insulator $(Bi_{0.5}Sb_{0.5})_2Te_3$ via *in situ* low temperature deposition of Cr LIUQI YU, JORGE BARREDA, LONGQIAN HU, P. XIONG, Florida State University, TONG GUAN, XIAOYUE HE, K. WU, Y. LI, Institute of Physics, Chinese Academy of Sciences — The robustness of the surface state of three dimensional topological insulators against local magnetic perturbation is still under debate, since a precise and well-controlled electrical characterization of the effects of the ferromagnetic dopant and their evolution with doping density are exceedingly difficult. Here we report results of magnetotransport measurements on epitaxial thin films of the $(Bi_{0.5}Sb_{0.5})_2Te_3$ in the presence of electrostatic gating and magnetic impurity. Magnetoresistance (MR) and Hall effect measurements have been performed in various back gate voltages. Ambipolar field effect has been observed, enabling effective tuning of the Fermi level across the band gap and identification of the surface transport in the topological transport regime. Taking advantage of the unique capability of *in situ* deposition of Cr atoms in a customized dilution refrigerator, magnetic impurities were incrementally quench-condensed onto the sample surface. Our results show the deposition of Cr effectively yields electron doping. The weak antilocalization (WAL) effect was found to be surprisingly insensitive to the magnetic impurity; the cusp-like negative magnetoconductivity remains even at the highest Cr concentration and no apparent weak localization was observed as expected from a gap opening at the Dirac point. WAL effect has the largest modification at a back gate voltage of -200 V where the Fermi level is considered relatively close to the Dirac point.

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