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Emergence and coupling of topological surface states in tunable TI-non TI heterostructures NIKESH KOIRALA, MATTHEW BRAHLEK, JIANPENG LIU, MARYAM SALEHI, TAHIR YUSUFALY, DAVID VANDERBILT, SEONGSHIK OH, Rutgers Univ — The most distinctive feature of topological insulators (TI) is the topologically protected surface states (TSS) that reside at the interface between TI and trivial insulators (non-TI). These TSS have been difficult to probe with transport measurements so far due to deleterious bulk conduction. Using atomically engineered TI – non TI heterostructures, we have studied the emergence and coupling of TSS at TI-non TI interfaces by tuning the thickness and transparency of the non-TI layer. Theoretical analysis based on first principle calculations as well as tunneling model are fully consistent with the observed experimental results and altogether provide a coherent picture of evolution of TSS at TI - non TI interface in such tunable heterostrucutres. Being near ideal systems for tuning TSS and allowing them to be probed via transport measurement such heterostructures open will new avenues for future research and applications.

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