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Strong scattering between surface and bulk electrons in a parent topological insulator Bi_2Se_3 SEUNG RYONG PARK, W.S. JUNG, CHUL KIM, D.J. SONG, C. KIM, Institute of Physics and Applied Physics, Yonsei University, S. KIMURA, UVSOR facility, Institute for Molecular Science and The Graduate University for Advanced Studies, Japan, K.D. LEE, N. HUR, Department of Physics, Inha University — We report on angle resolved photoemission spectroscopic studies on a parent topological insulator, Bi_2Se_3. The line width of the spectral function (inverse of the quasi-particle lifetime) shows an anomalous behavior. This behavior can be reasonably accounted for by assuming decay of the quasi-particles predominantly into bulk electronic states through electron-electron interaction and defect scattering. Studies on aged surfaces reveal that topological metallic states are very much unaffected by the potentials created by absorbed atoms or molecules on the surface, indicating that topological states are indeed protected against weak perturbations.

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