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Fabrication and transport measurements of stacked double layer topological insulator devices TAI-LUNG WU, Department of Physics and Birck Nanotechnology Center, Purdue University, West Lafayette, IN 47907, JIUNING HU, School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN 47907, JIFA TIAN, Department of Physics and Birck Nanotechnology Center, Purdue University, West Lafayette, IN 47907, IRENEUSZ MITKOWSKI, Department of Physics, Purdue University, West Lafayette, IN, 47907, YONG P. CHEN, Department of Physics and Birck Nanotechnology Center, Purdue University, West Lafayette, IN 47907 — A double-layer structure, consisting of two separated two-dimensional electron systems close in proximity, has been an interesting system to study novel ground states and transport properties driven by electron-electron interaction, e.g. Coulomb drag, exciton condensation, and counterflow superfluidity. Recently, topological insulators (TI), such as Bi_2Se_3 and Bi_2Te_3, have attracted much attention due to their exotic topologically protected spin-helical and Dirac-particle surface states. Motivated by a recently proposed "topological exciton condensate" that may be formed in two interacting TI surfaces, we have fabricated stacking double-layer TI structures and studied their electrical transport properties. Using a polyvinyl alcohol (PVA) based support film and micro-manipulator, double layer TI structures (Bi_2Se_3/boron nitride/Bi_2Se_3) were fabricated with exfoliated Bi_2Se_3 separated by thin boron nitride flakes ($\sim$ 20 nm). We will present results from transport measurements including mutual-gated electrical field effect, Coulomb drag ,and counterflow conductivity.

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