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Transport measurements of the topological surface states in Bi_2Te_3 nanoribbon field effect devices LUIS A. JAUREGUI, Purdue University, MICHAEL T. PETTES, LI SHI, University of Texas at Austin, LEONID P. ROKHINSON, YONG P. CHEN, Purdue University — We have grown nanoribbons (NRs) of Bi_2Te_3, a prototype topological insulator, by CVD and characterized them by TEM, Raman Spectroscopy and EDS. We fabricate backgated field effect devices where the chemical potential can be tuned and ambipolar field effect has been observed. The as-grown NRs are n-type and the 4-terminal resistance (R4p) versus temperature (T) shows a metallic behavior. Applying a sufficiently negative Vg, the R4p vs T displays an insulating behavior that saturates in a plateau at T $<$ 100K, suggesting a metallic surface conduction dominant at low temperatures. Aharonov-Bohm (AB) oscillations of surface conducting carriers are observed in the magneto-resistance (MR) with a magnetic (B) field parallel to the NR axis. We have also measured the Shubnikov de Haas (SdH) oscillations with the B-field perpendicular to the NR axis at different carrier densities (n). The extrapolated Landau level crossing at $1/B = 0$ is $\sim$0.5 and the extracted cyclotron mass from the T-dependence of the SdH oscillations is proportional to $\sqrt{n}$, providing direct evidence of the Dirac fermion nature of the topological surface state. Gate-tunable weak anti-localization is observed and the extracted number of decoupled coherent conduction channels is 2 at the charge neutrality point.

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