

Kondo semiconductors with a twist: f-orbital topological insulators

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SmB₆ is a canonical example of an f-electron system in which resistivity increases with decreasing temperature. The most puzzling property of this materials, which remains unexplained to date, is that resistivity saturates below 5K and remains essentially independent on the sample's quality. I will argue that this anomalous behavior can be explained by an existence of topologically protected metallic surface states at the sample's boundaries. These states emerge as a result of hybridization between conduction and f-electrons due to specific momentum dependence of the hybridization amplitudes, which are determined by the symmetry of the lowest lying crystalline field multiplet. In addition, I will review recent theoretical efforts towards the possibility of realizing topologically protected metallic states in Ce-based heavy-fermion semiconductors.