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Disorder-induced WAL-WL transition and anomalous Hall effect in undoped thin Sb_2Te_3 films[1] INNA KORZHOVSKA, CUNY-Graduate Ctr, The City College of New York, YURY DESHKO, LUKAS ZHAO, ZHIYI CHEN, LIA KRUSIN-EBAUM, The City College of New York, SIMONE RAOUX, Helmholtz-Zentrum, Berlin, Germany — We examine the effects of disorder on charge transport in thin (20-50 nm) films of topological insulator (TI) Sb_2Te_3, where, uniquely, structural disorder can be controllably tuned over a huge range - from amorphous to crystalline - by a suitable annealing schedule. We report on the observation of disorder-induced transition from weak localization-like state (WL-like) to weak anti-localization (WAL), at which conductance changes its character from 3D in the WL-like state to 2D in the WAL (crystalline) state. Near the transition, the conductance is $G \approx e^2/h$, suggestive of the transport through a surface channel that is decoupled from the bulk by disorder. Quite remarkably, the onset of the WL state (where bulk transport is of variable range hopping type) is found to be concurrent with the appearance of anomalous Hall signal (AHE) which grows with increased disorder, with Hall resistivity ρ_{xy} scaling as the longitudinal resistivity squared, $\rho_{xy} \propto \rho_{xx}^2$. The nature of spin correlations (probed directly by the arrays of micro Hall sensors) responsible for AHE in disordered TI films in the absence of magnetic dopants will be discussed.

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