Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Van der Waals epitaxy of Bismuth Telluro-Sulfide nanosheets and magnetotransport in devices TANUJ TRIVEDI, SUSHANT SONDE, SANJAY K. BANERJEE, Microelectronics Research Center, The University of Texas at Austin — Growing interest in probing topological surface states from transport experiments has led to the recent development of ternary and quaternary compounds of Bismuth chalcogenides. The search for complex 3D topological insulator compounds is motivated by the need for reduced bulk conduction and easier access to the Dirac point of the surface states, as compared to in the binary phases Bi_2X_3 (X=Te,Se). To this end, we have grown nanosheets of Bismuth Telluro-Sulfide directly on different substrates with van der Waals epitaxy. The growth method utilizes novel solid-state, non-elemental precursors of Bismuth, Tellurium and Sulfur. Nanosheet growth is observed on different substrates, such as amorphous SiO_2, hexagonal-BN and mica, and grow layer-by-layer in varying thicknesses (3 nm to >100 nm) and sizes (up to few microns). Stoichiometric analysis of the nanosheets is close to previously reported crystal growth of tetradymites, and the crystalline nature is confirmed with Raman and XRD measurements. We have fabricated devices on as-grown nanosheets of varying thicknesses, with nonmagnetic metal contacts. Preliminary magneto-transport experiments are promising, motivating further in-depth transport analysis for probing topological surface states.

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Date submitted: 14 Nov 2014 Electronic form version 1.4