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Optical study of the metal-insulator transition in $Bi_{1-x}Sb_x$ alloys DIRK VAN DER MAREL, FLORENCE LEVY, JULIEN LEVALLOIS, ALEXEY KUZMENKO, ENRICO GIANNINI, University of Geneva, ZAHID HASSAN, DAVID HSIEH, Princeton University, UNIVERSITY OF GENEVA COLLABORATION, PRINCTETON UNIVERSITY COLLABORATION — $Bi_{1-x}Sb_x$ exhibits rich physics related to fact that it is an exactly charge compensated plasma of electrons and holes. The electronic structure is controlled by a massive hole band and a 3 dimensional Dirac cone with a gap. The latter gap can be tuned through zero by controlling the Sb concentration, which also results in a relative shift of the bands. Samples can be prepared which are either semi-metallic, semiconducting, or insulating in the bulk with a topological conducting phase at the surface. Detailed optical studies have been realized by means of infrared reflectivity on four different $Bi_{1-x}Sb_x$ alloys doped at 1%, 6.5%, 7% and 10%. This systematic study demonstrates that chemical pressure tuning induces a zero-temperature metal-insulator transition and reveals a spontaneous phase separation for the 6.5% doped sample.

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