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Emergence of a coherent in-gap state in SmB_6 Kondo insulator revealed by scanning tunneling spectroscopy WEI RUAN, CUN YE, MINGHUA GUO, Tsinghua University, FEI CHEN, XIANHUI CHEN, USTC, GUANGMING ZHANG, YAYU WANG, Tsinghua University — SmB_6 is a Kondo insulator that exhibits transport anomalies at temperatures below 5 K, where resistivity saturates instead of diverging. It has long been ascribed to in-gap states which become coherent at low temperatures. Recently, a host of theoretical and experimental studies suggest that SmB_6 may be a topological Kondo insulator with topological protected metallic surface states. In this talk we present STM studies of the (001) surface of cleaved SmB_6 single crystal. We have observed four different kinds of surface morphologies with similar dI/dV spectra. Variable temperature dI/dV spectroscopy up to 60 K reveals a gap-like density of state suppression around the Fermi level, which is due to the hybridization between the itinerant Sm $5d$ band and localized Sm $4f$ band. At temperatures below 40 K, a sharp coherence peak emerges within the hybridization gap near the lower gap edge. We propose that the in-gap resonance state is due to a collective excitation in magnetic origin that is specific to the mixed valent Kondo insulator. Implications of these results to the electronic structure evolution and transport anomaly in SmB_6 will be discussed.

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