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Spin- and angle-resolved photoemission on the first topological Kondo Insulator: SmB_6[1]

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The concept of a topological Kondo insulator (TKI) has been brought forward as a new class of topological insulators in which non-trivial surface states appear in the bulk Kondo band gap at low temperatures due to the strong spin-orbit coupling. Theoretical considerations have shown that SmB_6 is a promising candidate for the first realization of TKIs. In this contribution we will present comprehensive studies of the bulk and surface electronic structures of SmB_6. Using high-resolution angle-resolved photoemission spectroscopy (ARPES) we revealed that the two dimensional surface states reside within a bulk Kondo gap and form three Fermi surfaces in the surface Brillouin zone [1]. The odd number of surface bands crossing the Fermi level fulfills the necessary condition of topologically nontrivial surface states and is in good agreement with the theoretical prediction. Applying spin-resolved ARPES to SmB_6, we show that the energy bands of the surface states around the X bar points are spin-polarized. The spins of the surface states are locked to crystal momentum and the spin-helical structure fulfills the requirement of time-reversal symmetry [2]. Our results prove that SmB_6 is the first realization of strongly correlated topological Kondo insulator. We will also show the evolution of the bulk electronic structure from a metallic state at high temperatures to a Kondo insulating phase, and how the non-trivial states appear in the system [3].

[1] N. Xu *et al.*, Surface and bulk electronic structure of the strongly correlated system SmB_6 and implications for a topological Kondo insulator, Phys. Rev. B **88**, 121102 (rapid, editor's suggestion) (2013)

[2] N. Xu *et al.*, Direct observation of the spin texture in SmB_6 as evidence of the topological Kondo insulator, Nature Comms. **5**, 4566 (2014).

[3] N. Xu *et al.*, Exotic Kondo cross-over in a wide tempersture region in the toplogical Kondo insulator SmB_6 revealed by high-resolution ARPES, Phys. Rev. B **90**, 085148 (2014)

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