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An infra-red study of thin film Bi_2Se_3 electronic structure across multiple thicknesses

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The issue of self doping via selenium vacancies in the topological insulator (TI) Bi_2Se_3 has hindered efforts to produce samples with surface dominated conductivity. In fact, previous transport measurements of Bi_2Se_3 samples grown by molecular beam epitaxy (MBE) have demonstrated that the charge carrier density varies as a function of the thickness. To explore this issue in Bi_2Se_3 we have used various methods of infrared spectroscopy, including transmission and ellipsometry, to probe the electronic structure of Bi_2Se_3 thin films grown using MBE. From these measurements, we have developed an enhanced understanding of how the sample thickness affects the material properties.

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