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Temperature dependence, termination dependence, and the spin chirality of the electronic structure of a mixed-valent topological insulator: SmB6

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A great deal of recent effort has been paid to demonstrate the topological origin of a strongly correlated mixed-valent insulator SmB6. Despite extensive research, however, there is no consensus yet on the topological nature of the Kondo insulator SmB6. In this respect, the works reported so far need be reexamined carefully to see whether the reported results are relevant to the intrinsic property or not. For example, the termination-dependent physical properties of the surface in-gap states in SmB6 have hardly been examined seriously. Also it is important to investigate the spin chirality of the surface states in SmB6. Furthermore, if bulk SmB6 is really a Kondo insulator, its energy gap should have a many-body origin. Then the temperature-dependent evolution of electronic structure is expected in both the bulk and surface bands, which can be measured by ARPES. We have investigated the topological properties of SmB6, based on the dynamical mean-field theory (DMFT) calculations [1] and the density-functional theory (DFT) slab calculations [2], and compared them with those of a similar mixed-valent system of golden phase SmS and other hexaboride systems.

[1] J. D. Denlinger, J. W. Allen, J.-S. Kang, K. Sun, J.-W. Kim, J.H. Shim, B. I. Min, Dae-Jeong Kim, Z. Fisk, arXiv:1312.6637.

[2] Junwon Kim, Kyoo Kim, Chang-Jong Kang, Sooran Kim, Hong Chul Choi, J.-S. Kang, J. D. Denlinger, B. I. Min, Phys. Rev. B 90(7), 075131 (2014).