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Surface state transport suppression in topological insulators[1] ANJAN A. REIJNDERS, Y. TIAN, G. POHL, I.D. KIVLICHAN, S.Y. FRANK ZHAO, Y-J. KIM, University of Toronto, S. JIA, R.J. CAVA, Princeton University, D.C. KWOK, N. LEE, S.W. CHEONG, Rutgers University, KENNETH S. BURCH, University of Toronto — An unresolved question in experimental research on topological insulators (TI) is the suppression mechanism of a TI's surface state transport. While room temperature ARPES studies reveal clear evidence of surface states, their observation in transport measurements is limited to low temperatures. A better understanding of this suppression is of fundamental interest, and crucial for pushing the boundary of device applications towards room-temperature operation. In this talk, we report the temperature dependent optical properties of the topological insulator Bi_2Te_2Se (BTS), obtained by infrared spectroscopy and ellipsometry, probing surface and bulk states simultaneously. We see clear evidence of coherent surface state transport at low temperature and find that electron-phonon coupling causes the gradual suppression of surface state transport as temperature rises to 43K. In the bulk, electron-phonon coupling enables the emergence of an indirect band gap transition, which peaks at 43K, and is limited by thermal ionization of the bulk valance band above 43K. For comparison with other resistive TIs, we also discuss the optical properties to $BiSbSe_2Te$.

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