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Hybridization Gap, Metallic Surface States and Quantum Transport in SmB_6

JOHNPIERRE PAGLIONE, Center for Nanophysics and Advanced Materials, Department of Physics, University of Maryland

Topological insulators, with metallic boundary states protected against time-reversal-invariant perturbations, are a promising avenue for realizing exotic quantum states of matter. According to recent theoretical predictions, a topological insulating state can emerge not only from a weakly interacting system with strong spin-orbit coupling, but also in insulators driven by strong electron correlations. The Kondo insulator compound SmB_6 is an ideal candidate for realizing this exotic state of matter, with hybridization between itinerant conduction electrons and localized f-electrons driving an insulating gap that facilitates the emergence of topological surface states at low temperatures. In this talk I will discuss our point-contact spectroscopy studies of the bulk hybridization gap of SmB_6 and its relation to purported metallic surface states. I will also present milliKelvin magnetotransport studies that reveal both weak antilocalization and quantized conductance phenomena that provide strong evidence for topologically non-trivial surface states in SmB_6.