Spin- and angle-resolved photoemission on the first topological Kondo Insulator: SmB\textsubscript{6}\textsuperscript{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\textsubscript{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\textsubscript{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\textsubscript{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\textsubscript{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].


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