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Turning topological insulators 'insulating' using irradiation with swift particle beams LUKAS ZHAO, HAIMING DENG, City College of New york, M. KONCZYKOWSKI, Ecole Polytechnique - Palaiseau, A. HRUBAN, Institute of Electronic Materials Technology - Warsaw, LIA KRUSIN-ELBAUM, City College of New york, CCNY TEAM, ECOLE POLYTECHNIQUE TEAM — To understand the transport and quantum electronic behaviors of the topological Dirac surface states, it is essential to develop techniques that will unambiguously separate surface physics from that of the bulk. In the approaches taken thus far, such as nanostructured materials synthesis, doping, or compositional tuning, the complete elimination of the bulk conduction still remains a challenge. Here we present a different approach that uses swift particle beams to introduce controlled disorder into a bulk of topological insulators (TIs) thereby increasing bulk resistivity by orders of magnitude. The process creates Frenkel pairs, with charged vacancies stable up to room temperature. We report the results of irradiation of TIs Bi_2Te_3 and Sb_2Te_3 – both p-type in as-grown state – with 2.5 MeV electrons performed at liquid hydrogen temperature (20 K). The longitudinal resistivity ρ_{xx} monitored *in-situ* as a function of particle fluence ϕ displays a maximum at which the hole (p-type) conduction appears compensated; beyond ϕ_{max} a conversion to n-type is obtained. The effect of this 'compensation' on the surface states of the irradiated TIs probed in electric-field gated structures will be discussed.

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