Evidence for intrinsic magnetic scatterers in the topological semimetal $(Bi_2)_5(Bi_2Se_3)_7$

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We report the synthesis and characterization of high-quality thin films of the topological semimetal $(Bi_2)_5(Bi_2Se_3)_7$. [1,2] Cryogenic magneto-transport experiments reveal strong metallic character and spin-orbit coupling in the films. By studying the temperature dependence of the electrical resistance of the topological semimetal, we observe a pronounced Kondo effect which points towards the presence of magnetic scatterers. [3,4] With the aid of density functional theory calculations we identify Bi vacancies as intrinsic magnetic scatterers in this topological semimetal.

References
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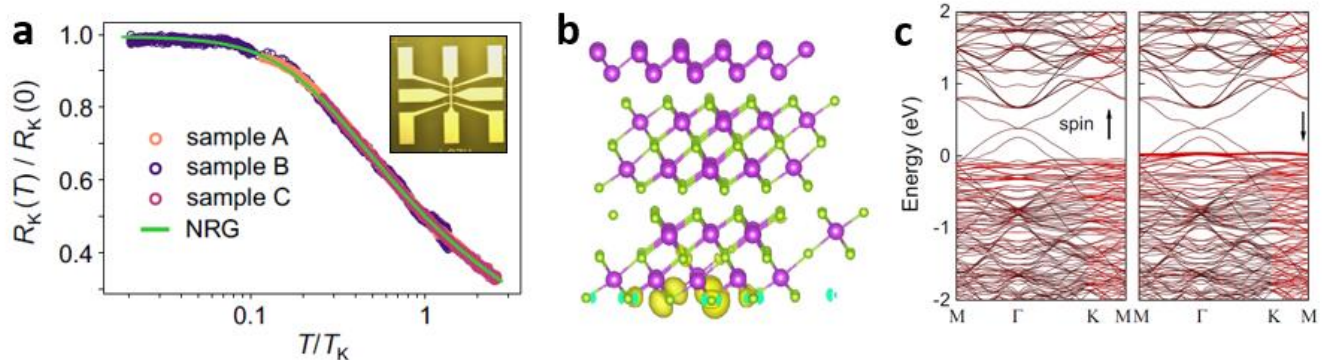
Figures

Figure 1: (**a**) Normalized Kondo resistivity as a function of temperature (normalized by the Kondo temperature) for samples A, B and C (open circles) together with the universal functional predicted by NRG calculations (green line). [4] Example device as inset image. (**b**) Atomic structure of a Bi2/(Bi2Se3)2 stack with a Bi vacancy in the bottom Bi2Se3 layer. The band-decomposed charge densities in the energy range between -0.02 and 0.03 eV are also shown in yellow. (**c**) Projected band structures of the system, for spin-up and spin-down electrons. The red lines correspond to the contributions from the 4p-Se orbitals around the Bi vacancy.