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Bulk-Insulating Bi_2Se_3 Thin Films and Decoupled Topological Surface States MATTHEW BRAHLEK, NIKESH KOIRALA, MARYAM SALEHI, NAMRATA BANSAL, SEONGSHIK OH, Rutgers Univ — By applying the simple criteria given by Mott and Ioffe-Regel it is easily seen that even the best TIs are not true insulators in the Mott sense, but at best are weakly-insulating bad metals. However, band-bending effects contribute significantly to the TI transport properties, and we show that utilization of this band-bending effect can lead to a Mott insulating bulk state in the thin regime. This is realized in transport experiments on compensation doped Bi_2Se_3 thin-films, where the bulk-insulating picture is supported by enhanced surface mobilities, Hall effect, Shubnikov de-Haas oscillations as well a clear signature of a thickness dependant decoupling of surface states by analyzing the weak anti-localization effect.

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