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Engineering three dimensional topological insulator in layered heterostructures T. DAS, LANL, A.V. BALATSKY, LANL and Nordita. Sweden — We show that three dimensional topological insulator can be designed artificially via staking layers of two-dimensional Fermi gases (2DEGs) with finite inter-layer tunneling. The approach is based on stacking bilayers of Rashba-type spin-orbit coupled 2DEG with opposite spin-orbit coupling on opposite planes of bilayers. Spin Orbit interaction locks electronic states with respective spin projections, i.e.+/-a(k*s) with 'a' is the Rashba-spin-orbit coupling strength, 'k' is the momentum, and 's' is Pauli matrices for spin. We find that in the stack of bilayers grown along (001)-direction, a topological phase transition occurs above a critical number of Rashba-bilayers, with formation of a single spin-polarized Dirac cone at the \Gamma-momentum . This approach offers a path to design artificial topological insulators in a set up that takes full advantage of atomic layer deposition approach, is free from crystal geometry, and is tunable. Work is supported by US DOE and Nordita.

Tanmoy Das
LANL

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