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Effects of Surface Morphology on the 3D Topological Insulator Samarium Hexaboride[1] STEVEN WOLGAST, YUN SUK EO, CAGLIYAN KURDAK, Dept. of Physics, University of Michigan, DAE-JEONG KIM, ZACHARY FISK, Dept. of Physics and Astronomy, University of California, Irvine
— The recent verification of a topologically-protected surface state in SmB_6 at low temperatures has led to several transport studies of the surface states. This task is complicated because current can flow on all surfaces of a topological insulator, each of which can have different transport characteristics. Our own measurements using a Corbino disc geometry overcome this difficulty, limiting the conduction to individual surfaces. However, the sheet conductivities of our samples counter-intuitively decrease with finer surface polishing. We therefore investigate surface and sub-surface morphology as a factor affecting the surface conductivity. Specifically, surface cracks may themselves harbor surface states and contribute to the total electrical conduction, yielding a higher measured sheet conductivity than that of a flat surface. This situation may contribute to the (sometimes unphysically) large surface conductivities already observed in SmB_6.

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