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Topological insulator nanowires and nanowire hetero-junctions¹ HAIMING DENG, LUKAS ZHAO, The City College of New York - CUNY, TRAVIS WADE, MARCIN KONCZYKOWSKI, Ecole Polytechnique - Palaiseau, LIA KRUSIN-ELBAUM, The City College of New York - CUNY — The existing topological insulator materials (TIs) continue to present a number of challenges to complete understanding of the physics of topological spin-helical Dirac surface conduction channels, owing to a relatively large charge conduction in the bulk. One way to reduce the bulk contribution and to increase surface-to-volume ratio is by nanostructuring. Here we report on the synthesis and characterization of Sb_2Te_3 , Bi₂Te₃ nanowires and nanotubes and Sb₂Te₃/Bi₂Te₃ heterojunctions electrochemically grown in porous anodic aluminum oxide (AAO) membranes with varied (from 50 to 150 nm) pore diameters. Stoichiometric rigid polycrystalline nanowires with controllable cross-sections were obtained using cell voltages in the 30 - 150 mVrange. Transport measurements in up to 14 T magnetic fields applied along the nanowires show Aharonov-Bohm (A-B) quantum oscillations with periods corresponding to the nanowire diameters. All nanowires were found to exhibit sharp weak anti-localization (WAL) cusps, a characteristic signature of TIs. In addition to A-B oscillations, new quantization plateaus in magnetoresistance (MR) at low fields (< 0.7 T) were observed. The analysis of MR as well as I - V characteristics of heterojunctions will be presented.

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