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Crystal growth and characterization of materials with topological properties in their bandstructure

Using the flux growth method we have synthesized single crystals of materials that are debated as candidates to hold topologically non-trivial electronic excitations. First, we have grown the systems Au2Pb. This system shows a huge magnetoresistance, with several structural transitions whose origin is still debated. The low temperature crystalline phase is orthorhombic and it becomes superconducting below 1,2K. We discuss the crystal growth process and present specific heat measurements, showing a large peak at the structural transition. We have also grown Ru2Sn3 crystals. This material is a 3D topological insulator, which, unlike the 3D topological insulators known until now, does not display radially isotropic Dirac cones. Instead, the Dirac cones are shaped, showing flat dispersion along high-symmetry directions of the crystalline structure. We describe the system and present resistivity vs temperature measurements showing the high quality of the obtained crystals. Finally, we discuss a new nanocalorimetry method, with which we aim to make fast characterizations of the crystals.

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